

**FACTORS ASSOCIATED WITH UPTAKE OF EARLY INFANT
DIAGNOSIS OF HIV AMONG HIV EXPOSED INFANTS IN MBEYA
CITY COUNCIL, MBEYA REGION, TANZANIA.**

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**Master of Public Health
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By

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**A Dissertation Submitted in Partial Fulfillment of the Requirement for Degree of
Masters of Public Health of Muhimbili University of Health and Allied Sciences**

October, 2021

CERTIFICATION

The undersigned certifies that he has read and hereby recommends for examination by the Muhimbili university of health and allied sciences a dissertation entitled ***“Factors associated with the uptake of early infant diagnosis of HIV among HIV exposed infants in Mbeya City Council Mbeya Region, Tanzania”*** in (partial) fulfillment of the requirements for the degree of masters of public health of Muhimbili University of Health and Allied Sciences.

Dr. Innocent Semali (PhD)

(Supervisor)

Date

DECLARATION AND COPYRIGHT

I, Iman Eliud Mwakabanje, declare that this dissertation is my original work and it has not been presented and will not be presented to any other University for a similar or any other degree award.

Signed 

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DEDICATION

This work is dedicated to my beloved wife **Ajile** and children **Einstein & Roberto** for their encouragement and patience in the course of pursuing this study.

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LIST OF ABBREVIATIONS

AIDS	Acquired immunodeficiency syndrome
AOR	Adjusted Odds Ratio
ART	.....	Antiretroviral therapy
ARV	.....	Antiretroviral
CI	.....	Confidence Interval
CTC	.....	Care and treatment center
CDC	.....	Center for Disease Control
DBS	.....	Dried blood spot
DNA	.....	Deoxyribonucleic acid
EID-	.....	Early infant Diagnosis
HEI	.....	HIV-exposed infant
HIV	.....	Human immunodeficiency virus
PMTC	.....	Prevention of mother to child transmission
MUHAS	.....	Muhimbili University of Health and Allied Sciences
OR	.....	Odds Ratio
PCR	.....	Polymerase chain reaction
PEPFAR	.....	President Emergency Plan for AIDS Relief
PLWHA	.....	People living with HIV/AIDS
RAS	.....	Regional Administrative Secretary
RCH	.....	Reproductive and child's health
SPSS	.....	Statistical Package for Social Sciences
SSA	.....	Sub-Saharan Countries
WHO	.....	World Health Organization

OPERATIONAL DEFINITION

Early infant diagnosis of HIV infection: It is virological testing that detects HIV DNA or RNA used to diagnose HIV infection in exposed infants and children below 18 months of age.

Exposed infants: These are infants aged 0-18 months born to HIV-positive mothers.

DNA PCR infant HIV testing: A direct method of testing for HIV using DNA PCR testing method performed on DBS collected from infants as early as between four to six weeks before the age of eighteen months.

Uptake of DNA PCR HIV testing services: In this study, it means bringing an HIV exposed infant for HIV testing using DNA PCR on time (Between 4-8 weeks for first DNA PCR).

ABSTRACT

Background

Early infant diagnosis (EID) of HIV infection provides the opportunity for identifying, follow up, and testing for HIV-exposed infants. In Tanzania, despite the availability of early infant diagnosis (EID) services, many children are left undiagnosed or diagnosed late which leads to increased childhood HIV-related mortalities.

Objective

To determine factors associated with the uptake of early infant diagnosis of HIV among HIV exposed infants in Mbeya City Council.

Material and method

A cross-sectional study design employing a quantitative approach was conducted in Mbeya health care facilities. A closed-ended questionnaire was used to collect data from the eligible study participants. Data were collected through interviewing mothers/guardians of HIV-exposed infants using a closed-ended questionnaire, CTC cards were used to countercheck linkage to CTCs. The collected data were, coded, entered, cleaned imported into SPSS software for analysis. Descriptive statistics, binary and multivariable regression analysis with 95% confidence intervals were carried out and P-value less than 0.05, were used to determine the significant association between independent variables and dependent variables. The adjusted odds ratio was used to establish the association between a dependent variable and independent variables

Results

The proportions of early infant diagnosis uptake among HIV exposed infants in Mbeya City Council found was 76.7%. The major factors strongly associated with late uptake of infant diagnosis of HIV among HIV exposed infants were lower age group (AOR; 0.819 (0.482-0.972), being unmarried (AOR; 0.322 (0.264-0.723), lack of knowledge on PMCTC(AOR; 0.897(0.318-0.917), suboptimal care givers ART adherence (AOR; 0.497(0.272-0.917), non-disclosure of HIV status(AOR; 0.354 (0.245-0.742), unknown status of male partner HIV status (AOR; 0.752 (0.562-0.980), long distance to the health care facilities (AOR; 0.250(0.034-0.834), inadequate training and unavailability of facilities for DBS sample

collection (AOR; 0.685(0.310-0.976) and long waiting time for ANC services at the health care facilities (AOR; 0.250(0.034-0.834)

Conclusion

The proportions of early infant diagnosis uptake among HIV exposed infants found in this study was comparatively better, however, there is a continual need for the Government, policy makers, NGOs, and all key players in the fights against HIV/AIDS to put more emphasis on increasing knowledge and awareness on the importance of PMCTC and EID services focused on ensuring more HIV positive mothers/caregivers are linked to PMCTC program, tested for HIV status, initiated with ART and their exposed infants gets EID services to improve maternal and child health.

