EFFECTIVENESS OF REMINDERS AND SOCIAL SUPPORT FRAMEWORK ON BIRTH AND HEALTH OUTCOMES AMONG HIV EXPOSED INFANTS IN NYAHURURU COUNTY REFERRAL HOSPITAL, KENYA

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Effectiveness of Reminders and Social Support Framework on Birth and Health Outcomes among HIV Exposed Infants in Nyahururu County Referral Hospital, Kenya

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DECLARATION

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

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DEDICATION

This work is dedicated to the following individuals: My son Robert Samal, my daughters Jackline Naro, Renet Namosing'o and Rufina Silale, Bishop Emeritus Virgilio Pante, and in loving memory of my late parents, Mr. Paul Long'olea and Catherine Naroo Tyoko.

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ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immunodeficiency Syndrome
ANC	Antenatal Clinic
APGAR	Appearance, Pulse, Grimace, Activity, and Respiration
APOs	Adverse Pregnancy Outcomes
ART	Antiretroviral Therapy
BFCI	Baby-Friendly Community Initiative
CD4	Cluster of Differentiation 4
CEO	Chief Executive Officer
DBS	Dried Blood Sample
DTG	Dolutegravir
EBF	Exclusive Breastfeeding
EFV	Efavirenz
EIBF	Early Initiation of Breastfeeding
EID	Early Infant Diagnosis
HEIs	HIV exposed Infants
HEU	HIV exposed Uninfected
HIV	Human Immunodeficiency Virus
HU	HIV unexposed
HUU	HIV unexposed Uninfected

LAZ	Length-for-Age
MTCT	Mother-to-Child Transmission
PCR	Polymerase Chain Reaction
PLWHA	Pregnant Women Living with HIV/AIDS
PMTCT	Prevention of Mother-to-Child Transmission
PROM	Premature Rupture of Membranes
SDG	Sustainable Development Goal
SMS	Short Message Service
SPSS	Statistical Package for Social Sciences
TPB	Theory of Planned Behavior
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNICEF	United Nations Children's Fund
WAZ	Weight-for-Age
WHO	World Health Organization
WLH	Women Living with HIV
WLWH	Women Living with HIV

DEFINITION OF OPERATIONAL KEY TERMS

ARV prophylaxis	The temporary administration of antiretroviral (ARV) drugs to both the mother and infant to mitigate mother-to-child transmission
Early infant diagnosis	This is the initial assessment for an infant born to an HIV positive mother, aimed at determining whether the infant has been exposed to or infected with the virus. It is conducted between six weeks and 18 months of age
Exclusive breast feeding	The practice of feeding an infant only breast milk for the first six months of life, with no other foods, liquids, or breast milk substitutes, including water
Exclusive formula feeding	Providing the infant solely with commercial infant formula milk during the first six months of life
Healthcare worker	Healthcare professionals stationed at the Maternal and Child Health (MCH) clinic encompass a range of roles within the healthcare sector, such as nurses, clinical officers, nutritionists, and community health workers
HIV exposed infant	An infant born to a mother known to be HIV positive with a negative result on HIV DNA PCR testing

HIV infected infant	HIV exposed infant testing positive on HIV DNA PCR
Mother to child transmission	The transmission of HIV from the mother to the infant, which can occur during pregnancy, childbirth, or breastfeeding
Replacement feeding	Feeding an infant who is not breastfeeding and is on a diet that provides all necessary nutrients suitable for the first six months of life

ABSTRACT

The reminder systems and social support mechanisms not only reduce antiretroviral therapy (ART) default rates but also ensure continuity of care, which is essential for improving both maternal and infant health outcomes. The role of short message service (SMS) reminders has significantly enhanced antenatal care (ANC) attendance, adherence to antiretroviral drugs (ARVs), viral suppression, and prevention of mother-to-child transmission (PMTCT) of HIV. In Kenya, mother-to-child transmission remains a concern, with Laikipia County showing a higher infection rate among infants. These trends highlight the urgent need for targeted interventions in Laikipia County to improve infant health outcomes. The objective of the study was to assess the effectiveness of reminders and the social support framework on birth and health outcomes among HIV exposed infants (HEIs) at Nyahururu County Referral Hospital in Laikipia County. A quasi-experimental design was used in this study. In addition, 220 HIV positive pregnant mothers attending the comprehensive care Centre were recruited. Systematic random sampling was used to select the respondents. Both primary and secondary data were collected using structured questionnaires. The collected data were analyzed using Statistical Package for Social Sciences (SPSS) software, version 28. Descriptive statistics, including frequencies and percentages, were used to summarize and organize the data. Correlation, regression and Chi- square statistic was used to test for association/relationship between variables and level of significance. All statistical tests of significance were conducted at a coefficient level of alpha less than 0.05 with the help of SPSS 2.5 for windows. Results showed that 63.1% of mothers in the reminder group adhered to three to four ANC visits, compared to 57.7% in the routine group. In addition, the study found that most mothers in both groups had spontaneous vaginal deliveries (96.4% in the reminders group), with fewer requiring medical interventions. Moreover, the findings showed that 77.7% of mothers in the reminder group practiced exclusive breastfeeding for six months, compared to 65.0% in the routine follow-up group, indicating. Moreover, the study found a significantly higher proportion of infants in the reminder group tested HIV negative (98.2%) compared to 95.0% in the routine group. Survivorship was also higher, with 95.5% of infants in the reminder group surviving past one year, compared to 86.0% in the routine follow-up group. The correlation coefficient of 0.78 signified a strong positive relationship between the use of on reminders and improved health outcomes for HIV exposed infants, including higher survival rates (p-value=0.000). The Chi-Square value of 20.8 reflected a significant association between the use of reminders and improved health outcomes for infants, underscoring the substantial impact of on reminders on enhancing infant health and survival rates (p-value=0.000). The study concludes that the use of reminders significantly enhances and infant health outcomes. The study recommends integrating structured reminder systems and social support into maternal and child health programs to improve adherence to ANC and ART, enhance birth outcomes, promote exclusive breastfeeding, and boost infant health and survival among HIV exposed populations.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Reminders and social support have been demonstrated to enhance maternal adherence to antiretroviral therapy (ART). Women living with Human Immunodeficiency Virus (HIV) are more likely to adhere to ART when they receive support from family members, friends, and healthcare providers, as such support increases motivation and reduces feelings of isolation (Wang *et al.*, 2020). Regular reminders, including phone messages, community health worker follow-ups, and peer support groups, help mothers remember clinic appointments and medication schedules. Improved adherence to ART during pregnancy and breastfeeding is critical in reducing the risk of mother-to-child transmission of HIV and improving maternal and infant health outcomes. Consequently, supportive interventions contribute significantly to the survival and wellbeing of HIV exposed infants.

Human Immunodeficiency Virus Exposed Infants (HEI) refers to infants born of an HIV positive mother (Tariq & Kasadha, 2022). This category of infants is at a greater risk of facing complications as, HIV infections, prematurity, low weight, or sepsis. According the World Health Organization (WHO) (2023), the prevalence of HIV infection among infants born to HIV positive mothers is 5.5% (WHO, 2023). With lack of proper treatment and care, a significant number of HIV infected children die before the age two years, with more than 50% dying before the age of two years and a peak mortality at early infancy (Prendergast & Evans, 2023).

Infants exposed to Human Immunodeficiency Virus (HIV) who do not receive timely HIV testing, antiretroviral therapy (ART), and appropriate healthcare services face a significantly higher risk of early mortality, particularly in the absence of prompt diagnosis and treatment (Ameyaw *et al.*, 2024). These challenges negatively affect maternal and infant health outcomes among HIV exposed infants (HEIs). Due to their weakened immune systems, HEIs are highly susceptible to infections such as respiratory, gastrointestinal, and invasive bacterial diseases (Kawuma *et al.*, 2021).

Additionally, poor maternal health, inadequate nutrition, and insufficient infant care contribute to malnutrition, growth failure, and stunting, particularly in Sub-Saharan Africa where these conditions remain prevalent (United Nations Children's Fund, 2020).

Despite the availability of effective measures, like ART during pregnancy, childbirth, and breastfeeding, numerous challenges continue to hinder elimination of MTCT (Tariq & Kasadha, 2022). These include poor ART adherence, limited maternal healthcare access, late diagnosis, and inadequate HIV testing services. According to Sustainable Development Goal (SDG) Target 3.3, ending the AIDS epidemic by 2030 includes eliminating MTCT as a priority (Luo & Vojnov, 2022). To address these gaps, strategies such as reminder systems and strong social support networks have proven effective in reducing default rates and improving care outcomes. ART non-adherence increases viral load, which significantly raises the risk of HIV transmission during pregnancy and lactation (Slogrove & Powis, 2021).

Digital interventions, such as SMS reminders and automated calls, directly support maternal and infant health outcomes among HIV exposed infants by promoting timely adherence to antiretroviral therapy (ART) and encouraging consistent attendance at clinic appointments (Fassinou *et al.*, 2024). The intervention comprises two key components: reminders and social support frameworks. Reminders include scheduled SMS messages, phone calls, or notifications that alert mothers about medication schedules, upcoming antenatal care (ANC) visits, postnatal check-ups, and infant immunizations (Luo & Vojnov, 2022). The social support framework involves structured assistance from family members, peer support groups, and community health workers, providing psychosocial encouragement, health education, and guidance on infant care (Slogrove & Powis, 2021).

1.1.1 Global Perspective

In the United States, Rendell et al. (2022) observed that reminder systems and social support mechanisms not only reduce ART default rates but also ensure continuity of care, which is critical for improving both maternal and infant health outcomes. These interventions assist mothers in remembering clinic appointments, adhering to

medication schedules, and accessing essential postnatal services, thereby lowering the risk of mother-to-child transmission of HIV and promoting healthy infant growth and development. Similarly, in Indonesia, Subandi (2023) found that reminder systems significantly enhance ART adherence among pregnant and breastfeeding women, improving retention in care and overall maternal wellbeing.

In China, Luo and Vojnov (2022) reported that SMS reminders contribute to viral suppression in mothers, reducing the risk of HIV transmission and supporting consistent infant care. These findings demonstrate the global effectiveness of combining digital reminder systems with social support interventions to improve health outcomes among HIV-exposed infants. Across these diverse settings, the evidence highlights that integrating technological tools with caregiver support strengthens adherence, promotes timely clinic attendance, and enhances both maternal and infant health outcomes.

1.1.2 Regional Perspective

In Ghana, Ameyaw et al. (2024) observed that social support plays a significant role in promoting adherence to antiretroviral therapy (ART) and encouraging retention among HIV-positive pregnant women. Such support systems, including family involvement, peer networks, and community-based initiatives, help mothers navigate the challenges of ART adherence and ensure consistent engagement with healthcare services. Similarly, in Uganda, Sabin et al. (2020) emphasized the importance of timely follow-up visits for HIV-exposed infants (HEIs), which are critical for growth monitoring, early HIV screening, immunizations, and the management of readily treatable infections. Despite the recognized benefits, many mothers fail to attend these essential health visits due to barriers such as high costs, long distances to healthcare facilities, and the absence of effective caregiver support systems.

To address these challenges and improve attendance rates for infant health check-ups, interventions such as SMS and automated phone reminder systems have been implemented. Studies in Uganda have shown that sending SMS reminders to caregivers significantly increases the likelihood of attending scheduled immunization and HIV testing appointments (Kawuma et al., 2021). These digital reminder systems

serve as cost-effective, scalable solutions to strengthen follow-up care, reduce missed appointments, and enhance overall health outcomes for HEIs. By combining social support with technological interventions, healthcare programs can more effectively promote retention in care and improve early detection and treatment of HIV-related health issues.

1.1.3 Local Perspective

As noted by Abbo (2022), the implementation of reminder systems aids in the reduction of lost chances for an HIV assessment in different parts of Kenya, allowing for faster detection and swift action, which helps in HIV prevention and protects the health of the child. Although reminder systems have helped with increased engagement in health care, the primary effects on birth results, including low birth weight, preterm births, and infections, are yet to be fully understood (Mogaka *et al.*, 2023). Nonetheless, improved ART compliance and greater attendance at prenatal clinics due to reminder systems improve maternal health and, in all likelihood, the birth outcomes of infants that are vulnerable to HIV.

In Kenya, some of the peer support groups and community health worker programs indeed provided psychosocial support, which increased maternal ART adherence and infant health outcomes (Mogaka *et al.*, 2023). These supportive interventions combining community health workers with peer counseling have proven to be very helpful in alleviating the adverse effects of stigma on health among HIV infected infants. These programs also help mothers with postnatal care and health education, which improves the child's survival and development for HIV exposed infants (Abbo, 2022).

HIV exposed infants face significant health risks, including HIV transmission, stunted growth, developmental delays, and other complications. In Laikipia County, 7.9% of children were infected with HIV in 2022, with a 4.1% transmission rate at 6 weeks, which could contribute to increased infant mortality linked to HIV (Mwangi *et al.*, 2019). Barriers such as inadequate healthcare access, poor adherence to treatment, and inconsistent follow-up care exacerbate these challenges

Despite global recognition of the importance of reminder systems and social support frameworks in improving maternal ART adherence and health outcomes for HIV exposed infants (HEIs), gaps still exist in both practice and theory. Many interventions have demonstrated positive outcomes in other regions, such as Uganda, Ghana, and Indonesia (Ameyaw *et al.*, 2024; Subandi, 2023; Sabin *et al.*, 2020). However, there is limited localized empirical evidence assessing their effectiveness in the Kenyan context, particularly in rural health facilities like Nyahururu Sub-County.

The discussion highlights the persistent challenges affecting maternal adherence to antiretroviral therapy and the health outcomes of HIV exposed infants despite the availability of prevention and treatment interventions. Although reminder systems and social support frameworks have shown promise in improving treatment adherence and clinic attendance in several countries, their effectiveness in improving maternal and infant health outcomes, including antenatal care utilization, birth outcomes, breastfeeding practices, and infant survivorship, remains inadequately documented in many local contexts. In Kenya, and particularly in facilities such as Nyahururu County Referral Hospital in Laikipia County, limited empirical evidence exists on how these interventions influence care continuity and infant health outcomes.

In Laikipia County, interventions to improve maternal and infant health outcomes among HIV exposed infants have primarily focused on prevention of mother-to-child transmission (PMTCT) programs, routine antenatal care (ANC) services, provision of antiretroviral therapy (ART), immunizations, and nutritional support (Wanjohi & Makunyi, 2022). Health facilities, including Nyahururu County Referral Hospital, have implemented standard measures such as scheduled clinic visits, health education sessions, growth monitoring, and early infant diagnosis (EID) to reduce HIV transmission and improve infant survival. Despite these measures, challenges persist, including missed appointments, ART non-adherence and insufficient support, which compromise both maternal and infant outcomes. These gaps highlight the need for targeted interventions like reminder systems and structured social support frameworks, which could strengthen adherence, timely care, and ultimately improve the birth and health outcomes of HIV exposed infants.

1.2 Statement of the Problem

Globally, about 1.5 million infants are born to HIV positive mothers each year, with 90% of these births occurring in Sub-Saharan Africa, where the burden of HIV is greatest (UNAIDS, 2021). Despite ART's proven effectiveness, 300,000 to 400,000 infants are still born into HIV positive environments annually due to inadequate ART access, weak healthcare systems, and low maternal adherence (UNAIDS, 2020). Sub-Saharan Africa continues to bear the greatest burden of HIV exposure among infants, accounting for roughly 90% of global cases, with over one million infants born to HIV positive mothers each year (UNICEF, 2020).

The prevalence of HIV among pregnant women in the region ranges from 10% to 30% depending on the locality, fueling the high number of HIV exposed infants (UNAIDS, 2021). Although antiretroviral therapies (ART) are widely promoted, their effectiveness is often undermined by poor access and inconsistent adherence (Ameyaw *et al.*, 2024). In areas where ART coverage is incomplete, vertical transmission rates can reach between 15% and 45% (WHO, 2021). In 2020, Sub-Saharan Africa, more 160,0000 infants were newly infected (UNAIDS, 2021). In East Africa, the prevalence of HIV infection among HIV exposed infants (HEIs) stands at 7.68%, highlighting the persistent challenge of preventing mother-to-child transmission (Belachew, Tewabe & Malede, 2020).

In Kenya, the mother-to-child transmission (MTCT) rate of HIV is 6.1%, meaning that over six infants per 100 HIV positive mothers are born with the virus. Laikipia County exhibits a higher burden, with 7.9% of children infected in 2019 and a 4.1% HIV transmission rate at six weeks of age, posing a serious threat to infant survival (Mwangi *et al.*, 2019). At Nyahururu County Referral Hospital, many HIV positive mothers miss critical antenatal care (ANC) appointments, early infant diagnosis (EID), and postnatal follow-up, which compromises timely ART adherence and infant health monitoring.

A survey by Makokha *et al.* (2018) found that community-led interventions in Laikipia County increased ANC attendance, HIV testing, and reduced MTCT by improving awareness, accessibility of PMTCT services, and reducing stigma through local

support networks. However, only about 9% of mothers reported receiving reminders via SMS or other digital platforms, leaving a large proportion without guidance for clinic attendance and treatment adherence. Similarly, Mogaka *et al.* (2023) showed that point-of-care EID improves HIV exposed infants' health outcomes through faster diagnosis, prompt treatment, and better retention in care.

These findings highlight a critical gap at Nyahururu County Referral Hospital in the use of reminders and structured social support frameworks. Evaluating the effectiveness of these interventions is therefore essential to improve maternal adherence to ART, timely clinic attendance, and the health outcomes of HIV exposed infants, including growth, immunization completion, and HIV free survival. This study seeks to provide localized evidence on whether reminders and social support can enhance maternal and infant health outcomes in this specific setting.

1.3 Justification of the Study

This study aimed to explore interventions, particularly reminders and social support frameworks, to improve maternal adherence to antiretroviral therapy (ART) and health outcomes for HIV exposed infants. Social support from healthcare providers, families, and peer networks enhances maternal motivation, reduces emotional burden, and encourages timely care seeking, while digital technologies such as SMS reminders and automated calls support adherence to treatment plans and clinic attendance. Despite evidence of effectiveness elsewhere, the impact of these low-cost, scalable interventions remains under-researched in resource-limited settings like Nyahururu County.

The study's outcomes include improved maternal ART adherence, increased antenatal and postnatal clinic attendance, timely early infant diagnosis, enhanced immunization completion, and improved infant growth and survival. Beneficiaries include HIV positive mothers and their infants, who will experience better health outcomes, healthcare providers, who will gain practical strategies to improve service delivery and retention in care, and policymakers, who can use the evidence to guide resource allocation and intervention planning. Evaluating these interventions provides a rationale for integrating reminders and structured social support into routine HIV care,

demonstrating how accessible and low-cost strategies can effectively improve adherence, continuity of care, and overall maternal and infant health outcomes in a local context.

This study is significant because it aligns with both national and global health priorities. At the national level, it supports the Kenya National AIDS Strategic Plan (2023/24–2027/28), which emphasizes strengthening prevention of mother-to-child transmission (PMTCT), retention in care, and improving maternal and infant health outcomes. Globally, the study contributes to achieving Sustainable Development Goal (SDG) 3.3, which targets ending the AIDS epidemic by 2030, and aligns with WHO guidelines on HIV care for pregnant women and HIV exposed infants, emphasizing early diagnosis, treatment adherence, and continuous follow-up. By evaluating reminders and social support frameworks, the study generates evidence on accessible, low-cost interventions that can accelerate progress toward these national and global targets.

The study benefits multiple stakeholders. HIV positive mothers gain improved adherence to ART, timely antenatal and postnatal care, and better health outcomes for themselves and their infants. HIV exposed infants benefit from enhanced growth, immunization completion, reduced risk of HIV infection, and overall improved survival. Healthcare providers gain practical strategies to increase retention, adherence, and continuity of care, while policymakers and program managers receive evidence to inform resource allocation and integration of reminder and support interventions into routine HIV care. Overall, the study promotes improved maternal and infant health outcomes in resource-limited settings like Nyahururu County.

1.4 Research Questions

1. How effective are reminders and social support frameworks in improving level of adherence to antenatal care services and antiretroviral therapy among HIV positive pregnant mothers attending Nyahururu County Referral Hospital?
2. How effective are reminders and social support frameworks in improving maternal and birth outcomes among HIV positive pregnant mothers and their newborns at Nyahururu County Referral Hospital?

3. How effective are reminders and social support frameworks in influencing breastfeeding practices of HIV positive mothers six months post-delivery at Nyahururu County Referral Hospital?
4. How effective are reminders and social support frameworks in improving health outcomes and survivorship of infants born to HIV positive mothers at Nyahururu County Referral Hospital?

1.5 Study Objectives

1.5.1 Broad Objective

To determine effectiveness of reminders and social support framework on birth and health outcomes among HIV exposed infants in Nyahururu County Referral Hospital, Laikipia County.

1.5.2 Specific Objectives

1. To evaluate effectiveness of reminders and social support framework on adherence to antenatal care services and antiretroviral therapy among HIV positive pregnant mothers on reminders and on routine follow-up attending Nyahururu Referral County Hospital.
2. To determine effectiveness of reminders and social support framework on maternal and birth outcomes among HIV positive pregnant mothers and their newborns on reminders and on routine follow-up in Nyahururu County Referral Hospital.
3. To assess the effectiveness of reminders and social support framework on the breastfeeding practices of HIV positive mothers six months post-delivery on reminders and on routine follow-up in Nyahururu County Referral Hospital.
4. To determine the effectiveness of reminders and social support framework on health outcomes and survivorship of infants born of HIV positive mothers on reminders and on routine follow-up in Nyahururu County Referral Hospital.

1.6 Theoretical Framework

The effectiveness of reminders and social support in improving birth and health outcomes among HIV exposed infants can be understood through several key theoretical frameworks, particularly those that emphasize behavioral change, social influence, and health-related behaviors. The Health Belief Model (HBM) suggests that individuals' health-related behavior is influenced by their perceptions of the severity of a health threat and the benefits of taking action (Green *et al.*, 2020). In relation to HIV exposed infants, reminders (such as text or phone reminders) can strengthen perceived susceptibility and severity, while social support can reinforce the benefits of taking preventive actions (Kyando *et al.*, 2024).

Reminders can help increase the perceived danger of failing to prevent the spread of HIV, highlighting the severity of the risks involved. This heightened awareness can motivate caregivers to adopt the correct health behaviors to protect both the infant and themselves (Nkhonjera *et al.*, 2021). Additionally, social support from family members, healthcare providers, and peer groups can serve as a powerful motivator for caregivers to adhere to recommended health practices. Kyando *et al.* (2024) indicated that by strengthening caregivers' belief in their ability to succeed with protective measures, such as timely breastfeeding, social support encourages consistent care and improves overall health outcomes for HIV exposed infants.

Albert Bandura's social cognitive theory emphasizes the significance of observational learning, self-efficacy, and social influence to health behaviors (Bandura, 2023). This found that individuals learn and enact behaviors through observing others and receiving feedback in terms of reinforcement for what they did. Reminders serve as environmental cues to behavior, which reinforce and sustain the actions of caregivers and parents in managing HIV exposed infants (Boruchovitch, 2023). Social Support is significant in modeling behaviors because caregivers may observe others (e.g., family, healthcare providers, peer networks) implement suggested practices to promote infant health outcomes.

The Theory of Planned Behavior (TPB) proposes that attitudes, subjective norms (social pressure), and perceived behavioral control have an effect on intention to engage in a behavior (Ajzen, 1991). Reminders, under the theory, have the potential to influence attitudes and perceived control, while social support has the potential to influence subjective norms and enhance the intention to act. Reminders influence the caregiver's attitude by encouraging timely information reminding them about the importance of preventive actions (e.g., adherence to ART, immunization). Social Support (e.g., from family or healthcare workers) enhances perceived social approval and reinforces medical advice compliance, thereby leading to positive health effects among HIV exposed infants.

Social support theory focuses on the psychological and functional assistance provided by other individuals in an individual's social support system, which assists in reducing stress and improving health outcomes (Jolly *et al.*, 2021). Support can be emotional, informational, or instrumental in type. Social Support as emotional support, encouragement, and guidance from health professionals and social networks (support groups and family) can enhance caregivers' mental health and adherence to healthcare behaviors (early diagnosis and ART adherence). Reminders are a form of informational support that motivates caregivers to stay on track with needed healthcare behaviors for HIV exposed infants.

Ecological systems theory suggests that human development is influenced by many systems within the environment, including the microsystem (family), mesosystem (interactions between family and health care providers), ecosystem (policy), and macrosystem (cultural beliefs) (Bronfenbrenner, 1979). Ecological Systems Theory emphasizes the interrelatedness of environmental forces in creating health outcomes. Social Support is one of the key elements of the microsystem (family support) and mesosystem (healthcare networks) that influence the capacity of caregivers to comply with health regulations for HIV exposed infants. Reminders are effective at the microsystem and can be tailored to caregivers based on their specific setting.

1.7 Conceptual Framework

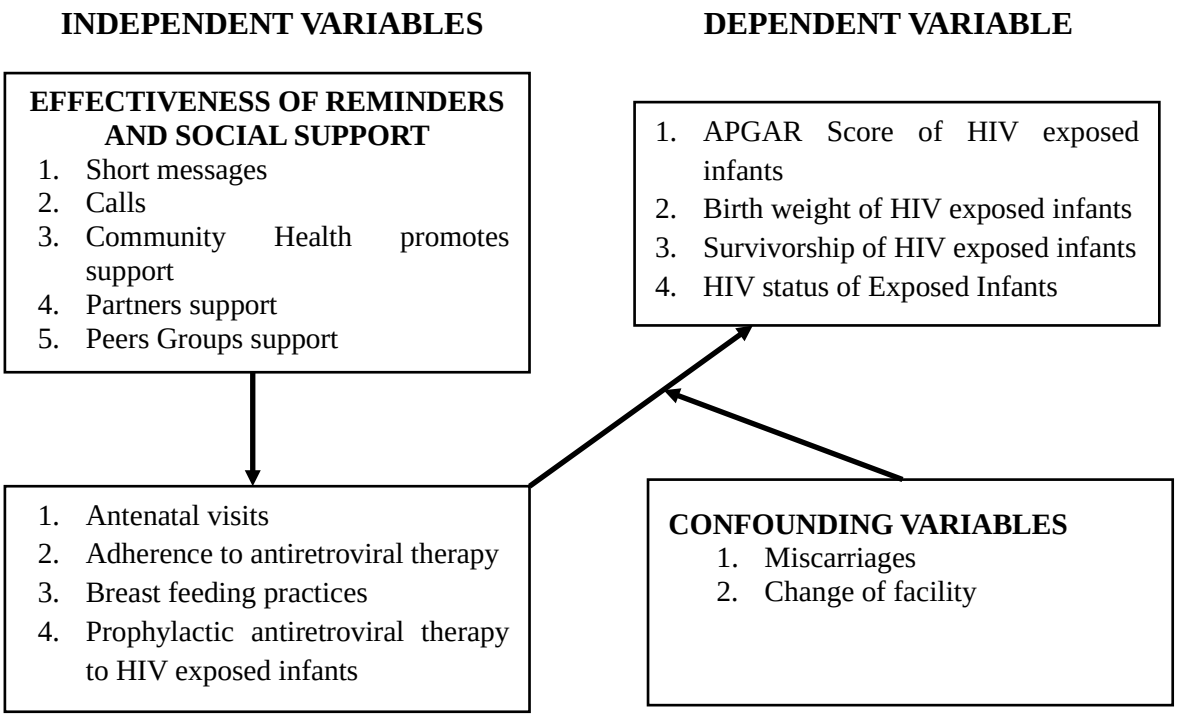

Figure 1. 1: Conceptual Framework

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews existing literature relevant to the study on the effectiveness of reminders and social support frameworks in improving maternal and infant health outcomes among HIV exposed infants. The review explores how these interventions influence adherence to antenatal care (ANC) services and antiretroviral therapy (ART), maternal and birth outcomes, breastfeeding practices, and infant health and survivorship. It synthesizes evidence from global and local studies, highlighting successful strategies, challenges, and gaps in current knowledge.

2.2 Reminders and Social Support Framework and Adherence to ANC services and ART among HIV positive mothers

Adherence to antenatal care (ANC) services and antiretroviral therapy (ART) among HIV positive mothers is crucial for preventing mother-to-child transmission (MTCT) and safeguarding maternal and infant health (Guta *et al.*, 2024). Regular ANC visits enable HIV screening, counseling, and monitoring, while consistent ART maintains viral suppression, reducing transmission risk during pregnancy, labor, and breastfeeding (Agabu *et al.*, 2020). However, adherence is often affected by stigma, lack of partner support, transport barriers, and limited awareness. The Reminder and Social Support Framework, including SMS messages, phone calls, and app alerts, has been applied to address these challenges, promoting timely clinic visits, ART adherence, and infant testing (Abbo, 2022; Mogaka *et al.*, 2023).

In Indonesia, Apriani (2022) conducted a qualitative study to explore the types and roles of social support experienced by pregnant women living with HIV/AIDS (PLWHA) in Cilacap District. Using a phenomenological approach and thematic analysis, the study identified four major themes from interviews with pregnant women and their family members: pregnant women often feel insecure and emotionally distressed about their HIV status; families generally demonstrate acceptance of the women’s condition; both families and pregnant women express a need for stronger

support from healthcare providers; and there is a desire for structured systems, such as On reminders, to help ensure consistent ARV adherence.

In South Africa, Dube-Pule *et al.* (2021) evaluated the effectiveness of an SMS-based mobile health (mHealth) intervention in enhancing adherence to infant antiretroviral (ARV) prophylaxis and improving the uptake of early infant diagnosis (EID) and PMTCT practices. Among the 251 mothers enrolled, 73.3% of infants received HIV PCR testing at 10 weeks postpartum—a rate notably higher than typically reported in national studies, though not statistically significant compared to the district's data at the time. The intervention helped address gaps in maternal knowledge regarding EID timing and highlighted challenges in the implementation of PMTCT protocols. High-risk mothers tended to be younger, initiated antenatal care later, had less knowledge of prophylaxis, and delivered lower-birthweight infants.

Mubiana-Mbewe *et al.* (2021) evaluated the impact of an Enhanced Adherence Package (BEAP) on early antiretroviral therapy (ART) uptake among HIV positive pregnant women in Lusaka, Zambia, using a randomized controlled trial. BEAP incorporated reminders and social support interventions, including phone calls, home visits, counseling, male partner involvement, and missed-visit follow-up. ART initiation within 30 days was nearly universal (98.2%), and per-protocol analysis showed better adherence in the BEAP group (91.9% vs. 80.4%). Complementing this, Kanguya *et al.* (2022) identified social and relational barriers, such as fear of disclosure and divorce, while partner support and maternal motivation strongly facilitated adherence, highlighting the importance of holistic reminder and social support strategies for successful PMTCT programs.

In Central Ethiopia, Wondimu *et al.* (2020) investigated adherence to Option B+ PMTCT care among 347 HIV positive pregnant women across 12 health facilities. Overall adherence was 80.2%, which was inadequate for optimal viral suppression. Higher adherence was associated with early ART initiation, reduced stigma, ANC attendance, male partner support, and counseling—highlighting the importance of social support in promoting adherence. Similarly, in Western Uganda, Tusabe *et al.* (2024) found that among 380 HIV positive pregnant refugee women in Kyangwali

Refugee Camp, 27.4% were non-adherent despite high ART usage (98.7%). Non-adherence was linked to late PMTCT initiation, lack of decision-making support, and negative healthcare experiences. Both studies underscore the need for reminders and structured social support frameworks to overcome social, behavioral, and systemic barriers and improve maternal and infant health outcomes.

In Kenya, Abuogi *et al.* (2022) assessed the effectiveness of behavioral interventions—community-based mentor mothers (cMM) and text messaging—on postpartum retention in HIV care and adherence to antiretroviral therapy (ART) among pregnant women living with HIV (WLWH). While intention-to-treat analysis showed no significant difference in retention at 12 months postpartum, time-to-event analysis indicated that women in the combined cMM and text messaging arm had lower rates of loss to follow-up. Per-protocol analysis showed significantly improved retention among women who received more than 80% of the intervention, though ART adherence did not vary by study arm. Similarly, Abdihakim (2023) examined psychosocial and demographic influences on ART adherence among pregnant women at Mbagathi and Kenyatta National Hospitals. While adherence was sub-optimal (78.8%), anxiety, depression, and social support were not significantly associated. However, higher education level was significantly linked to better adherence, emphasizing its role in improving health outcomes.

2.3 Reminders and Social Support Framework and Maternal and birth outcomes among HIV positive pregnant mothers

Adherence to recommended HIV care among HIV positive mothers is crucial for ensuring positive maternal and birth outcomes, including reduced pregnancy complications, healthy gestational age, and optimal birth weight (Shafiq *et al.*, 2021). Regular follow-up allows for early detection and management of maternal health issues, continuous monitoring, and timely HIV-related interventions (Matthews *et al.*, 2023). However, maternal and birth outcomes can be negatively affected by stigma, limited partner or family support, distance to health facilities, medication side effects, and low awareness of treatment importance (Prendergast & Evans, 2023). Reminders and structured social support frameworks, such as SMS alerts, phone calls, peer

counseling, and family engagement, can help mothers adhere to recommended care schedules, thereby improving both maternal health and birth outcomes for their infants.

In addition, Mabachi *et al.* (2021) explored the design preferences for SMS messages intended to support prevention of mother-to-child transmission (PMTCT) care among pre- and post-partum women living with HIV and their male partners. The participants expressed a preference for ART adherence messages that were deliberately vague (low verbal immediacy), anonymous, and personalized in terms of timing and frequency. Contrary to some previous research, ambiguity in messaging was favored over personalization of message content for privacy concerns. However, for clinic appointment reminders and retention in care, participants preferred messages that were direct (high verbal immediacy), mentioned the baby, and came from identifiable clinical sources.

In Guinea-Bissau, Rasmussen *et al.* (2020) assessed HIV prevalence, associated risk factors, PMTCT treatment coverage, and the impact of maternal HIV on birth outcomes. Among 24,107 pregnant women, HIV-1 prevalence was 3.3%, HIV-2 0.8%, and HIV-1/2 dual infection 0.9%, with a significant decline over time. HIV infection was more prevalent among older women and certain ethnic groups. Although 85% of HIV-infected women received ART for PMTCT, coverage during labor and delivery declined, leaving 22% of infants without treatment. Furthermore, 67% of HIV-2-infected mothers and 77% of their infants received ineffective regimens. The study highlights the potential role of reminders and social support interventions, such as SMS alerts, counseling, and family engagement, to improve ART adherence, ensure timely maternal treatment, and optimize birth outcomes for HIV exposed infants.