CHAPTER ONE

INTRODUCTION

1.1 Background

Early Infant Diagnosis (EID) of HIV is part of Reproductive and Child Health (RCH) services that have been integrated into Prevention of Mother to Child Transmission of HIV (PMTCT) programs (MOH, 2012). In most sub-Saharan African countries (SSA) including Tanzania the services begun in 2006 (WHO, 2010).

Early infant diagnosis provides an opportunity for identification of HIV-infected infants for early clinical evaluation, provision of prophylaxis, and antiretroviral therapy (ART) to reduce morbidity and mortality (Tukei *et al.*, 2013). There are several factors for low uptake of EID among HIV exposed such as the limited capacity of health facilities to conduct HIV testing by using DNA PCR technique, shortage of health care workers, and the need for advanced laboratory infrastructure which is only present in large centralized laboratories. Other factors are infant's care givers factors such as knowledge of Early infant diagnosis (EID) services, non-disclosure of HIV status among HIV pregnant women, and socio-demographic factors such as age, education level, marital status, and level of economy (Nuwagaba-Biribonwoha *et al.*, 2010 and Adeniyi *et al.*, 2017).

Early HIV detection in exposed infants is important for their survival due to the increased risk of deaths due to lack of antiretroviral therapy (ART) compared to HIV-infected adults (Hampana, *et al.*, 2017). The WHO encourages early infant diagnosis in resource-limited settings using dry blood spot (DBS) polymerase chain reaction (PCR) technology at 4–6 weeks of life (WHO, 2010). However, current approximations indicate that less than half of the infants born from HIV-positive mothers in low- and middle-income countries obtain an HIV test within the first two months of life (HIV/AIDS, 2014). There have been several barriers in the healthcare system to early infant diagnosis of HIV in developing countries. This includes the use of DNA-PCR which requires sophisticated, expensive methods, highly

qualified staff, and progressive laboratory infrastructures, which are generally only present in large, centralized laboratories (Ciaranello *et al.*, 2011).

WHO is recommending early intervention to reduce the risk of vertical transmission of HIV. These include HIV prevention in women of reproductive age, diagnosis of HIV in all pregnant women, early initiation of anti-retroviral therapy (ART) to HIV positive individuals, prevention of unwanted pregnancies in women living with HIV, viral load testing to monitor the efficacy of treatment, a short course of antiretroviral drugs for the baby and early infant diagnosis (Bain, *et al.*, 2017 and Beyene, *et al.*, 2018). To respond to it sub-Saharan region is targeted to reduce new infection among children to less than 20000 and 95% ART initiation to HIV positive pregnant mothers by 2020; a target which is not met (UNAIDS, 2016).

In Tanzania, it is estimated that 43.6% of children were born to mothers with unknown HIV status, and 57.1% of infants accessed EID services between 4 and 6 weeks of age in the year 2016 (Gamaliel, 2012). Consequently, EID services are still challenging in Tanzania, where only a few HIV-exposed infants are tested (Gamaliel, 2012). It is estimated that 6% of the deaths among children aged below five years are attributed to HIV/AIDS which would have been prevented if access to EID was 95%. Despite, the strategies that have been promoted by the Tanzania Ministry of health (MoHCDGEC) and stakeholders, uptake of early infant diagnosis (EID) among HIV Exposed Infants (HEI) aged between 0-18 Months is still a challenge (Mwalimu, *et al.*, 2019). Thus, national and global efforts are urgently required to avert the observed sub-optimal uptake of early infant diagnosis services to achieve the global goal of reducing mother-to-child transmission of HIV by 95% (PEPFAR, 2019). Even though the country is implementing the 95,95,95 goal; it is still low particularly for the first component of HIV Testing which was at 61% by the end of 2017, the linkage to ART among those identified positive was 90% while viral suppression rates reached 88% (NACP, 2018).

Late diagnosis of pediatric HIV infections and persistence of vertical transmission continues to be a major challenge even with the introduction of PMTCT services. Efficient uptake of EID requires timely presentation of HIV-exposed infants, same-day DBS samples collection,

and prompt release of results after DBS testing at the testing laboratory. Since HIV diagnosis to exposed infants is not possible with antibody test; DNA-PCR test for detecting Viral RNA in an infant's blood sample is strictly recommended between 4 and 6 weeks of age (MOH, 2007 and Maritz *et al.*, 2014).

The limited capacity of health care facilities to perform HIV testing by using DNA PCR techniques, shortage of health care workers, and socio-economic factors facing infant caregivers are among the barriers which set back the testing coverage of those exposed infants (Maritz *et al.*, 2014)

Procedure for Early Infants Diagnosis (DBS)

At ART/ PMCTC center all HIV positive mothers are notified that dry blood spot samples will be collected from their infants and sample sent to the testing laboratory for confirming the HIV status of their infants. The dried blood spot (DBS) is collected from infants less than 18 months old with known HIV exposure. The blood sample (DBS) is collected from heel prick (for small infants) and big toe (for bigger infants). The introduction of dried blood spot (DBS) among infants born from known HIV status is to confirm the effectiveness of PMCTC intervention in preventing maternal-to-child transmission of HIV. (Thiha *et al.*, 2017).

The collected dried blood spot/DBS is sent to the testing laboratory for DNA PCR. After DBS collection is complete, samples are horizontally dried, carefully packed to maintain sample integrity and avoid any source of contamination. In the sample collection form, the sample collection date is made and finally transported to the testing laboratory on weekly basis either by EMS or riders (Thiha *et al.*, 2017).

Despite, the introduction of EID services in most POCT sites, still, gaps are existing on the uptake of EID, which includes; mothers' factors, child and household, community, health system, and governance (Finocchario-kessler *et al.*, 2018). Hence this study was designed to assess factors associated with uptake of early infant's diagnosis of HIV among exposed infants in Mbeya, Region, so that strategies to address the existing gaps may be proposed.

1.2 Problem statement

HIV is a global public health problem that continues threatening the lives of infants. Globally, it is estimated that 1.8 million children were living with HIV and 160,000 children were newly infected from their mothers by 2018 (Bwana *et al.*, 2018). The magnitude of HIV in sub-Saharan Africa is accounted for 90% of the global burden of paediatric HIV in which only 51% of HIV-exposed infants received early infant diagnosis tests (EID) within 2 months of life where as 33% of these infected infants die below 1 year without interventions (Gamaliel, 2012).

Early HIV detection in exposed infants is important for their survival due to the increased risk of deaths due to lack of antiretroviral therapy (ART) compared to HIV-infected adults (Hampana, Nimz, and Abuogi, 2017). Failure to diagnose infants within 2 months of age might increase morbidity and mortality to infants who might have been infected with HIV as there is no appropriate intervention.

The evidence from the previous study in Tanzania estimates that 43.6% of children were born to mothers with unknown HIV status, only 57.1% of infants accessed EID services between 4 and 6 weeks of age by the end of 2016 (Gamaliel, 2012). Consequently, EID services are still challenging in Tanzania, where only a few HIV-exposed infants are tested (Gamaliel, 2012).

In Mbeya region, 75.6% of the HIV-exposed infants presented for PCR test within the recommended age of 8 weeks, leaving behind 24.4% who are suspected to be presented for PCR test in more than 8 weeks and therefore, increasing the risk of vertical transmission of HIV from HIV positive mother to their infants (Mwashiuya and Abade, 2018).

Understanding the factors associated with the uptake of early infant diagnosis of HIV exposed infants was urgently needed to scale up early infant diagnosis services. Therefore, this study was proposed to determine the magnitude and various factors affecting the uptake of early infant diagnosis of HIV services among exposed infants in Mbeya city council so that strategies to address the existing gaps may be proposed.

1.3. Rationale of the Study

These findings contributed to the creation of awareness and understanding of the factors associated with the uptake of early infant diagnosis of HIV services in Mbeya city council. By doing so morbidity and mortality in HIV-infected infants in Mbeya region and Tanzania will be reduced hence progress towards attaining an AIDS-free generation. The findings from this study might be of clinical importance to health care professionals in Mbeya facilities and other key stakeholders working in HIV/AIDS interventions in the current and future management of early infant diagnosis of HIV services. This finding may provide the basis for future studies by other researchers and provide baseline information that may be used in the prevention, care, mitigation, and management of early infant diagnosis of HIV among HIV exposed infants born from HIV positive mothers/caregivers.

1.4. THE CONCEPTUAL FRAMEWORK

Several factors may be influencing the uptake of EID services among HEI, these factors can be grouped into health systems, infant's caregiver, and socio-demographic factors. In this concept, there is a relationship of several factors before a decision is made to bring an HIV exposed infant for DNA PCR HIV testing. For example; age, education, occupation, household income, and distance of residence from the health facility of the mother or caregiver play a key role in deciding to bring the HIV exposed infant for DNA PCR testing. Mothers who know their HIV status and disclosed their HIV status to sexual partners are significant in increasing the efficiency of the Prevention of Mother to Child Transmission (PMTCT) of HIV and hence the succeeding care of the HIV-exposed infant. This study focused mainly on identifying health system factors, infant's caregiver factors, and the socio-demographic factors associated with uptake of early infant diagnosis of HIV exposed infants in Mbeya City council, Mbeya region Tanzania.