In Botswana, Zash *et al.* (2021) examined the impact of maternal weight and weight gain during pregnancy on adverse birth outcomes among women living with HIV who conceived while on antiretroviral therapy (ART), assessing differences by ART regimens, including dolutegravir (DTG) and efavirenz (EFV). The study found that low baseline maternal weight was associated with higher risks of very preterm delivery and very small-for-gestational-age (SGA) infants, while high baseline weight increased the risk of macrosomia and maternal hypertension. Second-trimester weight

gain showed weaker associations. These findings underscore the importance of interventions, including reminders and social support frameworks, to ensure regular monitoring, adherence to ART, nutrition counseling, and clinic attendance, which can help mitigate risks associated with maternal weight and improve maternal and birth outcomes.

Fentie *et al.* (2022) assessed the prevalence of adverse birth outcomes and identified associated risk factors among HIV positive mothers who gave birth in referral hospitals in northwest Amhara, Ethiopia. Among 590 HIV positive mothers, 21% experienced adverse birth outcomes. Significant associated factors included a history of spontaneous abortion, premature rupture of membranes (PROM), opportunistic infections, pre-pregnancy BMI under 18.5, MUAC under 23 cm, and having fewer than four antenatal care visits. The study highlights the importance of nutritional support, infection prevention, and adequate antenatal care to reduce adverse outcomes among HIV positive pregnant women. Additionally, the use of reminders and structured social support frameworks, such as SMS alerts, counseling, and family engagement, can improve adherence to antenatal care schedules, enhance maternal monitoring, and support timely interventions, further reducing the risk of adverse maternal and birth outcomes.

2.4 Reminders and Social Support Framework and Breastfeeding Practices of HIV Positive Mothers Six Months Post-Delivery

Breastfeeding practices among HIV positive mothers six months post-delivery are guided by national and international recommendations that promote exclusive breastfeeding for the first six months, provided the mother adheres to antiretroviral therapy (ART) (Augustino *et al.*, 2024). Exclusive breastfeeding, along with consistent ART use, significantly reduces the risk of postnatal HIV transmission while providing essential nutritional and immunological benefits to the infant (Theunissen, 2020). Adherence to safe breastfeeding practices can be influenced by stigma, fear of transmission, socio-cultural beliefs, and access to counseling and support (Ashipala *et al.*, 2021). Reminders and structured social support frameworks, such as SMS alerts, phone calls, peer counseling, and family engagement, can reinforce adherence,

encourage timely follow-up visits, and provide ongoing education, thereby improving exclusive breastfeeding practices and overall maternal and infant health outcomes.

In Kilimanjaro, Tanzania, Philemon *et al.* (2022) assessed adherence to optimal breastfeeding practices among HIV positive mothers in the PMTCT program across 37 clinics, focusing on early initiation of breastfeeding (EIBF), exclusive breastfeeding (EBF), and continued breastfeeding up to one year. Among 524 mother-child pairs, 73.1% achieved EIBF, while factors such as cesarean delivery, low birth weight, and lack of partner disclosure were significant barriers. The study highlighted that the use of reminders, such as SMS alerts for clinic visits and infant check-ups, and structured social support from healthcare providers and peer groups improved adherence to EIBF and EBF. Approximately 19% of mothers did not practice EBF, and 43.3% of children over 12 months stopped breastfeeding early. Counseling on ARVs, prior pregnancies while HIV positive, and EBF, coupled with reminders and ongoing social support, were associated with continued breastfeeding.

In a separate study, Augustino *et al.* (2024) explored barriers to exclusive breastfeeding (EBF) among HIV positive mothers in Dar es Salaam and revealed individual, household, and community obstacles, such as postpartum depression, food insecurity, non-disclosure of HIV status, and poor retention in PMTCT programs. The study emphasized that reminders, including SMS alerts and phone calls for clinic appointments, along with structured social support from healthcare providers, peer counselors, and family networks, could help mothers overcome these barriers. Such interventions improved adherence to EBF, facilitated timely follow-up visits, and provided ongoing guidance, ultimately enhancing maternal confidence, infant nutrition, and overall maternal and infant health outcomes.

In Cape Town, South Africa, Theunissen (2020) evaluated early infant breastfeeding practices and identified predictors of breastfeeding cessation among HIV positive mothers on universal ART and HIV-negative mothers. This prospective cohort study followed 872 breastfeeding mother-infant pairs 461 HIV exposed uninfected (HEU) and 411 HIV-unexposed (HU) over 925 person-years. Findings showed that exclusive breastfeeding (EBF) was initiated by 86% of mothers, with higher rates among HEU

infants (91%) compared to HU infants (81%). However, the median duration of EBF was short at 1.4 months, and overall breastfeeding ended earlier among HEU infants (3.9 months) compared to HU (9.0 months). The study highlighted those interventions such as SMS reminders, phone follow-ups, and structured social support from healthcare providers and peer networks could promote adherence to recommended breastfeeding practices, encourage timely follow-up visits, and extend EBF duration, ultimately improving maternal and infant health outcomes.

In Koibatek Sub-County, Samburu *et al.* (2020) evaluated the effectiveness of the Baby-Friendly Community Initiative (BFCI) in promoting exclusive breastfeeding (EBF) among HIV-negative and HIV positive mothers. The intervention included structured social support through community health volunteers, peer counseling, and home visits, as well as regular reminders via SMS and phone calls to reinforce adherence to recommended breastfeeding practices. The study found that at six months postpartum, HIV-negative mothers in the BFCI intervention arm had significantly higher EBF rates (81.7%) compared to the control group (42.2%). Among HIV positive mothers, EBF rates were higher in the intervention group (81.8%) versus the control group (58.4%), though not statistically significant. The intervention also improved maternal knowledge and attitudes toward EBF for HIV exposed infants.

2.5 Reminders and Social Support Framework and Health Outcomes and Survivorship of Infants Born of HIV Positive Mothers

The health outcomes and survivorship of infants born to HIV positive mothers are closely linked to the mother's adherence to antiretroviral therapy (ART) and the timely use of preventive measures to reduce mother-to-child HIV transmission (Philemon *et al.*, 2022). With effective ART, early infant testing, and interventions that include structured reminders and social support frameworks, the risk of HIV transmission can be significantly reduced, ensuring better health outcomes for the child (Theunissen, 2020). Infants born to HIV positive mothers who receive appropriate care, such as postnatal prophylaxis, regular follow-up, and support through SMS reminders, phone calls, peer counseling, and family engagement, are less likely to develop HIV (Abdihakim, 2023). Challenges such as delayed diagnosis, limited healthcare access,

and underlying conditions can still affect infant health, but early intervention, consistent monitoring, and a supportive healthcare environment that integrates reminders and social support are key to improving survival rates and promoting long-term health for these infants.

2.5.1 Health outcome among HIV Exposed Infants

Early initiation of antiretroviral therapy (ART) for mothers and prophylactic treatments for infants significantly improve health outcomes for HIV exposed infants, including decreased mortality and better physical development. Interventions such as early infant diagnosis (EID) and cotrimoxazole prophylaxis further enhance health and reduce the risk of death, especially in resource-limited settings. In addition, structured reminders, such as SMS alerts and phone follow-ups, along with social support frameworks involving peer counseling, family engagement, and guidance from healthcare providers, have been shown to improve adherence to ART and follow-up care. In South Africa, research has shown that ART during pregnancy and breastfeeding significantly improves the health of HIV exposed infants, resulting in decreased mortality and better physical development (Goga *et al.*, 2018). This underscores the importance of early ART initiation, consistent adherence, and supportive interventions in reducing HIV transmission and improving infant health.

Further research from Malawi demonstrated that early initiation of cotrimoxazole prophylaxis, an affordable antibiotic, was associated with improved health outcomes among HIV exposed neonates, including lower mortality rates and better physical development (Phiri *et al.*, 2019). The study also noted that the use of reminders, such as SMS alerts for clinic visits, combined with structured social support from healthcare providers, peer counselors, and family members, reinforced adherence to prophylaxis and follow-up schedules, further enhancing infant health. Additionally, studies emphasizing early infant diagnosis (EID) and timely initiation of ART for HIV positive infants, such as one conducted in Uganda, confirm that early ART initiation leads to improved health status and reduced mortality rates (Kiyaga *et al.*, 2019). Together, these findings underscore the critical role of early interventions, reminders, and social support in ensuring the well-being of HIV exposed infants.

In Nairobi County, Kiilu (2021) examined health outcomes of infants enrolled in early infant diagnosis (EID) services for HIV in selected hospitals, focusing on factors influencing HIV positivity, infant survival, and nutritional status. The study found an HIV incidence rate of 9 cases per 100 person-years among infants over one year. Non-disclosure of HIV status significantly increased the risk of infant HIV positivity, while stunting was the most common form of malnutrition, linked to maternal underweight. The study emphasized that structured social support from healthcare providers, peer counselors, and family members could improve adherence to clinic visits, ART, and nutritional interventions, thereby enhancing infant survival and growth outcomes. Younger maternal age (18–24 years) and recent HIV diagnosis (≤2 years) were also associated with poorer infant survival outcomes.

In another study, Neary *et al.* (2022) compared growth outcomes, including stunting and poor growth, between HIV exposed uninfected (HEU) and HIV-unexposed uninfected (HUU) infants in Kenya. The findings indicated that HEU infants had significantly poorer growth outcomes compared to HUU infants. At six weeks, HEU infants had lower mean weight-for-age (WAZ) and length-for-age (LAZ) z-scores than HUU infants. Stunting was more prevalent among HEU infants at both six weeks and nine months, with 34% stunted at six weeks compared to 18% of HUU infants, and 20% versus 10% at nine months. The study highlighted that structured social support for mothers, including guidance from healthcare providers, peer counseling, and family involvement, could improve adherence to nutrition and healthcare practices, potentially mitigating growth deficits and enhancing overall infant health outcomes. HEU infants also had lower mean head circumference at nine months and higher prevalence of microcephaly compared to HUU infants.

2.5.2 The Survivorship of HIV Exposed Infants

The survivorship of HIV exposed infants (HEIs) is closely tied to timely access to HIV care, adherence to antiretroviral therapy (ART), and routine follow-up services (Guta *et al.*, 2024). Infants whose mothers receive consistent social support, from healthcare providers, peer counselors, and family members, are more likely to attend clinic visits, adhere to ART regimens, and access preventive interventions such as cotrimoxazole

prophylaxis and immunizations (Mogaka *et al.*, 2023). Social support helps mothers overcome barriers like stigma, fear of disclosure, and logistical challenges, which in turn improves infant retention in care programs and early identification of health complications (Agabu *et al.*, 2020). Consequently, integrating structured social support into maternal and infant care is critical for enhancing the survival and long-term health outcomes of HIV exposed infants.

In Lesotho, Tukei *et al.* (2020) assessed the 24-month HIV survival among HIV exposed infants (HEIs). The study found that the 24-month HIV-free survival rate among HEIs was 91.8%, with a 2.9% risk of HIV transmission by 24 months. The infant mortality rate among HEIs was 6.0%, slightly higher than the 3.8% observed among HIV-unexposed infants (HUIs). The study highlighted those interventions such as SMS reminders and phone follow-ups for mothers improved adherence to clinic visits, timely ART administration, and early infant testing, which contributed to higher survival rates. Lower maternal age and birth weight were still associated with an increased risk of HIV infection or death among infants.

A study conducted in South Africa revealed that cotrimoxazole prophylaxis was associated with better survival among HIV exposed infants, reducing infant mortality by 40% when administered appropriately (Cotton *et al.*, 2019). The study also emphasized the importance of early infant diagnosis (EID) and timely initiation of ART for infants who test positive at birth. In Kenya, 94% of HIV positive infants survived to 12 months, highlighting the benefits of early ART initiation. Importantly, structured social support, including guidance from healthcare providers, peer counseling, and family engagement, was shown to enhance adherence to prophylaxis, ART, and follow-up care, further improving survival outcomes among HIV exposed infants. These findings underscore the critical need for early interventions supported by social networks to maximize infant survival.

In rural Zimbabwe, Evans and Chasekwa (2021) evaluated mortality, HIV transmission, and growth outcomes among children exposed to HIV. The study found that HIV exposed children had a 40% higher mortality rate compared to HIV-unexposed children, with a hazard ratio of 1.41. Among the HIV exposed children, 3%

tested HIV positive, and vertical transmission rates ranged from 4.3% to 7.7%, exceeding elimination targets. HIV exposed uninfected children (CHEU) also had lower mean length-for-age z-scores, indicating poorer growth. The study indicated that structured social support, including caregiver counseling, community follow-ups, and peer guidance, improved adherence to infant care practices, clinic attendance, and nutrition monitoring, which in turn enhanced survival, reduced stunting, and lowered HIV transmission rates. Only 40% of children in non-IYCF arms were alive, HIV-free, and non-stunted at 18 months, compared to 60% of HIV-unexposed children.

In northern Uganda, Aguti *et al.* (2020) evaluated HIV-free survival among breastfed infants born to HIV positive mothers in two tertiary facilities. Among 365 HIV exposed infants, the HIV-free survival rate was 93.7%, with 2.7% testing HIV positive and 3.6% dying during the study period. Although 94.5% of infants were exclusively breastfed, only 29% maintained exclusive breastfeeding for six months. The study suggested that incorporating structured social support and reminder systems, such as counseling sessions, home visits, peer group follow-ups, and SMS reminders, could improve adherence to infant feeding and ART schedules, promote timely clinic attendance, and reinforce maternal engagement in care, ultimately enhancing HIV-free survival and overall health outcomes. Younger enrollment age and care at certain facilities were also associated with better outcomes.

In Tanzania, Saleh *et al.* (2023) investigated maternal antenatal depression, social support, and infant growth and development among 2,298 mothers living with HIV. They found that depressive symptoms increased the risk of infant wasting, while higher levels of affective and instrumental social support improved cognitive, motor, and overall developmental outcomes. These findings highlight that psychosocial support directly benefits infant growth and development. When combined with structured reminder systems, such as SMS alerts and peer follow-ups, social support can enhance maternal adherence to treatment, attendance at clinic visits, and engagement in infant care, thereby improving the survivorship and health outcomes of HIV exposed infants in resource-limited settings.

In Kenya, Kinuthia *et al.* (2021) evaluated the effectiveness of short message service (SMS) messaging in improving maternal retention in HIV care, viral suppression, and infant HIV survival among pregnant and postpartum women living with HIV. Among 824 pregnant women enrolled across six maternal-child health clinics, the study found no statistically significant improvement in viral suppression, clinic attendance, or infant HIV survival between women receiving SMS (either one-way or two-way) and those receiving no SMS. Viral non-suppression occurred in 9.8% of viral load assessments, with similar rates across all groups. On-time visit attendance was high across the board (89%), and the incidence of infant HIV or death was 3.01 per 100 person-years, with an HIV infection rate of 0.94%.

In another study, Nordberg *et al.* (2021) assessed whether weekly interactive text messaging (the WelTel intervention) could improve early infant diagnosis (EID) of HIV among HIV exposed infants in Kenya. The intervention involved sending weekly messages to pregnant women living with HIV, asking about their well-being and prompting responses, to support engagement in prevention of mother-to-child transmission (PMTCT) care. Among 600 enrolled women, the uptake of EID HIV testing by eight weeks of age was 85.5% in the intervention group and 84.7% in the control group. The difference was not statistically significant. The proportion of infants diagnosed with HIV was slightly lower in the intervention group (0.8% vs. 1.2%). Overall, the study found no evidence that the WelTel text messaging intervention improved EID HIV testing uptake.

2.6 Gaps in Literature

Existing studies indicate that reminders and social support frameworks, including SMS alerts, phone calls, peer counseling, home visits, and male partner involvement, enhance adherence to ART, ANC attendance, and early infant diagnosis (EID) among HIV positive mothers (Abbo, 2022; Mogaka *et al.*, 2023; Mubiana-Mbewe *et al.*, 2021). Evidence from Zambia, South Africa, Indonesia, Ethiopia, Uganda, and Kenya highlights the positive role of psychosocial and structural support in improving maternal adherence and infant health outcomes. However, gaps exist regarding their effectiveness in specific Kenyan contexts, particularly at Nyahururu County Referral Hospital. Few studies assess how reminders combined with structured social support

longitudinally affect maternal and infant outcomes or determine which components are most effective. This study sought to evaluate the integrated impact of reminders and social support on adherence, maternal outcomes, and infant survivorship locally.

In addition, research demonstrates that adherence to HIV care, including antenatal follow-up and ART, improves maternal and birth outcomes, while reminders and social support frameworks, such as SMS alerts, phone calls, counseling, and family engagement, enhance adherence and retention (Mubiana-Mbewe *et al.*, 2021; Mabachi *et al.*, 2021; Fentie *et al.*, 2022). Most studies, however, focus on urban or generalized populations, with limited evidence from resource-limited settings like Nyahururu County Referral Hospital. Moreover, while reminders and social support have been explored for ART adherence, their direct impact on maternal and birth outcomes remains under-investigated. This highlights the need to examine how structured reminders and social support specifically influence maternal and infant health outcomes in Nyahururu.