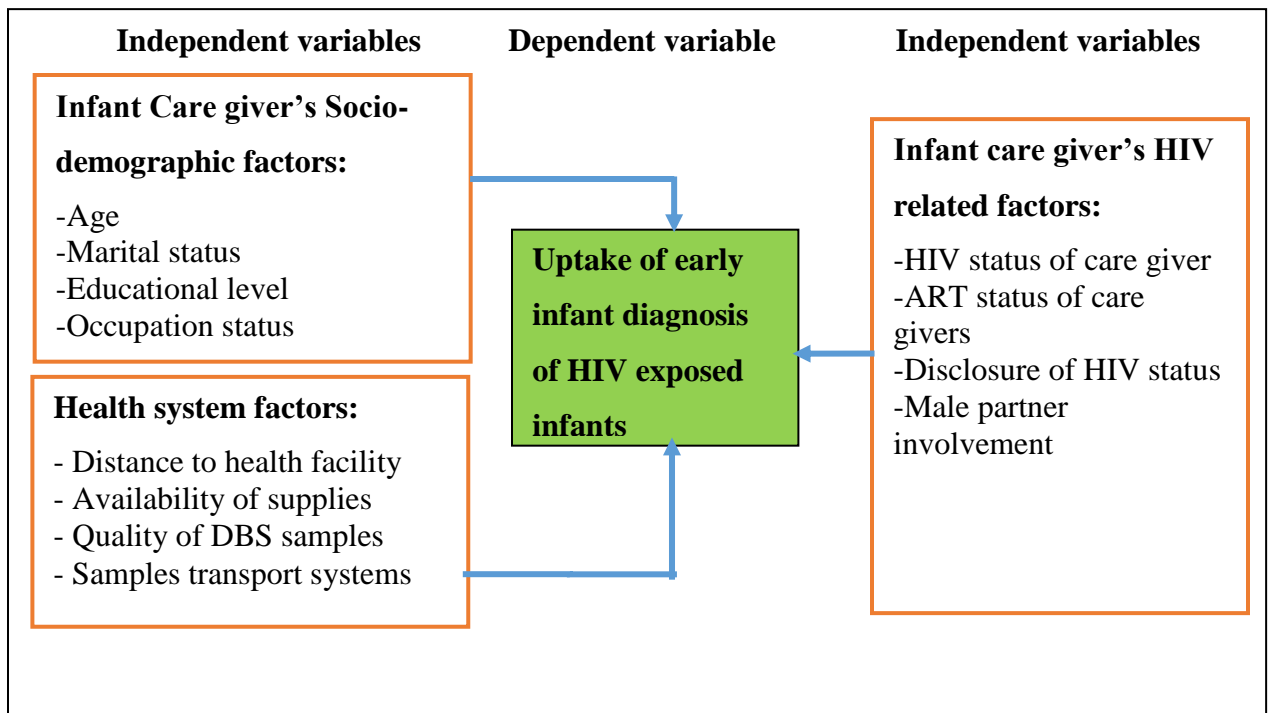


Figure 1: Conceptual framework on the factors associated with uptake of EID among HEIs (Adapted from Natukunda, 2019).

1.5 Research Questions

1.5.1 Main Research Question

What are the factors associated with the uptake of early infant diagnosis of HIV among HIV-exposed infants in Mbeya City Council?

1.5.2 Specific Research Questions

1. What are the proportions of early infant diagnosis uptake among HIV exposed infants in Mbeya City Council?
2. What are the infant caregiver's socio-demographic factors associated with the uptake of early infant diagnosis of HIV among HIV exposed infants in Mbeya City Council?
3. What are the health system factors associated with the uptake of early infant diagnosis of HIV among HIV-exposed infants in Mbeya City Council?

4. What are the infants care giver's HIV-related factors associated with the uptake of early infant diagnosis of HIV among HIV exposed infants in Mbeya City Council?

1.6 Objectives of the study

1.6.1 Broad objective

To determine the factors associated with the uptake of early infant diagnosis of HIV among HIV exposed infants in Mbeya City Council.

1.6.2 Specific objectives

1. To determine the proportions of early infant diagnosis uptake among HIV exposed infants in Mbeya City Council.
2. To determine infant care giver's socio-demographic factors associated with the uptake of early infant diagnosis of HIV among HIV exposed infants in Mbeya City Council.
3. To determine health system factors associated with the uptake of early infant diagnosis of HIV among HIV exposed infants in Mbeya City Council.
4. To determine the infants care giver's HIV-related factors associated with the uptake of early infant diagnosis of HIV among HIV exposed infants in Mbeya City Council.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview of Early Infant Diagnosis program

In 2018, it was estimated that 1.8 million children were living with HIV worldwide while 160,000 children were newly infected from their mothers (Bwana *et al.*, 2018). UNAIDS stipulated a fast-track combination strategy to reduce new infections to less than 500,000 by 2020 as a global target, and end HIV as a public health threat by 2030 (UNAIDS, 2018). Focusing on intensifying service delivery to community levels for demand creation and treatment adherence support (UNAIDS, 2018). Sub-Sahara Africa accounted for 90% of the global burden of paediatric HIV in which only 51% of HIV-exposed infants received early infant diagnosis tests (EID) within 2 months of life where as 33% of these infected infants die below 1 year without interventions (Gamaliel, 2012).