Moreover, existing literature shows that reminders and structured social support, such as SMS alerts, phone calls, peer counseling, and family engagement, can improve adherence to antenatal care, ART, PMTCT protocols, and breastfeeding practices among HIV positive mothers (Philemon *et al.*, 2022; Augustino *et al.*, 2024; Samburu *et al.*, 2020). Most studies, however, are conducted in urban or peri-urban settings, with limited evidence from resource-limited regions such as Nyahururu County. Few studies systematically evaluate the combined effect of reminders and social support on maternal, birth, and infant health outcomes within a single cohort. Additionally, little is known about how the type, frequency, and source of reminders and social support interact to influence long-term adherence and health outcomes. This study addresses these gaps locally.

Studies confirm that adherence to ART, early infant diagnosis (EID), prophylactic interventions, and breastfeeding practices critically affects maternal and infant health outcomes among HIV positive mothers (Philemon *et al.*, 2022; Theunissen, 2020; Saleh *et al.*, 2023). Structured reminders, such as SMS alerts and phone follow-ups, combined with social support from healthcare providers, peer counselors, and family members, improve adherence, retention, and infant survival (Kiilu, 2021; Tukei *et al.*,

2020). Yet, most research examines these interventions separately, without analyzing how integrated reminder and social support frameworks influence maternal adherence, birth outcomes, breastfeeding, and long-term infant survivorship. Limited evidence exists on the interaction with psychosocial factors, underscoring the need for a comprehensive study in resource-limited Kenyan settings.

Given Kenya's high HIV burden and persistent challenges in PMTCT, there is a critical need to evaluate context-specific interventions that optimize maternal and infant health outcomes. While reminders and social support frameworks have shown promise in improving adherence and retention, few studies assess their combined effect on maternal, birth, breastfeeding, and infant survivorship outcomes in resource-limited settings like Nyahururu County. This study is necessary to provide evidence on the integrated impact of reminders and social support on PMTCT outcomes, addressing local socio-cultural and health system barriers, and informing targeted strategies to reduce HIV transmission, enhance maternal adherence, and improve infant survival and growth.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study Site

The study was conducted at the Antenatal Clinic/Comprehensive Care Centre of Nyahururu County Referral Hospital, located in Laikipia West Sub-County, Laikipia County, in Kenya's Rift Valley region (GPS coordinates: 0°02'16.0"S, 36°23'45.0"E). Nyahururu is approximately 180 km west of Nanyuki and serves a catchment population of 154,704 (2019 Census). The area comprises fifteen rural administrative wards, with economic activities dominated by farming and small-scale businesses (figure 3.1). The hospital provides care to over 399 HIV positive pregnant mothers, mostly from rural communities. Nyahururu was selected as the study site due to its high local HIV burden among pregnant women, accessibility for longitudinal follow-up, and its representativeness of rural populations in PMTCT programs, making it ideal for evaluating the impact of reminders and social support interventions.

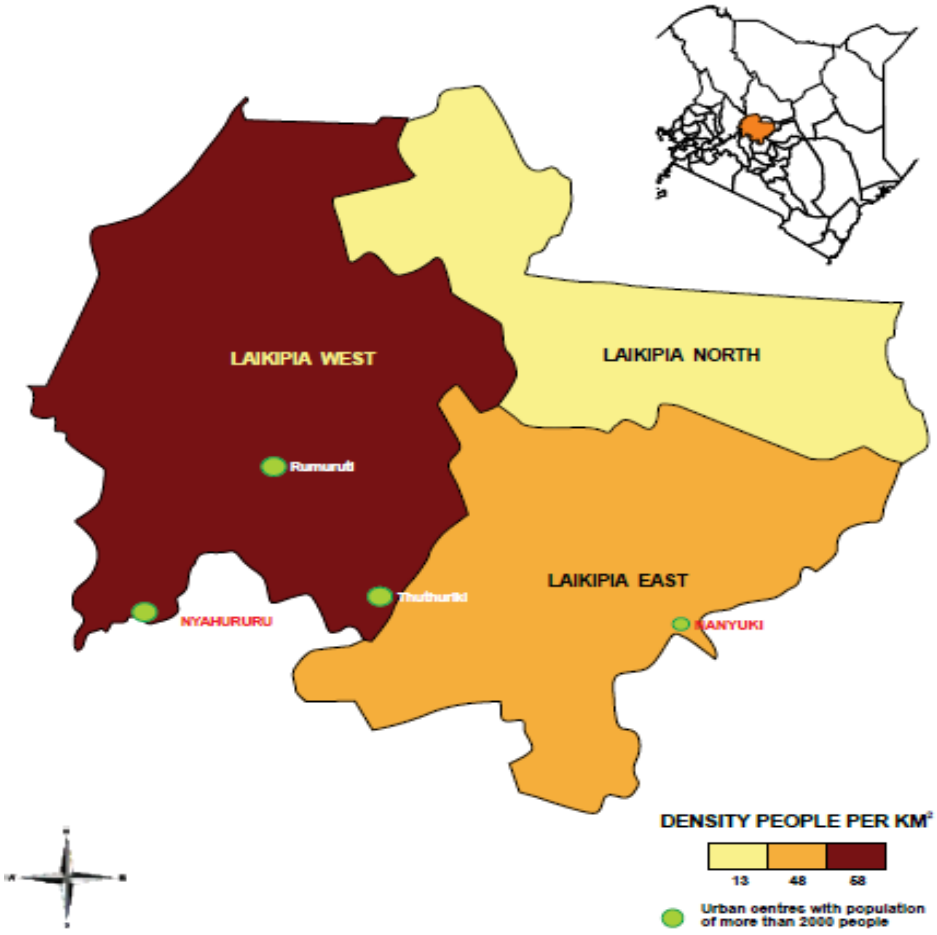

Figure 3. 1: Map of Kenya indicating the study site

3.2 Study Design

This study adopted a quasi-experimental, non-equivalent groups design to evaluate the effect of reminders and social support frameworks on adherence to PMTCT services among HIV positive pregnant mothers and health outcomes of their HIV exposed infants at Nyahururu County Referral Hospital. A quasi-experimental research design is a type of empirical study that evaluates the effect of an intervention or treatment on a target population without using random assignment to allocate participants to intervention and control groups. In this design, participants were assigned to intervention and comparison groups without randomization due to feasibility and ethical considerations. The intervention aimed to assess whether structured reminders and social support could enhance maternal adherence, retention in care, and infant outcomes compared to standard practices. The non-equivalent groups design allowed

for real-world evaluation in a routine clinical setting while controlling for baseline similarities between groups.

HIV positivepregnant mothers in the intervention group were recruited during their second trimester and followed for nine months, while their infants were monitored for twelve months postpartum. They received structured SMS reminders, phone calls, and social support from healthcare providers, peer counselors, and family members to reinforce clinic attendance, ART adherence, and early infant diagnosis (EID). Messages were delivered in English and Swahili (Swahili: *"Unakumbushwa ya Kwamba unapaswa kuhudhuria kliniki siku ya kesho"*, English: *"Kindly note that your next appointment is tomorrow"*). In contrast, the comparison group received routine follow-up only, representing the standard PMTCT care provided at the facility, without additional reminders or structured social support.

Participants were purposively selected based on inclusion criteria such as maternal age, gestational stage, ART initiation, and baseline adherence to ensure comparability between groups. The study also included a retrospective component that reviewed medical records of HIV positive mothers and their HIV exposed infants who had previously received PMTCT services at the hospital. This component provided historical data for comparison and helped evaluate the effect of the intervention on maternal adherence, retention, birth outcomes, breastfeeding practices, and infant survivorship.

3.3 Study Variables

The study examined both independent and dependent variables, along with potential confounding factors. The independent variables focused on the effectiveness of reminders and social support provided to HIV positive pregnant mothers. These were operationalized as short messages (SMS), phone calls, support from community health promoters, partner involvement, and peer group engagement. The dependent variables included neonatal outcomes such as APGAR scores, birth weight, survivorship, and HIV status of HIV exposed infants. In addition, the outcomes related to the effectiveness of reminders and social support were measured through maternal health behaviors, including attendance of antenatal care (ANC) visits, adherence to

antiretroviral therapy (ART), breastfeeding practices, and administration of prophylactic ART to HIV exposed infants. Confounding variables considered in the study were miscarriages and changes of healthcare facility during pregnancy.

3.4 Study Population

The primary study population consisted of HIV positive pregnant mothers and their HIV exposed infants attending the antenatal clinic and PMTCT Centre at Nyahururu County Referral Hospital. 399 mothers were eligible for inclusion; however, only those recruited during the study period from January 2022 to January 2023 formed the active study cohort. Mothers were enrolled from their second trimester of pregnancy and were followed up until delivery. Their infants were subsequently followed for one year to assess health outcomes, including HIV status, growth, and survivorship.

For study design purposes, participants were divided into an intervention group, which received structured reminders and social support (SMS, phone calls, partner and peer support, and community health promoter engagement), and a control group, which received standard PMTCT care without the enhanced reminder and social support package.

In addition to prospective recruitment, the study included a retrospective review of medical records of HIV positive pregnant mothers and their HIV exposed infants who had previously received MTCT services at the facility, providing supplemental data to strengthen the study findings. The findings are primarily generalizable to HIV positive pregnant mothers and their HIV exposed infants attending public referral hospitals in similar settings.

3.4.1 Inclusion Criteria

1. Confirmed HIV positive status of the pregnant mothers
2. HIV Positive Pregnant mothers enrolled in the PMTCT program at Nyahururu County Referral Hospital.
3. All HIV positive pregnant mothers attending the ANC/CCC from the second trimester.

4. All consenting HIV positive pregnant mothers.
5. All previous files available in the archives

3.4.2 Exclusion Criteria

1. HIV positive pregnant mothers who were too ill to participate.
2. HIV positive pregnant mothers who did not provide consent to participate in the study.

3.5 Sampling Frame

A sampling frame is a complete and organized list or representation of all members of the target population from which a study sample is drawn. It serves as the reference point to ensure that every eligible individual has a chance of being selected, reducing selection bias. The sampling frame was the list or registry of all HIV positive pregnant mothers attending the antenatal clinic and PMTCT Centre at Nyahururu County Referral Hospital during the study period from January 2022 to January 2023. This list provided the reference population from which eligible participants (mothers in their second trimester) were systematically selected for inclusion in the study.

3.6 Sample Size Determination and Sampling Technique

3.6.1 Sample Size Determination

The Slovin's formula (1967) for sample size determination from a finite or known population was used to calculate the sample size for the study. The Slovin's formula assumes a finite and known population, random sampling, and a pre-specified margin of error to ensure the sample is representative. It also assumes a relatively homogeneous population so that the selected sample adequately reflects the characteristics of the entire population. This formula helped to ensure that the sample was statistically representative of the population, considering the desired level of precision. The formula was as follows;

$$n = \frac{N}{(1 + Ne^2)}$$

Where:

n= Required sample size,

N =The Given population size (399)

e= acceptable Error and Degree of Accuracy (=0.05).

Therefore: -

$$n = \frac{399}{(1 + 399 * 0.05^2)}$$

=200 pregnant mothers, add 10% to cater for loss to follow-up.

Therefore, n_1 = 220 HIV positive pregnant mothers on reminders

n_2 = 220 HIV positive pregnant mothers on routine care

3.6.2 Sampling Technique

A systematic sampling technique was employed to recruit HIV positive pregnant mothers attending antenatal care at Nyahururu County Referral Hospital. The sampling frame consisted of the list of all HIV positive pregnant mothers attending the clinic from January 2022 to January 2023, as recorded in the PMTCT register. The sampling interval (k) was calculated by dividing the total number of eligible mothers on the register (399) by the desired sample size. After determining the interval, the first participant was randomly selected from the first k mothers on the list, and subsequent participants were selected at every kth position.

Once identified, participants received an initial counseling session at the Comprehensive Care Centre, where study objectives and procedures were explained, and informed consent was obtained. Each consenting participant was assigned a unique identification code by four trained research assistants, supervised by the principal researcher, who also assisted with completing the questionnaires. Recruitment and data collection were conducted in private rooms to ensure confidentiality, with each session lasting approximately 30 minutes.

Participants underwent a full antenatal assessment, including medical exams, laboratory tests, IFAS supplementation, tetanus immunization, and ARV counseling. Follow-up visits were scheduled according to individual health needs and continued through pregnancy to six weeks postpartum. Mothers were encouraged to deliver at the hospital, where newborns were assessed, initiated on ARV prophylaxis, and monitored for breastfeeding practices and health outcomes. All data were securely recorded in study checklists to ensure accurate tracking throughout the study period. For study design purposes, participants were assigned to either the intervention or the control group based on the systematic sequence, ensuring comparable representation in each group while maintaining the integrity of the randomization process.

3.7 Study Instruments/Tools

The study used both primary and secondary data. Primary data was collected by use of structured questionnaires (See Appendix II). The questionnaires captured key socio-demographic characteristic, antenatal profiles, adherence to ART, maternal and HIV exposed infants' health outcomes, breastfeeding practices and survivorship of HIV exposed infants. Secondary data was obtained by reviewing previous antenatal records. Additionally, mother and child handbooks that constituted the part of the checklist, commonly used during routine antenatal visits, were reviewed and provide a good follow-up. These handbooks contained essential medical records, including diagnosis, laboratory and imaging results, treatment plans, mode of delivery, and post-natal follow-ups.

To enhance communication and engagement, short text messages (SMS) were sent to the participants' registered mobile numbers, acting as on reminders and delivering essential study-related information. These messages included key updates, instructions, and scheduled on reminders to ensure participant involvement. In addition to SMS, direct phone calls were made to address any concerns, clarify doubts, and confirm participation, ensuring clear communication. Follow-up efforts were further extended through partners, social workers, and Community health volunteers to maximize participation and support the data collection process, ensuring comprehensive and accurate responses.

The questionnaire was structured into five sections (V), each targeting specific study variables. Section one collected socio-demographic information of the mothers, while section two assessed maternal adherence to ART and attendance of antenatal care visits. Section three evaluated the effectiveness of reminders and social support, including SMS, calls, partner and peer engagement, and community health promoter support. Section four focused on infant health outcomes, and section five examined breastfeeding practices and the use of prophylactic ARVs for HIV exposed infants.

3.8 Data Collection Procedures

A site visit to Nyahururu County Referral Hospital was conducted for data collection. Three research assistants and the principal investigator, assisted by Comprehensive Care Centre staff, administered pre-tested questionnaires during face-to-face sessions with participants. The use of research assistants aimed to minimize potential biases from the principal investigator. To ensure participant privacy, questionnaires were completed in quiet, private rooms within the PMTCT clinic, with each session lasting between 10 to 25 minutes, after which participants were thanked for their participation. HIV positive pregnant mothers who met the inclusion criteria completed the questionnaires, while participants who were unavailable for face-to-face sessions provided responses via phone calls, which were recorded by the research assistants. Appointments were scheduled at the participants' convenience to ensure privacy and comfort within the MCH/PMTCT clinic.

In addition to the questionnaires, mother and child handbooks were reviewed to obtain medical records, including diagnosis, laboratory and imaging results, treatment history, mode of delivery, and postnatal follow-ups. To further enhance engagement, short text messages (SMS) were sent to participants registered mobile numbers as reminders, and direct phone calls were used to clarify concerns and confirm participation. Follow-up efforts also extended through participants' spouses and social networks to ensure maximum engagement and comprehensive data collection. This multifaceted approach, combining self-administered, researcher-assisted questionnaires and medical record review, ensured the accuracy and completeness of the collected data.

3.9 Pre testing of the Research Instruments

Before implementation, the study tools were pre-tested at Samburu County Referral Hospital. This site was selected because it serves a population of HIV positive pregnant mothers similar in socio-demographic and clinical characteristics to those attending Nyahururu County Referral Hospital, including age distribution, HIV prevalence, and access to PMTCT services, making it suitable for assessing the clarity and applicability of the instruments. In accordance with Hall (2020), a pre-test sample size of 10% (20 respondents) was selected. The pilot study was conducted by the principal investigator and a trained research assistant to standardize the questionnaires and detect any deficiencies in the study design. Necessary modifications were made based on the pilot study findings to improve clarity and relevance. To prevent double recruitment, participants' file numbers were recorded in a serialized register, which was periodically reviewed to check for duplicate entries. If a duplicate was identified, one of the entries was discarded, and the serialization process corrected before proceeding with recruitment.

3.9.1 Validity of the Research Instrument

Validity refers to the extent to which a research instrument accurately measures what it is intended to measure (Devi, 2019). This study focused on two types of validity, which include content validity and face validity. Content validity refers to the extent to which a research instrument comprehensively covers all aspects or domains of the concept it is intended to measure (Greene & Dreyer, 2021). To enhance content validity, experts or specialists in public health, like supervisors, reviewed the questionnaire to ensure that the questions were relevant and comprehensive for the research objectives, ensuring that they measured what they were intended to measure. Face validity is the degree to which a research instrument appears effective in terms of its stated aims, at face value (Kothari, 2023). To enhance face validity, pre-testing the questionnaire on a small sample helped ensure that it appeared to measure the intended variables and was understood by participants.