2.2 Factors associated with uptake of early infant diagnosis

2.2.1 Socio-demographic factors:

Age

Late diagnosis of pediatric HIV infections and persistence of vertical transmission continues to be a major challenge even with the introduction of PMTCT services (WHO, 2015). Several studies have reported age of caregivers is among the barriers which set back the testing coverage of those exposed infants (Bain, *et al.*, 2017 and Beyene, *et al.*, 2018). The study done in Rural Kenya in 2013 revealed that young women (≤ 27 years) were more likely to delay and even drop out of the EID programs of their babies (Hassan *et al.*, 2012). Efficient uptake of early infant diagnosis (EID services) requires timely presentation of HIV-exposed infants, same-day DBS samples collection, and prompt release of results after DBS testing at the testing laboratory.

Marital Status

The evidence from the previous study demonstrates that a couples-based framework may be useful for the prevention of HIV during pregnancy and breastfeeding, hence leading to the improved health outcome among HIV exposed infants born from HIV positive mothers (Chi *et*

al., 2020). In addition to that, many PMTCT programs offer facility-based couples counseling and these services can be enhanced with different options for partner notification (Chi *et al.*, 2020).

Education level

The evidence from the previous study revealed that HIV exposed infants born from mothers/caregivers with a higher level of education, were more likely to access EID service on time (Peltzer, *et al.*, 2011, Dionne-Odom *et al.*, 2016 and Haile, *et al.*, 2016). Educated women are more likely to gain and exploit PMTCT services which in turn, enhance their knowledge on MTCT and PMTCT of HIV. This is because they are in a better position to understand the instruction provided by health care workers on the proper use of medication needed for their exposed infants. Understanding of PMTCT and MTCT in women coincides with education levels as confirmed in a study of more than 10,000 women in Tanzania (Haile, *et al.*, 2016).

Occupational status

Occupational status is one of the factors affecting the uptake of early infants diagnosis (EID) services among exposed infants born from HIV positive mothers, because being employed, empower people living with HIV to have a better, quality and improved life through access to a balanced diet and ultimately leads to the improved health outcomes among infants born from those caregivers with good economic status (Chi *et al.*, 2020).

2.2.2 Infant caregiver's factors:

Maternal HIV status

There is an increased risk of missing early infant diagnosis to children born to mothers with unknown HIV status at conception compared to those born from mothers with known HIV status (Bwana *et al.*, 2018). If a mother's HIV status is not known, it may delay identification of the exposed infants and hence no connection to EID care point for exposed infant services (Samson *et al.*, 2018). Knowing the HIV status of the mother may result in the early booking of PMTCT services which in turn could result in increased uptake of early infant diagnosis (Chiduo *et al.*, 2013). Late maternal diagnosis of HIV may account for the low uptake of early infant diagnosis (Dionne-Odom *et al.*, 2016). A study conducted in Tanzania shows that some women make their first ANC visit during the second, third, or appears to a health facility during delivery. Thus for

the lately diagnosed mother, the chance of uptake of early infant diagnosis is very low (MOHCDGEC, 2019).

Maternal ART status

The use of ART in people living with HIV obeys the international plan for 2020 targeting to end AIDS as a public health problem by 2030. To reach such a target it necessitates the achievement of the three 90s; that is 90% of the people living with HIV know their HIV status, 90% of the people who know their HIV status receiving ART, and 90% of the people receiving ART having suppressed viral loads (UNAIDS, 2018a). Acceptance of ART by the mother of the HIV-exposed infant increases the chance of acceptance of EID services. According to a study conducted in Zambia, Mozambique; three-quarters of HIV-infected women in rural Mozambique did not bring their infant for EID services since most of them were not initiated ART (Cook et al., 2011). Not being on antiretroviral therapy when eligible, is significantly associated with non-completion of the PMTCT cascade (E.A. et al., 2016).

Disclosure of HIV status

Lack of disclosure of the HIV status of the mother to her partner is associated with low uptake of EID since it hinders male involvement in PMTCT services (Nyondo, et al., 2014). If there is no HIV disclosure to fathers and caregivers other than mothers, this can lead to a poor understanding of the importance of follow-up of HIV exposed infants for EID (Ciaranello et al., 2011). HIV-positive women who have disclosed their diagnosis to their partners, family, or friends are generally more likely to accept PMTCT interventions such as initiation of ARV for themselves and prophylaxis for their infant, feeding options for infants, early diagnosis for their infants (Unicef, 2016). A study conducted in Kenya by Walcott et al (2013) revealed that when women have disclosed their HIV status and their male partners are involved in antenatal care, there will be improved uptake of early infant diagnosis of HIV among HIV exposed infants (Walcott et al., 2013). HIV free infant survival Studies conducted in Kenya, Tanzania, and Ethiopia showed that disclosure of HIV status by HIV positive pregnant women increases support reduces anxiety, and increases intention to utilize Malawi PMTCT services which in turn increases the uptake of early infant diagnosis (Kebede et al., 2014; E.A. et al., 2016; Bwana et al., 2018 and Kiilu et al., 2019). Disclosing HIV status to partners enabled the mother to release

emotions by receiving psychological and material support like transport to the hospital (Kirsten et al., 2011).