3.9.2 Reliability of the Research Instrument

Reliability of a research instrument refers to the consistency, stability, and dependability of the instrument in measuring what it is intended to measure (Creswell & Creswell, 2022). In this study, Cronbach's alpha was used to assess the internal consistency of the research instrument, evaluating how closely related the items within each section of the questionnaire were in measuring the same construct (Kothari, 2023). The questionnaire was administered to a pre-test sample at Samburu County Referral Hospital, and responses were analyzed to calculate Cronbach's alpha for each section. A Cronbach's alpha coefficient of 0.7 or higher was considered acceptable, indicating that the instrument was reliable and that the items consistently measured the intended variables. This approach ensured that the questionnaire would produce dependable and consistent results when used in the main study at Nyahururu County Referral Hospital.

3.10 Data Management and Analysis

3.10.1 Data Management

All completed questionnaires and checklists were reviewed daily for completeness, consistency, and clarity by the principal investigator and trained research assistants. The data from structured questionnaires and checklist forms were coded and entered into a secure database using Microsoft Excel.

3.10.2 Data Analysis

The data were later exported to Statistical Package for Social Sciences (SPSS) version 25.0 for cleaning and analysis. Descriptive statistics, such as frequencies and percentages, were used to summarize socio-demographic characteristics, antenatal profiles, level of adherence to ART, breastfeeding patterns, and health outcomes of HIV-exposed infants. For inferential analysis, chi-square tests were used to determine associations between categorical variables, while correlation analysis examined the strength and direction of relationships between key continuous variables. A p-value of less than 0.05 was considered statistically significant at a 95% confidence level. The results were presented using tables and figures, including bar charts and pie charts.

3.11 Ethical Considerations

The study received ethical approval from the Kenyatta National Hospital-University of Nairobi Ethics and Research Committee (KNH-UON ERC), reference number KNH-UON A/30 (Appendix IV), which authorized the study to be conducted and confirmed adherence to ethical standards. Research clearance letters were obtained from the Jomo Kenyatta University of Agriculture and Technology Board of Postgraduate Studies for academic approval, and official permission to conduct the study at Nyahururu County Referral Hospital was granted by the Chief Executive Officer (CEO) of the facility. A support letter from the Laikipia County Director of Health Services was also obtained to facilitate coordination and access to the study population; this letter did not constitute ethical approval but allowed the research team to liaise with the hospital and county health staff.

Participation in the study was strictly voluntary. All potential participants were clearly informed about the purpose, procedures, benefits, and potential risks of the study before being asked to participate. Only those who provided informed consent, both verbal and written, were enrolled in the study (Appendix I). Participants were assured that their decision to take part was entirely voluntary and that they could withdraw from the study at any stage without facing any penalty or loss of access to medical care or services at the facility.

To maintain participant anonymity, personal identifiers such as names, phone numbers, and identification numbers were not included in the data collection tools or databases. Instead, each participant was assigned a unique identification code used throughout the study to ensure that responses could not be traced back to any individual. This approach helped to protect the identity of participants and ensured that the data collected was anonymized.

Confidentiality of all study participants was strictly maintained throughout the research process. All completed questionnaires and study-related documents were securely stored in locked cabinets, accessible only to the principal investigator and authorized research assistants. Digital data were stored on password-protected computers, and all electronic files were encrypted. Only authorized members of the

research team had access to the data. During data analysis and reporting, information was presented in aggregated form, with no personal details revealed, ensuring that individual responses could not be identified.

CHAPTER FOUR

RESULTS

4.1 Reliability Results

The reliability of the research instrument was assessed using Cronbach's alpha, which measures the internal consistency of questionnaire items for each construct. This assessment ensures that the items within each section of the questionnaire consistently measure the intended variables.

Table 4. 1: Reliability Results

Construct / Section	Cronbach's Alpha (α)	Interpretation
Effectiveness of Reminders & Social Support	0.82	Acceptable
Maternal Adherence to ANC & ART	0.78	Acceptable
Maternal and Birth Outcomes	0.75	Acceptable
Breastfeeding Practices	0.80	Acceptable
Infant Health Outcomes & Survivorship	0.77	Acceptable

The reliability of the research instrument was assessed using Cronbach's alpha, which measures the internal consistency of questionnaire items for each construct. All five constructs demonstrated acceptable internal consistency, with Cronbach's alpha values ranging from 0.75 to 0.82. Specifically, the Effectiveness of Reminders & Social Support scale showed the highest reliability ($\alpha = 0.82$), indicating that the items measuring this construct were highly consistent in capturing participants' perceptions of reminders and social support. The Maternal Adherence to ANC & ART ($\alpha = 0.78$), Maternal and Birth Outcomes ($\alpha = 0.75$), Breastfeeding Practices ($\alpha = 0.80$), and Infant Health Outcomes & Survivorship ($\alpha = 0.77$) also exhibited acceptable reliability, confirming that the questionnaire items were stable and consistently measured the intended variables.

4.2 Antenatal uptake and adherence to ART among HIV positive pregnant mothers in Nyahururu County referral hospital

4.5.1 Initial Diagnosis of the HIV among HIV Positive Pregnant Mothers

Results indicated that, out of 220 HIV positive pregnant mothers on reminders and social support 123 (69.1%) HIV status was diagnosed during routine pregnancy/ANC visits while 6 (2.7%) during labour. Out of 220 HIV positive pregnant mothers on routine follow-up, 146 (66.4%) HIV status was diagnosed during routine pregnancy/ANC visits while 8.6% (69.1%), during labor (Table 4.2).

Table 4. 2: Initial Diagnosis of the HIV among HIV Positive Pregnant Mothers in the study

	Intervention (n=220)			Control (n=220)		
	Frequency	**Percentage**	**CI**	**Frequency**	**Percentage**	**CI**
During pregnancy	151	68.6	0.02-0.75	146	66.4	0.60-0.73
Vol. counseling	34	15.5	0.11-0.21	29	13.2	0.09-0.18
Couple Counseling	29	13.2	0.09-0.18	26	11.8	0.08-0.18
During labor	6	2.7	0.01-0.06	19	8.6	0.52-0.13

4.5.2 Duration on ART among HIV positive pregnant mothers

The results indicated that, out of 220 HIV positive pregnant mothers on reminders and social support 183 (83.2%) have been on antiretroviral therapy for more than a year, while 5 (2.3%) have never been on antiretroviral therapy. The study also indicated out of 220 HIV positive pregnant mothers on routine follow-up, 143 (65.0%) have been on antiretroviral therapy for more than a year while 18 (8.2%) have never been on antiretroviral therapy (Figure 4.1).

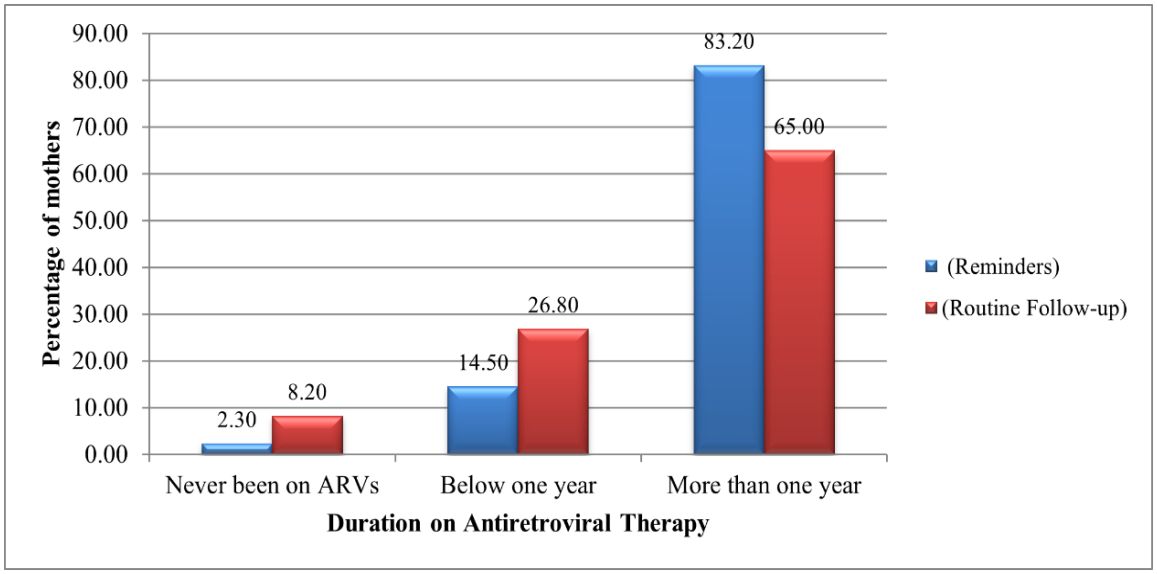

Figure 4. 1: Duration on ART among HIV positive pregnant mothers in the study

4.2 Retention of HIV positive pregnant mothers on reminders and on routine follow-up in the study

Results indicated that, out of the 220 HIV positive pregnant mothers on reminders, 178 (80.9%) were retained in the study while 42 (19.1%) were lost to follow-up while of the 220 HIV positive pregnant mothers on routine lost follow-up, 159 (72.3%) were retained the study while 61(27.7%) lost follow-up (Table 4.3).

Table 4. 3: Retention of HIV positive pregnant mothers on reminders and on routine follow-up

	Intervention (n=220)			Control (n=220)		
	Frequency	**Percentage**	**CI**	**Frequency**	**Percentage**	**CI**
Retained	178	80.9	0.75-0.85	159	72.3	0.66-0.78
Lost follow-up	42	19.1	0.14-0.25	61	27.7	0.22-0.34

4.3 Socio-Demographic characteristics of HIV positive pregnant Mothers

The results showed that a substantial proportion of HIV-positive pregnant mothers on reminders and social support were aged 31–40 years (45.5%), with a smaller number aged 41 years and above (3.6%). Similarly, the majority of those on routine follow-up fell within the 31–40-year age group (41.8%).

Most mothers in both groups reported having partners, with slightly higher proportions among those on reminders and social support (64.1%) compared to routine follow-up (60.5%). Regarding education, a notable difference was observed in formal schooling, with fewer mothers on reminders and social support having no formal education (6.4%) compared to those on routine follow-up (28.6%).

Partner support was generally high across both groups, with more mothers on routine follow-up reporting receiving partner support (60.9%) compared to those on reminders and social support (51.4%) (Table 4.4).

Table 4. 4: Socio-Demographic Characteristics of HIV positive Pregnant Mothers

Characteristic	Intervention (n=220)		Control (n=220)	
	(%)	95% CI	(%)	95% CI
Age (years)				
11–20	21 (9.5)	0.06–0.14	42 (19.1)	0.14–0.25
21–30	91 (41.4)	0.35–0.48	84 (38.2)	0.32–0.45
31–40	100 (45.5)	0.39–0.52	92 (41.8)	0.35–0.49
41–50	8 (3.6)	0.01–0.07	2 (0.9)	0.01–0.02
Marital Status				
With Partner	141 (64.1)	0.57–0.70	133 (60.5)	0.54–0.67
Without Partner	79 (35.9)	0.30–0.43	87 (39.5)	0.33–0.43
Level of Education				
Never attended	14 (6.4)	0.03–0.10	27 (12.3)	0.08–0.18
Primary	72 (32.7)	0.27–0.39	63 (28.6)	0.23–0.35
Secondary	96 (43.6)	0.37–0.50	113 (51.4)	0.45–0.58
Post-secondary	38 (17.3)	0.13–0.22	17 (7.7)	0.04–0.12
Social Support				
Partner	113 (51.4)	0.45–0.58	134 (60.9)	0.54–0.67
Family / Relative	50 (22.7)	0.17–0.29	65 (29.5)	0.24–0.36
Friend	36 (16.4)	0.12–0.22	8 (3.6)	0.02–0.07
None	21 (9.5)	0.06–0.14	13 (5.9)	0.03–0.10

4.4 Antenatal profile of HIV positive pregnant mothers in Nyahururu County referral hospital

4.4.1 Parity of HIV positive pregnant mothers

Results indicated that, out of 220 HIV positive pregnant mothers on reminders and social support, 104 (47.3%) had their second pregnancies while 17 (7.7%) had more than three pregnancies. In addition, out of 220 HIV positive pregnant mothers on routine follow-up, 63 (28.6%) had their third pregnancies while 27 (12.3%) more than three pregnancies (Table 4.5).

Table 4. 5: Parity of HIV positive pregnant mothers in the study

	Intervention (n=220)			Control (n=220)		
	Frequency	**Percentage**	**CI**	**Frequency**	**Percentage**	**CI**
1st pregnancy	41	18.6	0.14-0.24	47	21.4	0.16-0.27
2nd pregnancy	104	47.3	0.41-0.54	83	37.7	0.31-0.44
3rdpregnancy	58	26.4	0.21-0.33	63	28.6	0.23-0.35
Above 3 pregnancies	17	7.7	0.05-0.12	27	12.3	0.08-0.17

4.4.2 Place of previous delivery among HIV positive pregnant mothers

The results indicated that, out of 220 HIV positive pregnant mothers on reminders and social support, 164 (74.6%) had their previous delivered at the government facility while 4 (1.8 %) delivered at the private facilities. Similarly, out of 220 of HIV positive pregnant mothers on routine follow-up, 142 (64.6%) delivered at the government facility while 17 (7.7%) delivered at private facilities (Table 4.6).

Table 4. 6: Place of previous delivery among HIV positive mothers in the study

	Intervention (n=220)			Control (n=220)		
	Frequency	**Percentage**	**CI**	**Frequency**	**Percentage**	**CI**
Government facility	164	74.6	0.68-0.80	142	64.6	0.58-0.71
Faith based facility	52	23.6	0.18-0.30	61	27.7	0.22-0.34
Private facility	4	1.8	0.01-0.05	17	7.7	0.05-0.12

4.4.3 Average number of antenatal visits among HIV positive pregnant mothers

Results indicated that, out of 220 HIV positive mothers on reminders and social support, 139 (63.1%) had an average of between three to four visits antenatal visits while 12 (5.5%) had an average of seven to eight visits. In addition, out of 220 HIV positive pregnant mothers on routine follow-up, 127 (57.7%) had an average of three to four antenatal visits while 5 (2.7%) had seven to eight antenatal visits (Table 4.7).

Table 4. 7: Number of antenatal visits among HIV positive pregnant mothers in the study

	Intervention (n=220)			Control (n=220)		
	Frequency	**Percentage**	**CI**	**Frequency**	**Percentage**	**CI**
1st - 2nd visits	14	6.4	0.04-0.10	54	24.6	0.19-0.13
3rd - 4th visits	139	63.1	0.56-0.61	127	57.7	0.31-0.64
5th - 6th visits	55	25.0	0.19-0.31	33	15.0	0.11-0.20
7th - 8th visits	12	5.5	0.03-0.09	6	2.7	0.01-0.58

4.4.4 Laboratory Results among HIV positive pregnant mothers

The results indicate that, out of 220 HIV pregnant mothers of on reminders and social support, 197 (89.5%) of had a CD4 count above 250 while 17 (7.7%) with a CD4 count below 250. Additionally, the study also indicated that 144 (65.4%) among HIV positive pregnant mothers had a CD4 of above 250 while 47 (21.4%) had a CD4 count below 250. The results indicated that out of 220 HIV positive pregnant mothers and

on reminders social support, 199 (90.5%) has undetectable viral load while 18 (8.2%) had a viral load below 1000 particles. In addition, out 220 HIV positive pregnant mothers on routine follow-up, 173 (78.6%) had undetectable viral load while 30 (13.6%) had a viral load below 1000 particles (Table 4.8).

Table 4. 8: Laboratory results among HIV positive pregnant mothers in the study

	Intervention (n=220)			Control (n=220)		
	Frequency	**Percentage**	**CI**	**Frequency**	**Percentage**	**CI**
CD4 count						
Above 250	197	89.5	0.85-0.03	144	65.4	0.58-0.72
Below 250	17	7.7	0.05-0.12	47	21.4	0.16-0.27
Not done	6	2.7	0.01-0.06	29	13.2	0.09-018
Viral Load						
Below1000 particles	18	8.2	0.05-0.13	30	13.6	0.09-0.19
Undetectable	199	90.5	0.86-0.94	173	78.6	0.73-0.84
Not done	3	1.4	0.02-0.04	17	7.7	0.05-0.12

4.6 Maternal and birth outcomes among HIV positive pregnant mothers and HIV exposed newborns in Nyahururu County referral hospital

The study sought to examine mode of delivery among HIV positive pregnant mothers. As shown in Table 4.9, the results indicated that, out of 220 HIV positive pregnant mothers on reminders and social support, 121 (96.4%) had spontaneous vaginal deliveries while 8 (3.6%) had caesarian section. Additionally, out of 220 HIV positive pregnant mothers on routine follow-up, indicated that 217 (98.6%) had spontaneous vaginal deliveries while 3 (1.4%) had caesarian section.

The study also sought to examine the duration of labour among HIV positive pregnant mothers. The results indicated that out of 220 HIV positive pregnant mothers on

reminders and social support, 213 (96.8%) had duration of labour less than 12 hours while 7 (3.2%) had duration of labour more than 12 hours. Similarly, out of 220 HIV positive pregnant mothers on routine follow-up, 211 (95.9%) had duration of labour less than 12 hours while 9 (4.1%) duration of labour lasted for more than 12 hours.