Male partner involvement

The evidence from the various studies demonstrates that male participation influences acceptance of PMTCT services than women in Africa culture (Elias et al., 2017). There is a great chance for women to learn and utilize PMTCT services once educated together with their partners. Some pregnant mothers don't accept HIV testing till they have their partner's consent or assent (Ramirez-Ferrero and Lusti-Narasimhan, 2012). Fear of disclosure of HIV results, lack of male partner support, fear of violence, abandonment, and stigmatization all involve a male partner thus male involvement may facilitate both ART initiation and adherence (Nyondo, et al., 2014a, Dionne-Odom et al., 2016; UNAIDS, 2017 and Kiilu et al., 2019).

2.2.3 Health system factors:

Distance to health facility and Availability of Health workers

Long-distance to health facilities and lack of health workers is also negatively impacting the adherence to ART as well as EID programs especially among newly HIV diagnosed women (Bain, et al., 2017). PMTCT doorway is mainly connected to the ANC clinic which involves testing as part of prenatal care; however, many women have no access to the clinic thus are never initiated on ART and even involved in EID programs (Bain, et al., 2017). Tanzania PMTCT's annual report of 2018 showed that there were an estimated 11,997 pregnant mothers, out of 84,964 who had completely missed PMTCT services (Gamell et al., 2017). Even when successfully initiated, the challenge of retaining women in care (Bain, et al., 2017) and adherence to ART for the duration of pregnancy and breastfeeding remains a significant challenge (Bain, et al., 2017 and Gammell et al., 2017). One of the reasons which hinder the EID program in these exposed HIV children is a failure to expose early HIV status to the partner, a relative, or a friend and also long distances to health facilities (Kirsten et al., 2011).

Availability of supplies

Stock out of supplies, limited laboratories that can perform PCR analysis, weak infrastructures, and inadequate health personnel trained in DBS techniques are the challenges for effective EID services execution in many countries in sub-Saharan Africa (Cherutich et al., 2008 and Bwana

et al., 2018). A study conducted at Muheza Tanga, Tanzania identified Stock out of laboratory materials like DBS kits as a barrier to uptake of EID (Bwana et al., 2018). On-time unavailability of supplies may compromise the on-time infant's diagnosis and late access to EID services due to delay of the laboratory PCR test result. (Bwana et al., 2018).

Skilled Personnel's

Low quality of DBS sample collected and lack of information of the age when the first HIV test to the exposed infants may affect the Early Infants Diagnosis (EID) services. A study conducted in Tanga showed that infants born in health facilities whose health care workers had no correct knowledge of DBS sample collection and time for the first HIV, had a great risk of delaying early infant diagnosis (Bwana et al., 2018). Sometimes there might be qualified staff at the health facility but stock out of materials such as DBS kits may also be a barrier to access EID services. Errors in specimen collection, labeling, packaging, and data entry, as well as damage or loss of specimens and assay failures in the laboratory, may contribute to delay in uptake of early infant diagnosis (E.A. et al., 2016). That's why many studies emphasize the provision of continuous training especially in PMTCT and EID services to health personnel is highly needed to attain HIV free generation (Bwana et al., 2018 and WHO, 2016).

Sample transportation system

A blood sample is collected (dry blood spot /DBS) for DNA PCR or frozen plasma in an ice box for RNA PCR) and a follow-up date, one month later, is allotted after being collected by a trained technician, entry of the sample collection date is made and the sample is sent to testing laboratory by EMS transportation twice a week (Thiha et al., 2017). PCR is routinely run within two weeks of sample receipt, subject to receipt of a sufficient number of samples (Thiha et al., 2017). Despite the introduction of the sample transportation system to the respective health care facilities, still there is a problem with the delayed transportation system of DBS samples (Finocchario-kessler et al., 2018).

However, in Tanzania little is known on the factors associated with uptake of early infant diagnosis of HIV among exposed infants especially in regions where there is a high prevalence of HIV infection such as Mbeya (MOH, 2012).

Mbeya is among the regions with the highest prevalence of HIV, in Tanzania which is estimated at 9.3% (UNAIDS, 2020). The proportions of early infant diagnosis uptake among HIV exposed infants in Mbeya City Council found in the previous study was 75.6% presented for PCR test within the recommended age of 8 weeks (Mwashiuya and Abade 2018).

Therefore there is a need to address the factors associated with uptake of early infant diagnosis (EID) services among HIV exposed infants in Mbeya to cover the remaining gap of 24.6% of exposed infants born from HIV positive mothers presented for PCR test out of the recommended age of 8 weeks. Therefore, this study was focused on determining the factors associated with uptake of early infant diagnosis of HIV among HIV exposed infants living in Mbeya region.