The study sought to examine complications during labour among HIV positive pregnant mothers. The study findings revealed that out of 220 HIV positive pregnant mothers on received on reminders, 5 (2.7%) experienced post-partum hemorrhage, 1 (0.5%) experienced uterine atony, and another 1 (0.5%) developed eclampsia. In addition, out of 220 HIV positive pregnant mothers on routine follow-up, 7 (3.4%) experienced post-partum hemorrhage, 5 (2.7%) developed uterine atony, and 3 (1.4%) experienced eclampsia.

The study sought to examine medications administered during the labour process among HIV positive pregnant mothers. As shown in Table 4.9, the results indicated that out of 220 HIV positive pregnant mothers on reminders and social support, 6 (2.7 %) received uterotonics while 1(0.5%) received eclampsia medication. Out of 220 HIV positive pregnant mothers on routine follow-up 18 (8.2%) received uterotonics while 6 (2.7%) received eclampsia medication.

Table 4. 9: Maternal and Birth Outcomes among HIV positive Pregnant Mothers

Outcome	**Category**	**Intervention (n=220)**		**Control (n=220)**	
		(%)	**CI**	**(%)**	**CI**
Mode of Delivery	Vaginal Delivery	212 (96.4%)	0.93–0.98	217 (98.6%)	0.96–0.98
	Caesarian Section	8 (3.6%)	0.07–0.12	3 (1.4%)	0.01–0.04
Duration of Labour	<12 hours	213 (96.8%)	0.94–0.99	211 (95.9%)	0.92–0.98
	>12 hours	7 (3.2%)	0.01–0.06	9 (4.1%)	0.02–0.08

Complications During Labour	Post-partum Hemorrhage	5 (2.7%)	0.01–0.05	7 (3.4%)	0.01–0.06
	Uterine Atony	1 (0.5%)	0.00–0.03	5 (2.7%)	0.01–0.05
	Eclampsia	1 (0.5%)	0.00–0.03	3 (1.4%)	0.00–0.03
Medication During Labour	Uterotonics	6 (2.7%)	0.10–0.56	18 (8.2%)	0.05–0.13
	Antibiotics	2 (0.9%)	0.00–0.03	13 (5.9%)	0.03–0.10
	Intravenous Fluids	7 (3.2%)	0.01–0.06	10 (4.5%)	0.02–0.05
	Eclampsia Medications	1 (0.5%)	0.00–0.25	6 (2.7%)	0.01–0.06

4.7 Birth outcome of HIV exposed infants born from HIV positive pregnant mothers in Nyahururu County referral hospital

4.7.1 APGAR score of HIV exposed infants born from HIV positive pregnant mothers

The results indicated that, out of 220 HIV exposed infants born from HIV positive pregnant mother on reminders and social support,178 (80.9%) had an APGAR score of 9.01-10.00 while 6 (2.7%) had an APGAR score of 7.01-8.00. Similarly, the study indicated that out of 220 HIV exposed infants born from HIV positive pregnant mothers on routine follow-up, 146 (66.3%) had an APGAR score of 9.01-10.00 while 25 (11.4%) had an APGAR score of 7.01-8.00 (Table 4.10).

Table 4. 10: APGAR Score of HIV Exposed Infants Born from HIV Positive pregnant mothers in the study

	Intervention (n=220)			Control (n=220)		
	Frequency	**Percentage**	**CI**	**Frequency**	**Percentage**	**CI**
<=7.00	0	0.0	0.0-0.02	0	0	0.00-0.02
7.01-8.00	6	2.7	0.01-0.06	25	11.4	0.07-0.16
8.01-9.00	36	16.4	0.12-0.22	49	22.3	0.17-0.28
9.01- 10.00	178	80.9	0.73-0.86	146	66.3	0.60-0.73

4.7.2 Average Weight of HEIs' Born from HIV Positive Pregnant Mothers

The results indicated that, out of 220 HIV exposed infants born from HIV positive pregnant mother on reminders and social support,179 (81.4%) weighed 2.51-3.00 kgs while 2 (0.9%) weighed 0.51-2.00 kgs. Similarly, the study indicated that out of 220 HIV exposed infants born from HIV positive pregnant mothers on routine follow-up, 111 (50.5%) weighed 2.51-3.00 kgs while 5(6.8%) weighed 0.51-2.00 kgs (Table 4.11).

Table 4. 11: Average Birth Weight of HEIs' Born from HIV Positive Pregnant Mothers in the study

	Intervention (n=220)			Control (n=220)		
	Frequency	**Percentage**	**CI**	**Frequency**	**Percentage**	**CI**
0.51 to 2.00 kg	2	0.9	0.00-0.03	15	6.8	0.04-0.11
2.01-2.50 kg	15	6.8	0.04-0.11	75	34.0	0.28-0.41
2.51-3.00 kg	179	81.4	0.78-0.86	111	50.5	0.44-0.57
3.10-3.50	18	8.2	0.45-0.13	14	6.4	0.04-0.10
3.51 and above	6	2.7	0.01-0.06	5	2.3	0.01-0.05

4.7.3 Administration of Initial Prophylaxis Nevirapine/Zidovudine among HEIs' born from HIV positive pregnant mothers

The results indicated that, out of 220 HIV exposed infants born from HIV positive pregnant mother on reminders and social support, 209 (95.0%) received initial Nevirapine/Zidovudine prophylaxis while 11 (5.0%) did not receive initial Nevirapine/Zidovudine prophylaxis. Similarly, the study indicated that out of 220 HIV exposed infants born from HIV positive pregnant mothers on routine follow-up, 197 (89.5%) received initial Nevirapine/Zidovudine prophylaxis while 23 (10.5%) did not receive Nevirapine/Zidovudine prophylaxis (Table 4.12).

Table 4. 12: Administration of Initial Prophylaxis Nevirapine/Zidovudine among HEIs' born from HIV positive pregnant mothers in the study

	Intervention (n=220)			Control (n=220)		
	Frequency	**Percentage**	**CI**	**Frequency**	**Percentage**	**CI**
Received	209	95.0	0.91-0.97	197	89.5	0.85-0.93
Did not receive	11	5.0	0.03-0.87	23	10.5	0.67-0.15

4.7.4 Collection on Spot DBS among HIV Exposed Infants

The results indicated that, out of 220 HIV exposed infants born from HIV positive pregnant mother on reminders and social support, 209 (95.0%) had Dried Blood Sample (DBS)taken while 11 (5.0%) had Dried Blood Sample (DBS)taken. Similarly, the study indicated that out of 220 HIV exposed infants born from HIV positive pregnant mothers on routine follow-up, 197 (89.5%) had Dried Blood Sample (DBS)taken while 23 (10.5%) had Dried Blood Sample (DBS)taken (Table 4.13).

Table 4. 13: Collection on Spot Dried Blood Sample among HEIs' in the study

	Intervention (n=220)			Control (n=220)		
	Frequency	**Percentage**	**CI**	**Frequency**	**Percentage**	**CI**
DBS collected	209	95.0	0.91-0.97	197	89.5	0.85-0.93
DBS not collected	11	5.0	0.03-0.87	23	10.5	0.67-0.15

4.8 Breastfeeding Practices of HIV Positive Mothers Six Months Post-Delivery

The study sought to examine the breastfeeding choices made by HIV positive pregnant mothers enrolled in the PMTCT program at Nyahururu County Referral Hospital. The findings indicated that, out of 220 HIV positive pregnant mothers on reminders and social support, 171 (77.7%) opted for exclusive six months breastfeeding while 16 (7.3%) opted for exclusive replacement feeding. Additionally, out of 220 HIV positive pregnant mothers on routine follow-up, 143 (65.0%) opted for exclusive six months breastfeeding while 28 (12.7%) opted for exclusive replacement feeding (Table 4.14).

Table 4. 14: Breastfeeding Options among HEIs' born from HIV positive pregnant mothers in the study

	Intervention (n=220)			Control (n=220)		
	Frequency	**Percentage**	**CI**	**Frequency**	**Percentage**	**CI**
Exclusive breastfeeding	171	77.7	0.72-0.83	143	65	0.58-0.71
Exclusive breastfeeding with early cessation	33	15	0.11-0.20	49	22.3	0.17-0.28
Exclusive replacement feeding	16	7.3	0.04-0.12	28	12.7	0.09- 0.18

4.9 Health Outcomes and Survivorship of HIV positive Exposed Infants Born of HIV Positive Pregnant Mothers in Nyahururu County referral hospital

4.9.1 HIV status of HIV exposed infants after one year

The results indicated that, out of 220 HIV exposed infants born from HIV positive pregnant mothers on reminders and social support, 216 (98.2%) of the HIV exposed infants turned HIV negative while 4 (1.8%) turned positive. In addition, out of 220 HIV exposed infants born from HIV positive pregnant mothers on routine follow-up, 209 (95.5%) of the HIV exposed infants turned HIV negative while 11(5.0%) turned HIV positive (Table 4.15).

Table 4. 15: HIV status among HIV Exposed infants after 1 year in the study

	On reminders (n=220)			On routine follow-up (n=220)		
	Frequency	**Percentage**	**CI**	**Frequency**	**Percentage**	**CI**
HIV negative	216	98.2	0.95-1.00	209	95.5	0.91-0.97
HIV positive	4	1.8	0.00-0.05	11	5	0.25-0.88

4.9.2 Survival and Mortality among HIV Exposed Infants after a year

The results indicated that, out of 220 HIV exposed infants born from HIV positive pregnant mothers on reminders and social support, 210 (95.5%) of the HIV exposed infants born from HIV positive pregnant mothers survived after one year while 10 (4.5%) did not survive. In addition, out of 220 HIV exposed infants born from HIV positive pregnant mothers on routine follow-up,189 (86.0%) of the HIV exposed infants turned survived after one year while 31 (14.0%) did not survive (Table 4.16).

Table 4. 16: Survival and Mortality among HIEs born of HIV positive mothers in the study

	Intervention (n=220)			Control (n=220)		
	Frequency	**Percentage**	**CI**	**Frequency**	**Percentage**	**CI**
Survived	210	95.5	0.92-0.98	189	86.0	0.81-0.90
Died	10	4.5	0.22-0.08	31	14.0	0.10-0.19

4.9.3 Inferential Statistics

4.9.4 Correlation Analysis

The correlation analysis revealed strong, statistically significant positive relationships between the use of reminders and key health outcomes among HIV-positive mothers. Specifically, reminders showed a very strong association with adherence to antenatal care (ANC) visits ($r = 0.85$, $p < 0.01$), indicating that increased use of reminders is linked to better ANC attendance. They also demonstrated a strong positive correlation with antiretroviral (ARV) adherence ($r = 0.80$, $p < 0.01$), highlighting their role in supporting consistent medication use. Additionally, reminders were strongly associated with improved health outcomes for HIV-exposed infants ($r = 0.78$, $p < 0.01$), suggesting that timely reminders contribute to better infant care and survival (Table 4.17).

Table 4. 17: Correlation Analysis Results

Variables	**Correlation Coefficient (r)**	**P-Value**
Reminders vs. ANC Visits	0.85	0.0053
Reminders vs. ARV Adherence	0.80	0.0026
Reminders vs. Infant Health Outcomes	0.78	0.0041

4.9.7 Association between use of reminders on antenatal visits, adherence to antiretroviral therapy and health outcomes of HIV exposed infants

The Chi-Square test results show that there is a statistically significant association between the use of reminders and improved health outcomes among the mothers and infants. The high Chi-Square values and low p-values indicate that the observed improvements in ANC visits, ARV adherence, and infant survival rates are unlikely to have occurred by chance.

4.9.7.1 Association between use of reminders vs. antenatal care visits

The Chi-Square value of 25.5 with a corresponding p-value of 0.002 indicates a significant association between the use of reminders and the frequency of antenatal care visits. In other words, the data suggests that the mothers who received reminders were more likely to attend their scheduled ANC visits than those who did not receive reminders. This result underlines the effectiveness of reminder systems in encouraging timely healthcare visits, which are crucial for preventing complications during pregnancy and ensuring the health of both the mother and the child.

Regular ANC visits are essential for monitoring both the health of the mother and the development of the fetus. These visits allow healthcare providers to manage any complications, such as high blood pressure, gestational diabetes, and HIV viral load. The use of reminders ensures that mothers adhere to the recommended number of visits, leading to better maternal and infant outcomes.

Table 4. 18: Association between use of Reminders vs. ANC Visits among HIV positive pregnant mothers

ANC Visits	Reminders	Routine Follow-up	Chi-Square Value	P-value
1st - 2nd Visits	95(43.6)	5(4.5)	25.5	0.002
3rd - 4th Visits	65(29.5)	8(7.2)		
5th - 6th Visits	40(18.2)	6(5.4)		
7th - 8th Visits	15(6.8)	1(0.9)		

4.9.7.2 Association between use of reminders vs. ARV Adherence

The Chi-Square value of 23.0 and a p-value of 0.007 demonstrate a statistically significant relationship between the use of reminders and adherence to antiretroviral therapy (ART). This finding shows that reminders had a positive impact on improving the adherence rates of HIV positive mothers to their ART regimens. Mothers who received reminders were more likely to consistently take their ART medications, which is critical for preventing mother-to-child transmission (MTCT) of HIV.

Adherence to ART is crucial for reducing viral load and preventing the transmission of HIV to the infant. When HIV positive mothers do not adhere to ART, their viral load increases, which increases the risk of HIV transmission to the fetus during pregnancy, childbirth, or breastfeeding. Reminders ensure that mothers remember to take their medication on time, which significantly lowers the risk of transmission and improves the overall health of the mother.

Table 4. 19: Association between use of Reminders vs. ARV Adherence among HIV positive pregnant mothers

	Reminders	**Routine Follow-up**	**Chi-Square Value**	**P-value**
ARV Adherence	220(99.1)	215(97.8)	23.0	0.007
ARV Non-Adherence	2(0.9)	5(2.2)		

4.9.7.3 Association between of use of reminders vs. infant health outcomes

The Chi-Square value of 20.8 with a p-value of 0.009 indicates a strong and significant association between the use of reminders and improved health outcomes for HIV exposed infants (HEIs). The findings suggest that infants born to mothers who received reminders had better health outcomes, including higher rates of HIV-negative results, fewer complications, and improved overall growth and development.

HIV exposed infants are at a higher risk of infections, low birth weight, and delayed developmental milestones. The use of reminders to encourage ART adherence and regular health check-ups for the mother significantly improves the likelihood of better birth outcomes. These positive outcomes can include a reduction in the rate of HIV transmission to the infant, lower incidence of preterm birth, and healthier weights at birth. Additionally, these reminders can also enhance the likelihood that infants will receive timely medical care, including HIV testing and prophylaxis (Table 4.20).

Table 4. 20: Association between of use of reminders vs. infant health outcomes

Variables	**Reminders**	**Routine Follow-up**	**Chi-Square Value**	**P-value**
HIV Negative	216(97.2)	209(95.5)	20.8	0.009
HIV Positive	4(1.8)	11(5.0)		

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

5.1.1 Uptake of ANC Services and adherence to ART among HIV Positive Mothers

The study found that the majority of HIV positive pregnant mothers in both groups were aged between 31 and 40 years, representing 45.5% in the reminders and social support group and 41.8% in the routine follow-up group. These findings align with Kanguya *et al.* (2022), who observed that women in their thirties constitute a key demographic for targeted HIV interventions in sub-Saharan Africa. Additionally, most participants were married, accounting for 64.1% of mothers receiving reminders and 60.5% of those on routine follow-up, whereas divorced or separated mothers represented a smaller proportion in both groups. This marital profile underscores the potential role of partner involvement in adherence to antenatal care and PMTCT services.

The findings agree with Wondimu *et al.* (2020) findings showing that marital relationships often provide a foundation for better healthcare access and adherence through spousal encouragement and shared responsibility. A significant proportion of mothers had attained secondary education, 43.6% in the reminders group and 51.4% in the routine group, while fewer had no formal education. The findings also agree with previous studies like Augustino *et al.* (2024), which link higher education levels to increased health-seeking behavior and ART adherence. In addition, partner support was the most common form of social support, reported by 51.4% of mothers in the reminders group and 60.9% in the routine follow-up group.

The findings are consistent with Philemon *et al.* (2022), who emphasized the role of male involvement in successful PMTCT programs. However, the presence of participants with limited or no support reflects ongoing challenges noted in studies like Theunissen (2020), indicating the continued need for broader community and psychosocial support systems to enhance care for HIV positive mothers. The findings revealed that HIV positive pregnant mothers in the reminders group had slightly higher

adherence to recommended ANC schedules, with 63.1% making three to four visits compared to 57.7% in the on routine follow-up group. Moreover, 5.5% of mothers in the on reminders group made seven to eight visits, double the proportion in the routine group (2.7%). This is in line with Guta *et al.* (2024), who emphasized that regular ANC visits offer multiple touchpoints for reinforcing ART adherence and preventing MTCT.

Similarly, Wondimu *et al.* (2020) identified ANC attendance as a significant predictor of adherence to Option B+ PMTCT care in Ethiopia. The reminder system used in Nyahururu, including SMS and phone call follow-ups, mirrors the Enhanced Adherence Package described by Mubiana-Mbewe *et al.* (2021) in Zambia, which also contributed to higher health service utilization.

The study found that a greater proportion of mothers in the reminder group had CD4 counts above 250 (89.5%) and undetectable viral loads, compared to 65.4% and 78.6% respectively in the routine group. Furthermore, a smaller percentage of mothers in the reminder group missed these tests. This shows that structured follow-up contributed to improved laboratory monitoring, a critical element in managing HIV in pregnancy. These findings support Tusabe *et al.* (2024), who reported that late initiation of PMTCT care and missed testing were linked to non-adherence. Guta *et al.* (2024) similarly noted that ART adherence and laboratory monitoring are essential for viral suppression.

In the reminders group, 68.6% of mothers were diagnosed during ANC visits, compared to 66.4% in the routine group. Notably, fewer mothers in the on reminders group (2.7%) were diagnosed during labor compared to the routine group (8.6%). Early diagnosis allows timely initiation of ART and better pregnancy outcomes. This observation aligns with the findings by Abuogi *et al.* (2022), where early intervention strategies, including text messaging, were associated with improved engagement in HIV care. Similarly, Wondimu *et al.* (2020) emphasized that early HIV diagnosis and immediate ART initiation contributed to higher adherence levels.

The study showed that 83.2% of mothers in the reminders group had been on ART for more than one year, compared to 65.0% in the routine care group. Only 2.3% of the mothers in the on reminders group had never initiated ART, as opposed to 8.2% in the routine group. This difference indicates better ART retention and follow-up in the on

reminders group. This finding resonates with the Enhanced Adherence Package (BEAP) model by Mubiana-Mbewe *et al.* (2021), which combined counseling, follow-up visits, and phone on reminders to significantly improve ART uptake.

Furthermore, the psychosocial dynamics noted by Kanguya *et al.* (2022) in Zambia highlight how ongoing support systems like on reminders can motivate adherence despite fears of stigma or disclosure. Similarly, Abdihakim (2023) emphasized the positive role of education and informed engagement, which the reminder system in Nyahururu effectively fostered through regular touchpoints and reinforcement.

5.1.2 Maternal and Birth Outcomes among HIV positive Pregnant Mothers

The study found that the majority of HIV positive mothers, both in the reminders and routine follow-up groups, had spontaneous vaginal deliveries (96.4% and 98.6%, respectively). The findings are consistent with Shafiq *et al.* (2021), who indicated that vaginal delivery remains the preferred mode for HIV positive women unless specific obstetric complications arise. This aligns with the broader literature suggesting that caesarean sections are not routinely indicated for HIV positive women unless medically necessary (Rasmussen *et al.*, 2020). The slightly higher proportion of vaginal deliveries in the routine follow-up group may be influenced by other factors such as maternal education, access to skilled birth attendants, and socioeconomic status, which can affect decision-making during labor.

In this study, most HIV positive mothers in both groups experienced labor durations of less than 12 hours, indicating generally uncomplicated labors. These findings are in line with Zash *et al.* (2021), who reported that HIV positive women with adequate prenatal care and adherence to ART typically do not experience prolonged labor. Shafiq *et al.* (2021) also note that well-managed HIV positive pregnancies often exhibit labor durations similar to those of HIV-negative pregnancies. Importantly, the reminders group experienced slightly fewer labor complications, which may be partly attributable to improved engagement with antenatal care, timely reporting of symptoms, and better adherence to ART, all facilitated by regular reminders and social support. Maternal education, partner involvement, and overall socioeconomic resources likely enhanced the ability of mothers in the reminders group to act on health advice and access timely care, reducing complications.

The study further found that fewer mothers in the reminders group required uterotonics or eclampsia medication, suggesting that proactive monitoring and early interventions may have prevented complications from escalating. This aligns with Zash *et al.* (2021), who observed that well-managed HIV positive pregnancies reduce the need for intensive labor interventions. Regular reminders may have enhanced adherence to antenatal care schedules and ensured early detection of risk factors, thereby contributing to smoother labor outcomes. Additionally, infants born to mothers in the reminders group had higher APGAR scores, with 80.9% scoring between 9.01 and 10.00. These findings are in agreement with Shafiq *et al.* (2021), who reported that HIV exposed infants of mothers receiving consistent prenatal care and social support tend to have better immediate post-birth health indicators, including higher APGAR scores. The effect of reminders likely reflects the combined influence of timely maternal care, adherence to ART, and psychosocial support, which collectively promote healthier fetal outcomes.

Regarding birth weight, infants in the reminders group were more likely to weigh between 2.51–3.00 kg, with fewer low-birth-weight cases. This is consistent with Fentie *et al.* (2022), who found that HIV positive mothers with adequate nutrition, ART adherence, and prenatal monitoring had a lower incidence of low-birth-weight infants. The reminders may have reinforced maternal adherence to ART, nutritional guidance, and clinic attendance, while socioeconomic status and partner or family support likely moderated these outcomes. Moreover, a higher percentage of infants in the reminders group received initial prophylaxis with Nevirapine or Zidovudine (95.0%), supporting findings by Prendergast and Evans (2023) that targeted interventions improve the likelihood of timely prophylaxis. Similarly, the reminders group had a higher rate of dried blood spot (DBS) collection for HIV testing (95.0%), consistent with Rasmussen *et al.* (2020), who noted that enhanced engagement and follow-up mechanisms, such as reminders and social support, increase the likelihood of early infant HIV testing. Taken together, these results suggest that structured reminders and social support positively influenced maternal adherence and infant care, while factors such as education, socioeconomic resources, and partner support likely contributed to the observed improvements in maternal and birth outcomes.

5.1.3 Breastfeeding Practices of HIV Positive Mothers Six Months Post-Delivery

The findings of this study indicated that the majority of HIV positive mothers at Nyahururu County Referral Hospital practiced exclusive breastfeeding (EBF) for six months, with 77.7% in the on reminders and social support group and 65.0% in the on routine follow-up group. This suggests a generally high adherence to recommended breastfeeding practices, especially among those receiving additional support through reminders and counseling. The higher adherence in the reminders group may be attributed to consistent reinforcement of infant feeding guidance, ongoing psychosocial support, and timely follow-ups that allowed mothers to address challenges such as milk insufficiency or concerns about HIV transmission. In contrast, the lower adherence observed in the routine follow-up group could be influenced by several factors, including limited counseling opportunities, inconsistent ART adherence, socioeconomic constraints, lower levels of maternal education, and reduced partner or family support, all of which may hinder sustained EBF practices. The results are in line with Augustino *et al.* (2024), who emphasized that adherence to ART and continued support significantly reduce postnatal HIV transmission risks and promote EBF.

Similarly, Philemon *et al.* (2022) in Kilimanjaro found a 73.1% early initiation and relatively high EBF rates, though they also noted barriers such as cesarean delivery and non-disclosure of HIV status. These factors may partly explain why a segment of mothers in the current study—particularly in the routine follow-up group—opted for early cessation or exclusive replacement feeding. Moreover, the current findings are consistent with those of Samburu *et al.* (2020), who observed improved EBF rates among HIV positive mothers participating in community-based interventions like the Baby-Friendly Community Initiative (BFCI). Though their study noted that the statistical significance for HIV positive mothers was limited, the trend was similar: mothers receiving focused support demonstrated better adherence to EBF. This further highlight that structured reminders, counseling, and social support mechanisms can effectively address barriers and improve breastfeeding outcomes compared to standard routine follow-up practices.

5.1.4 Health Outcomes and Survivorship of Infants Born of HIV Positive Mothers

The study revealed that a significantly higher percentage of HIV exposed infants (HEIs) whose mothers received reminders and social support tested HIV negative (98.2%) compared to those under routine follow-up (95.0%). These findings are in line with Philemon *et al.* (2022) and Theunissen (2020), who emphasized that maternal adherence to ART and consistent follow-up care reduce the risk of mother-to-child HIV transmission. Similarly, Goga *et al.* (2018) confirmed that effective ART during pregnancy and breastfeeding leads to better health outcomes, reducing vertical transmission and improving infant health. The results also support Abdihakim (2023) and Kiyaga *et al.* (2019), who found that early infant diagnosis (EID) and timely ART initiation significantly reduce HIV positivity among HEIs. The lower HIV positivity in the reminders group reinforces the importance of structured interventions in enhancing treatment adherence, timely follow-up, and overall infant diagnostic outcomes.

Survivorship after one year was higher among infants in the reminders group (95.5%) compared to those in the routine follow-up group (86.0%). This finding is consistent with Tukei *et al.* (2020) in Lesotho, who reported a 91.8% HIV survival rate among HEIs, highlighting the importance of maternal support and timely healthcare. It also aligns with Cotton *et al.* (2019) and Aguti *et al.* (2020), who found that cotrimoxazole prophylaxis and early breastfeeding support enhance infant survival. Moreover, the current study's findings reflect those of Evans and Chasekwa (2021), who reported elevated mortality and stunting in HIV exposed infants without adequate care. The increased survivorship in the reminders group could be attributed to timely interventions, improved maternal ART adherence, and structured follow-up practices. Conversely, the lower survivorship in the routine follow-up group may have been influenced by delayed recognition of illness, inconsistent prophylaxis, limited maternal or partner support, or socio-economic constraints that impeded timely healthcare access. While the study did not explore the exact causes of infant deaths, these factors likely contributed, representing a limitation and highlighting areas for future research.

Although this study did not directly measure growth and nutritional outcomes, the findings resonate with Neary *et al.* (2022) and Kiilu (2021), who observed that HIV exposed uninfected infants (HEU) generally exhibit poorer growth indicators compared to HIV-unexposed peers. The structured reminders and social support mechanisms in the current study likely mitigated these risks by ensuring adherence to maternal ART, timely infant prophylaxis, and early identification of health concerns. Additionally, the combination of psychosocial support, counselling, and regular follow-up may have indirectly contributed to improved developmental outcomes. These results show that interventions such as reminders and structured support can positively influence infant health and survivorship while also highlighting the ongoing need to address confounding factors, including maternal education, socio-economic status, and family support, to maximize infant health outcomes.

5.2 Limitations of the Study

This study had several limitations that should be considered when interpreting the findings. First, adherence to ART, antenatal care visits, and breastfeeding practices was partly self-reported, which may have introduced social desirability or recall bias. Second, the study employed a non-randomized design with participants assigned to either the reminders and social support group or routine follow-up group, which may have introduced selection bias despite efforts to match participants on key socio-demographic characteristics. Third, the study relied on a facility-based sample from Nyahururu County Referral Hospital, which limits the generalizability of the findings to mothers and infants outside the hospital setting or in more rural or community-based contexts. Additionally, some confounding factors, such as socioeconomic status, maternal education, and family support, may have influenced maternal and infant outcomes despite being considered in the analysis. To mitigate these limitations, the study utilized structured and pre-tested questionnaires, reinforced follow-up through SMS reminders and phone calls, and triangulated data with medical records to enhance accuracy and reduce reporting errors. While these measures improved the reliability and validity of the findings, caution should be exercised in generalizing the results beyond the study population.

5.3 Conclusions

1. Adherence to antenatal care (ANC) and antiretroviral therapy (ART) among HIV positive pregnant mothers at Nyahururu County Referral Hospital was higher in the reminders and social support group, with 80.9% retained in care compared to 72.3% in the routine follow-up group, highlighting the effectiveness of structured reminder interventions.
2. Mothers who received reminders demonstrated improved ANC attendance, timely HIV diagnosis, longer continuity on ART (83.2% on ART >1 year vs. 65.0% in routine follow-up), and consistent laboratory monitoring, indicating that reminder-based support enhances adherence to PMTCT services.
3. Maternal and birth outcomes were more favorable in the reminders group, including fewer complications during labor (e.g., 2.7% post-partum hemorrhage vs. 3.4%), shorter labor durations (<12 hours in 96.8% vs. 95.9%), and reduced need for medical interventions, demonstrating the protective impact of structured support.
4. Infants born to mothers in the reminders group had higher APGAR scores (80.9% scored 9.01–10.00), higher birth weights (81.4% weighed 2.51–3.00 kg), and higher rates of timely HIV prophylaxis (95.0%) and DBS testing (95.0%), suggesting that maternal adherence facilitated by reminders translates into better neonatal outcomes.
5. Exclusive breastfeeding for six months was more common among mothers receiving reminders (77.7% vs. 65.0% in routine follow-up), indicating that structured support positively influences adherence to recommended postnatal feeding practices.
6. Overall, structured interventions combining reminders and social support were associated with improved maternal adherence, better birth outcomes, and higher one-year survivorship among HIV exposed infants (95.5% vs. 86.0%), underscoring their critical role in strengthening PMTCT programs.

5.4 Recommendations

1. The County Health Management Teams, in collaboration with facility management at Nyahururu County Referral Hospital, should implement structured reminder systems—such as SMS or mobile notifications—to improve adherence to ANC visits and ART. These reminders should be scheduled according to ANC appointment dates and ART refill schedules, as the study showed that mothers receiving reminders had higher retention and better ART adherence.
2. Maternal care services should formally integrate reminder-based support to reduce labor complications and enhance birth outcomes. The study findings indicate fewer complications and better neonatal indicators among mothers who received reminders, demonstrating the feasibility and potential impact of these interventions within existing hospital services.
3. Reminder interventions should be leveraged to encourage exclusive breastfeeding for six months. Health facilities should integrate postnatal reminders aligned with routine follow-up schedules to reinforce recommended feeding practices, as the study showed higher adherence to exclusive breastfeeding in the reminders group.
4. Facilities should use reminders to ensure infants receive timely Nevirapine/Zidovudine prophylaxis and Dried Blood Sample (DBS) testing. Structured follow-up through reminders should be maintained during the first year of life to support infant health outcomes and survival.
5. Nyahururu County Referral Hospital, in collaboration with county digital health teams, could develop a mobile application for HIV positive pregnant mothers. The app should provide automated ANC visit and ART adherence reminders, track maternal and infant follow-up schedules, and include simple, multilingual interfaces. The study findings suggest such a system could replicate the positive outcomes observed in the reminders group, improving maternal adherence and infant survivorship within the hospital's existing care framework.

5.5 Areas for Further Research

Future studies could explore barriers to antiretroviral therapy access among HIV-infected children and adolescents in public hospitals, as well as factors influencing social support and adherence to ART in this population. Additionally, research should evaluate the cost-effectiveness and long-term sustainability of structured reminder systems for pregnant mothers and caregivers, including their potential scalability across different healthcare settings. Investigating these aspects would provide critical insights for optimizing resource allocation, enhancing adherence strategies, and ensuring lasting impact of reminder-based interventions in HIV care programs.

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APPENDICES

Appendix I: Consent Form

Topic: Effectiveness of on reminders and Social Support Framework on Birth and Health Outcomes among HIV Exposed Infants in Nyahururu County Referral Hospital, Laikipia County

Investigators/Affiliations:

PI -Silas Lodeke, Ph.D. student at Jomo Kenyatta University of Agriculture and Technology. I am pursuing a Ph.D. in public health.

Supervisors: Prof. Karanja Simon of college of Public Health (JKUAT), Dr. Raphael Lihana-Postgraduate School (KEMRI).

The following questions aim to explore factors associated with health outcomes among HIV exposed infants and their mothers at Nyahururu County Referral Hospital in Laikipia County. We kindly request your participation to provide information on these matters. Please answer all questions truthfully.

Your responses will be kept confidential and solely utilized for this research. They will not be traceable to you in any manner in the future. There are no anticipated risks or discomforts associated with your participation, aside from the investment of your time. Interviews will be arranged at a time and location convenient for you.

We understand that discussing matters related to your health during pregnancy, delivery, and your infant's HIV status may evoke concerns or anxiety. Rest assured that every precaution will be taken to safeguard your privacy and confidentiality throughout your involvement in the study. Your HIV status and that of your infant will be verified, but your anonymity will be maintained.

All information collected about you and your infant will be treated with utmost confidentiality and solely used for the purposes of this study. Interviews will be conducted in private, and no identifying names will be used in the questionnaire;

instead, each participant will be assigned a unique code. Access to this information will be restricted to the researchers involved in the study.

Participation in this study is entirely voluntary, and no compensation will be provided. Upon completion of the study, an analysis will be conducted to identify gaps, with the aim of generating recommendations to enhance service delivery in Laikipia County. Your contribution is highly valued, and we appreciate your willingness to participate.

I have read and willingly agreed to participate in the interview.

Signature……. Date…….....

If you have any questions or need further clarification, please feel free to contact the following:

1. My personal contact: Silas Lodeke Mobile: +254701363515 Email: silaslodeke@gmail.com

2. Kenyatta National Hospital-University of Nairobi ERC Secretary. Telephone: 2726300 Ext 44102 Email: uonknherc@uonbi,ac.ke

3. Professor Simon Karanja (Supervisor)-0726424669Email: skaranja@jkuatac.ke

4. Dr.Raphael Lihana (Supervisor)-0721879497.Email:lihanaraphael@gmail.com

Appendix II: Questionnaire

SERIAL NO……. DATE OF THE INTERVIEW……

Research topic Effectiveness of on reminders and Social Support Framework on Birth and Health Outcomes among HIV Exposed Infants in Nyahururu County Referral Hospital, Laikipia County**.**

Investigators/Affiliations: Silas Lodeke, Prof.Karanja Simon, College of Public Health (JKUAT), Dr. Raphael Lihana-Postgraduate School (KEMRI).

INTRODUCTION: Silas Lodeke, a Ph.D. student at Jomo Kenyatta University of Agriculture and Technology, is conducting this research project. We are reaching out to invite you to participate in this study because you are aware of your HIV status and regularly attend the antenatal clinic at this facility. Your insights are invaluable and relevant to achieving the study objectives.