CHAPTER THREE

METHODOLOGY

3.1. Study design

A descriptive, cross-sectional study was carried out in four (4) health facilities namely; Ruanda, Iyunga, Uhai Baptist, and Igawilo health care facilities in Mbeya Region. A cross-sectional study design was selected due to its ability to determine the association between exposures and outcomes at the same point in time. In this case, the same instruments recorded the exposure and the outcome at the same time. The study employed quantitative research methods in the pro factors associated with early infant diagnosis of HIV among HIV exposed infants in Mbeya City Council Mbeya Region Tanzania.

3.2 Study Area

This study was conducted in Mbeya Region. Mbeya Region is one of Tanzania's 31 administrative regions, It is located in the country's southwest. The regional capital is the city of Mbeya. According to the 2017 pre-census projection of 2,822,396 population and the region's 2.7 percent average annual population growth rate was tied for the tenth highest in the country (37).

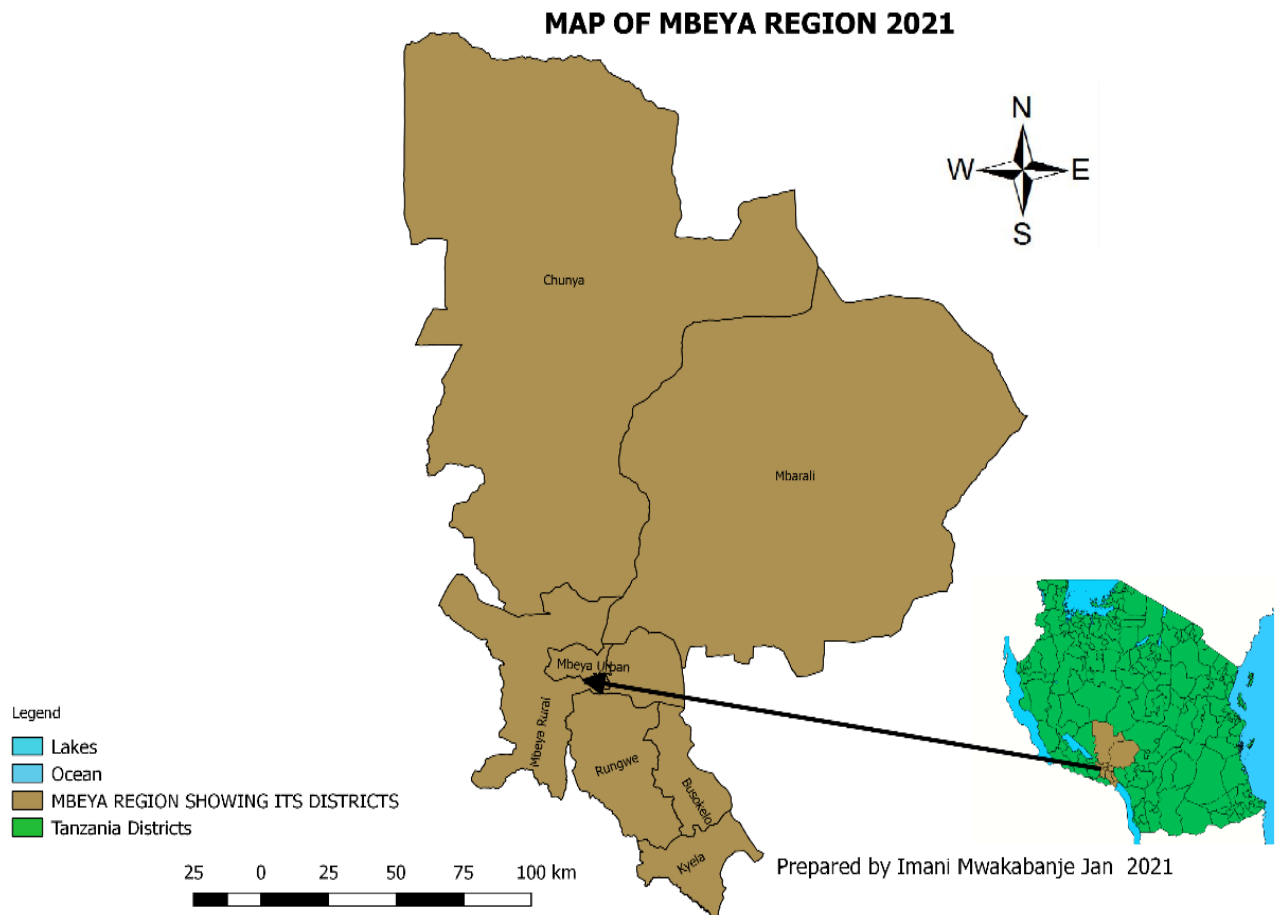


Figure 2: Map of Mbeya Region

Mbeya Region is selected as a study area because it is one of the most hit Region with a high prevalence of HIV/AIDS, which is estimated at 9.5%, higher than the national HIV prevalence rate (NACP; 2018). Mbeya is also a region with a reported low adherence level to option B+ (Chiduo *et al.*, 2013). In addition, to that, there are ongoing interventions for early infant diagnosis at four Health care facilities that provide early infant diagnosis services in the Mbeya region namely; Ruanda Health Centre, Iyunga Health Center, Uhai Baptist Health Center, and Igawilo Health Centre. The intervention in these centers is focused on improving the uptake of early infant's diagnosis services, increasing the number of infants who access early infant diagnosis within 8 weeks after birth, increasing the proportion of HIV positive infants who are initiated on antiretroviral therapy immediately after diagnosis, and strengthening advocacy to increase awareness among pregnant women and the community at large (NACP, 2018.)