Section One

UPTAKE OF ANTENATAL CARE SERVICES AMONG HIV PREGNANTMOTHERS

Socio-demographic characteristics

1. Age in years …….
   A. 10-20
   B. 21-30
   C. 31-40
   D. 41-50
   E. Above 50

2.Marital status

   A. Single
   B. Widow
   C. Married
   D. Divorced/separate cohabiting

3. Level of education

A. None
B. Primary
C. Secondary
D. Tertiary

4. Occupation

A. Housewife
B. Self-employed
C. Formal employment
D. Informal/casual employment

5.source of social support?

A. Your partner/ spouse
B. Family/ relatives
C. Your partner Friend
D. None

Antenatal profile

6.. Parity

A. 1st pregnancy
B. 2nd pregnancy
C. 3rd pregnancy
D. More than 3

7.. Where was your previous delivery?

A. This is the first pregnancy
B. Government health facility
C. Faith-Based facility
D. Private facility

9. Antenatal clinic attendance checklist (Check from the booklet during every visit)

No of visit	Date	WT	BP	HB	URINE	VDRL	V/L	CD4	TT
1stVisit									
2nd Visit									
3rdVisit									
4thVisit									
5thVisit									
6th Visit									
7th Visit									
8th Visit									

SECTION TWO

ADHERENCE TO PROPHYLACTIC ANTIRETROVIRAL THERAPY AMONG HIV POSITIVE PREGNANT MOTHERS

10. When did you learn of your current HIV status?
    A. During pregnancy (ANC visits)
    B. During labour After delivery
    C. Voluntary counseling and testing
    D. Couple counseling
11. For how long have you been on ART?
    A. Never been on ARVs
    B. Below one year
    C. More than one yea

SECTION THREE

MATERNAL OUTCOMES AMONG HIV POSITIVE PREGNANT MOTHERS

12. Mode of delivery:
    A. Spontaneous Vaginal delivery
    B. Caesarian section
13. Duration of labor:
    A. Less than 12 hours
    B. More than 12 hours
14. Complications encounter during labor process
    A. Post-partum hemorrhage
    B. Eclampsia
    C. Cervical tear/laceration
    D. Others specify
15. Medication given during all stages of labor
    A. Oxytocin
    B. Antibiotics
    C. Antihypertensive
    D. Misoprostol
    E. Intravenous fluids

SECTION FOUR

BIRTH OUTCOMES OF HIV EXPOSED NEONATES BORN TO HIV POSITIVE PREGNANT MOTHERS

17.Immediate assessment of the newborn

PARAMETER		Any comment
Birth Weight		
Apgar score		
Asphyxia		
Convulsions		
Bleeding from the cord		
Congenital Anomalies		
Others specify		

18. Blood tests are done

A. DBS

B. Others specify

SECTION FIVE

BREASTFEEDING PRACTICES OF HIV POSITIVE MOTHERS FOR 6 MONTHS POST-DELIVERY

19. After delivery, when did you start breastfeeding the baby?

A. Within 1 hour

B. Within the first 12 hours

C. Within the first 24 hours

D. None

31. What feeding option have you chosen?

A. Exclusive Breast Feeding

B. Breastfeeding with early cessation

C. Expressed Heat Treated Breast Milk

D. Exclusive Replacement Feeding

E. Home prepared formula

F. Mixed feeding

SECTION SIX

HEALTH OUTCOMES OVER ONE YEAR AMONG INFANTS BORN TO HIV POSITIVE MOTHERS

32.HIV status of HIV exposed infants after one year (Tick appropriately).

HIV Positive	
HIV Negative	

PART SEVEN

SURVIVORSHIP OF INFANTS BORN TO HIV POSITIVE MOTHERS IN NYAHURURU COUNTY REFERRAL HOSPITAL

33.Survivorship of HIV exposed infants

	Number
Survived	
Died	

Appendix III: Actual approval from the County

REPUBLIC OF KENYA
COUNTY GOVERNMENT OF LAIKIPIA
DEPARTMENT OF MEDICAL SERVICES AND PUBLIC HEALTH

OFFICE OF THE COUNTY DIRECTOR
P.O. Box 1271-10400,
Nanyuki, Kenya

Ref: CGL/HEALTH/RESEARCH/VOL.1/26 **Date**: 5th February, 2020

SILAS LODEKE
DOCTOR OF PHILOSOPHY
ADM CHSH411-0798/2018
JOMO KENYATTA UNIVERSITY OF AGRICULTURE

RE: RESEARCH AUTHORIZATION

This is to grant you authority to undertake a research on "Health outcome among HIV positive pregnant mothers and their infants in Nyahururu County Referral Hospital, Laikipia County from 2020 to 2021.

Please share your findings with office of County Director, Department of Health, County Government of Laikipia.

I take this opportunity to wish you success in your research.

Yours faithfully

COUNTY DIRECTOR OF HEALTH - MEDICAL SERVICES
DEPARTMENT OF HEALTH
05 FEB 2020
COUNTY GOVERNMENT OF LAIKIPIA

DR. WAIHENYA M[illegible]
COUNTY DIRECTOR MEDICAL SERVICES
LAIKIPIA COUNTY

Cc. Chief Officer of Health

Appendix IV: Ethical Clearance from KNH-UON ERC

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

KNH-UON ERC
Email: uonknh_erc@uonbi.ac.ke
Website: http://www.erc.uonbi.ac.ke
Facebook: https://www.facebook.com/uonknh.erc
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/30

27th January 2020

Silas Lodeke
Reg. No.HSH411-0798/2018
(PhD Candidate)
School of Public Health
College of Health Sciences (CoHES)
J.K.U.A.T

Dear Silas

RESEARCH PROPOSAL: HEALTH OUTCOMES AMONG HIV EXPOSED INFANTS AND THEIR MOTHERS IN NYAHURURU COUNTY REFERRAL HOSPITAL, LAIKIPIA COUNTY, KENYA (P446/06/2019)

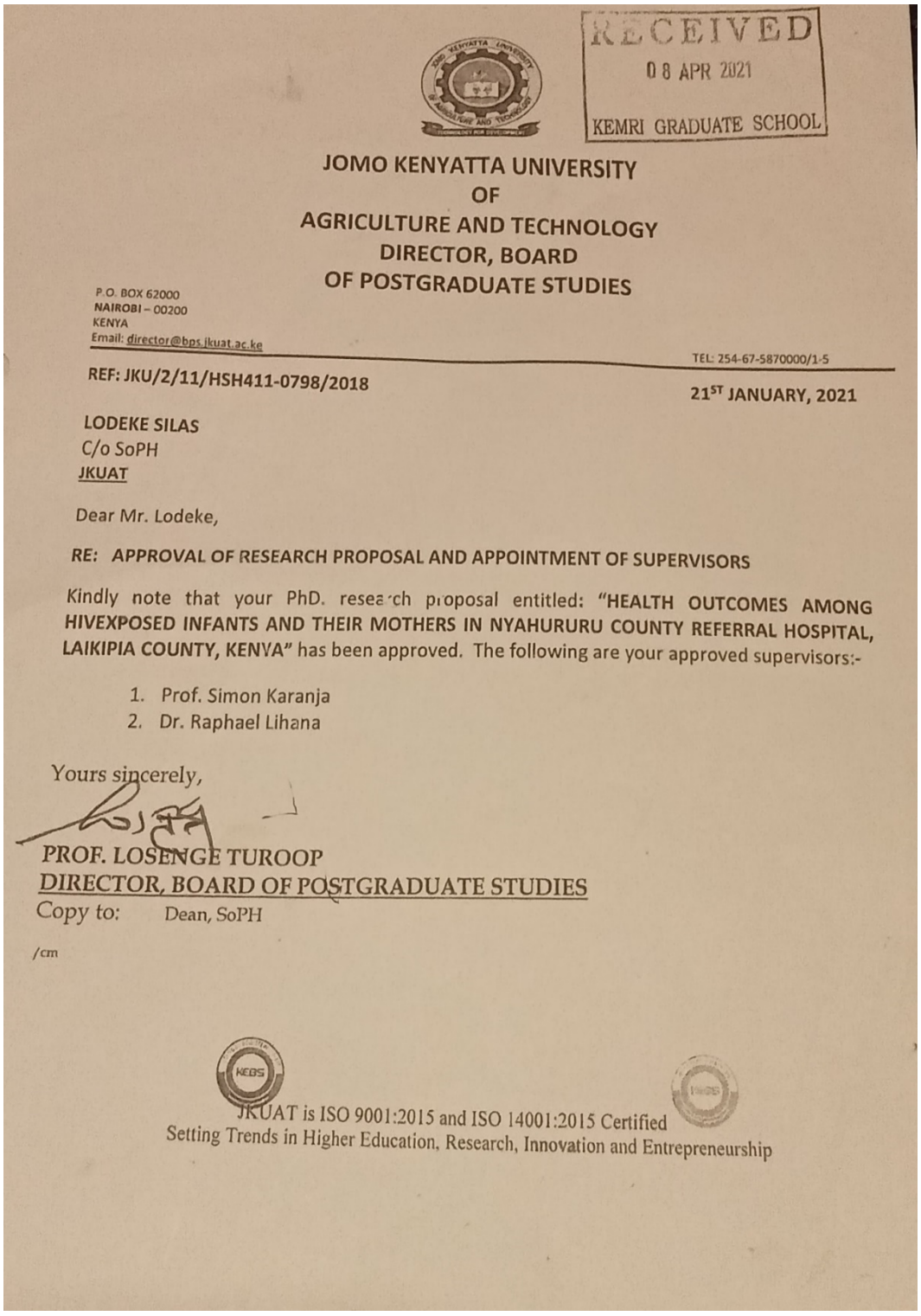
This is to inform you that the KNH- UoN Ethics & Research Committee (KNH- UoN ERC) has reviewed and **approved** your above research proposal. The approval period is 27th January 2020 – 26th January 2021.

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 serious 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. Clearance for export of biological specimens must be obtained from KNH- UoN ERC for each batch of shipment.
f. 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*).
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.

Protect to discover

Appendix V: Approval Letter from Board of Postgraduate Studies



RECEIVED
08 APR 2021
KEMRI GRADUATE SCHOOL

JOMO KENYATTA UNIVERSITY
OF
AGRICULTURE AND TECHNOLOGY
DIRECTOR, BOARD
OF POSTGRADUATE STUDIES

P.O. BOX 62000
NAIROBI – 00200
KENYA
Email: director@bps.jkuat.ac.ke

TEL: 254-67-5870000/1-5

REF: JKU/2/11/HSH411-0798/2018

21ST JANUARY, 2021

LODEKE SILAS
C/o SoPH
JKUAT

Dear Mr. Lodeke,

RE: APPROVAL OF RESEARCH PROPOSAL AND APPOINTMENT OF SUPERVISORS

Kindly note that your PhD. research proposal entitled: **"HEALTH OUTCOMES AMONG HIVEXPOSED INFANTS AND THEIR MOTHERS IN NYAHURURU COUNTY REFERRAL HOSPITAL, LAIKIPIA COUNTY, KENYA"** has been approved. The following are your approved supervisors:-

1. Prof. Simon Karanja
2. Dr. Raphael Lihana

Yours sincerely,

PROF. LOSENGE TUROOP
DIRECTOR, BOARD OF POSTGRADUATE STUDIES

Copy to: Dean, SoPH

/cm

JKUAT is ISO 9001:2015 and ISO 14001:2015 Certified
Setting Trends in Higher Education, Research, Innovation and Entrepreneurship

Appendix VI: Seminar Minutes

In Search of Better Health

KENYA MEDICAL RESEARCH INSTITUTE

GRADUATE SCHOOL

ISO 9001:2015 CERTIFIED

MINUTES

CONCEPT NOTE AND SEMINAR PRESENTATIONS HELD ON 15th NOVEMBER 2022 AT 11:00 AM

FACULTY MEMBERS PRESENT

1. **Dr. Martin Rono– Chairperson**
2. **Prof. Karanja Simon**
3. **Dr. Christina Mwachari**
4. **Prof. Waihenya**
5. **Prof. Joseph Gikunju**
6. **Dr. Joseph Mutai**
7. **Dr. Raphael Lihana**
8. **Dr. Jackline Nyaberi**
9. **Christine Bii**
10. **Andrew Nyerere**
11. **Chemutai Rono - Minutes**

Students Present

1. Silas Lodeke
2. Manaseh A. Bocha
3. Rosemary Okuku
4. Ruth Wambui Gicho
5. Suge Titus K
6. Lilly M. Nyagah

KENYA MEDICAL RESEARCH INSTITUTE

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E-mail: graduateschool@kemri.org Website: www.kemri.org

VIRTUAL MINUTES OF CONCEPT NOTES/SEMINAR PRESENTATIONS HELD ON 21 APRIL 2022 08.00AM.

FACULTY MEMBERS PRESENT

1. Dr Martin Rono Chairman
2. Dr. Edward Githinji
3. Aggrey Mokaya
4. Dr. Redemter Awuor
5. Dr. Elizabeth Matey
6. Dr. Martin Bundi
7. Chemutai Rono - Minutes
8. Dr.Daniel Nyamongo
9. Dr. Edward Maina
10. Dorcas Wachira
11. Dr Fred Munyokoli
12. Dr. Joseph Mutai

STUDENTS PRESENT

1. Mercy Owendy Achulu
2. Dan Ngugi
3. Mercy Wangu Munyeki
4. Adan Asma Ahmed
5. Silas Lodeke
6. Rose Anyango Oloo
7. Meshack Wadegu
8. Rose Aluoch Ojuok
9. Juma John Hassen
10. Omolo Besil

Appendix VII: Publications

Antenatal Care Uptake and Observance of Prophylactic Antiretroviral Therapy among HIV-Positive Pregnant Mothers in Nyahururu County Referal Hospital, Kenya

Lodeke L.S. [1*], Karanja S.K. and Lihana R.W.[3]

[1]College of Health Sciences, School of Public Health, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya; [3]Centre for Virus Research, Kenya Medical Research Institute, Nairobi, Kenya.

***Corresponding author:** Lodeke L. Silas, College of Health Sciences, School of Public Health, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya.
Email: silaslodeke@gmail.com. Orcid Number: 0000-0001-5611-2544

Summary

BACKGROUND

Prevention of Mother-To-Child Transmission (PMTCT) of Human Immunodeficiency Virus (HIV) infection has been a fundamental advancement in the Acquired Immunodeficiency Syndrome (AIDS) response for the past decade. Although Kenya introduced the antiretroviral therapy programme as early as 2011, babies are still born with HIV. This study aimed at assessing the uptake of Antenatal Care Services (ACS) and the level of observance of prophylactic antiretroviral therapy among HIV-positive pregnant mothers attending antenatal clinics in Nyahururu Referral County hospital, Laikipia County, Kenya.

MATERIALS AND METHODS

We conducted an institutional-based prospective cohort study in a hospital. Our participants were 180 pregnant HIV-positive women enrolled through systematic random sampling from the PMTCT department. We followed and monitored them prospectively for nine months. In addition, were commenced on prophylactic antiretroviral therapy. We used descriptive statistical methods, correlations, bivariate analysis and multivariable logistic regression analyses to make sense of the collected data. A p-value of less than 0.05 was considered significant.

RESULTS

There was a significant response rate of 91%. Social support from partners accounted for 69.3%. In addition, 69.3% of the mothers had visited antenatal care more than four times. The majority of participants had undetectable viral load 97.5% and 89.0% had a cluster of differentiation above 250/ml).

CONCLUSIONS

Adequate follow-up, counselling, monitoring, social support and adherence to antiretroviral therapy can increase the chances of the HIV infected mothers delivering

Maternal Outcomes among HIV Positive Pregnant Mothers and Birth Outcomes of HIV Exposed Newborns in Nyahururu County Referral Hospital, Kenya

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Summary

BACKGROUND

Approximately 37 million people were living with HIV by the end of 2015. This led to high morbidity and mortality among women of childbearing age, especially in Sub-Saharan Africa which was the epicentre of this global pandemic. Strengthening and implementing prevention of mother-to-child (PMTCT) services could reduce the incidence of vertical transmission and improve quality of life. We aimed to determine maternal and birth outcomes among HIV-positive pregnant mothers and HIV-exposed newborns in Nyahururu county referral hospital, Laikipia, Kenya.

MAIN OUTCOMES MEASURES

Reduce maternal morbidity and mortality and other birth-related complications. In addition, this will also reduce infant mortality and morbidity among HIV-exposed infants.

MATERIALS AND METHODS

This was a hospital-based descriptive prospective study conducted at the PMTCT department at the Nyahururu County referral hospital. A sample of 180 HIV-positive pregnant women enrolled at the PMTCT consented to participate in the study. We monitored them until delivery and labour complications were addressed. Babies were scored against the APGAR scale, weighed and spot dried blood samples taken before breastfeeding; and started on prophylactic antiretroviral therapy.

RESULTS

Out of 180 participants, only 17 did not complete the study. Our findings indicate that 97.5 % of the mothers delivered in the hospital, had labour lasting less than 12 hours, 92.6% had a normal delivery and 94.9% had no complications during the labour period. About 2.5 % of the women had misoprostol administration. The majority of exposed babies had an average weight of between 2.51 - 3.00kg. No neonatal asphyxia was evident among exposed babies.

CONCLUSIONS

The majority of the respondents delivered in the hospital; no neonatal asphyxia was evidenced and there was a significant correlation between APGAR scores and infant weight. There is a need for active follow-up and monitoring of HIV pregnant women and their

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