In Mbeya, of 1176 records of the HIV exposed infants born from HIV positive mothers reviewed, 55 (4.7%) were found to be HIV positive and among the HIV positive infants, 29 (52.7%) were initiated on antiretroviral therapy (Mwashiuya and Abade, 2018).

3.3 Study population

The study population was infants born to HIV-positive mothers enrolled at facilities offering EID services at Mbeya city council. Participants were traced from the health care facilities offering PMTCT-RCH services through registers, patient files, HEI cards, and their contacts. However, the target population was infants born to HIV-positive mothers, whose mothers voluntarily signed consent forms to participate in the study.

3.3.1 Participant inclusion criteria.

- Infants of mothers who tested HIV positive at ANC who delivered July 2019 to June 2020
- Those, with complete records, traced through registers, patient files, HEI cards, and their contacts

3.3.2 Participant exclusion criteria

- Mothers and infants with incomplete records like DBS results
- Mothers of infants, who refused to give consent

3.4 sample size and Sampling Technique

3.4.1 Sample size

The Sample size was determined using 57.1%, the proportion of EID uptake among HIV exposed infants in Muheza District, North-East Tanzania (Bwana *et al.*, 2018), with a standard normal deviate of 1.96 for 95% confidence interval and 5% margin of error.

Therefore, minimum sample size was calculated as follows (**Israel, *et al*, 1992**)

For a large population:

$$n = \frac{z^2 p (1-p)}{}$$

$$\varepsilon^2$$

Where

n= required sample size

Z= Critical value of the standard normal distribution for the 95% confidence interval around the true proportion which is 1.96

P= expected proportion of EID uptake is 57.1 percent, which is the proportion of HIV exposed infants who were able to uptake early infants diagnostic Services in Muheza District, North-East Tanzania (Bwana *et al.*, 2018)

ε = accepted margin of error was set at 5%. From literature review of sample size calculation, if the Previous prevalence is below 20% and above 80%, the expected margin of error is set at 3% also if the previous prevalence is above 20% and below 80% then the expected margin of error is set at 5%.

Therefore; since the previous prevalence is 57.1% which is above 20%, the margin of error is set at 5%.

DF=Degree of freedom to fit the required sample size.

Substituting in the above formula;

$$n = \frac{1.96^2 \cdot 57.1 \cdot (100-57.1)}{5^2} = 423$$

Including non-response, the final sample size will be

$$10\%: N = (n / (100-10)) * 100\%$$

$$10\% = (423/90) * 100 = 470$$

Therefore, adjusting for 10% of non-response, the final sample size was 470 participants.

3.4.2. Sampling technique: Sampling with Probability Proportional to Size (PPS);

The sampling technique for this study was a **multi-stage sampling technique**, the first stage involved sampling of the health care facilities to be included in the study. Four health facilities namely; Ruanda Heath Centre, Iyunga Health Center, Uhai Baptist Health Center, and Igawilo Health Centre were purposively selected based on the criteria of the ongoing implementation of EID services.

The second stage involved, selection of the study participants, who were HIV-positive mothers/infant's caregivers, and records of data for infants born from HIV-positive mothers. The HIV-positive mothers /infant's caregivers were contacted via telephone or purposively selected each day as they were coming and invited for face-to-face interviews until the required sample size was reached. From the interviewed HIV-positive mothers/infant's caregivers, the previously recorded data of infants born with HIV-positive mothers were secondarily collected.

The total number of HIV-positive mothers/infant caregivers attending the selected health care facilities was summed up and the total number to be studied in each facility was determined by the proportion each facility contributes to the total until the required sample size of 470 was reached.

The proportions each facility contributes to the total sample size were estimated using probability proportional to size. This was done by multiplying the total number of infants born to HIV-positive mothers enrolled at facilities offering EID services at Mbeya city council (N) in each of the selected health facilities with the sampling fraction (F). The sampling fraction is equal to $470/1801=0.26$. The calculated numbers of study participants are shown below in table 1 on the selected HFs;

Table 1: Shows the total number of infants born to HIV positive mothers in each health facility

Name of HF	Population size(N)	Sampled population(NXF)
Ruanda Heath Centre	564	147
Iyunga Health Center	416	109
Uhai Baptist Health Center	345	90
Igawilo City Council Hospital	476	124
Total	N=1801	n=470

3.5 Data source, collection methods, and tool.

3.5.1 Data source

The source of data for this study was primary and secondary sources of data collection. Secondary data was collected to identify HIV exposed infants and whether taken early infants diagnosis (EID) and primary data was collected from mothers to determine factors associated with EID uptake.

3.5.2 Data collection methods/Tool

For primary data collection, the selected HIV-positive mothers/infant caregivers who had babies between July 2019 and June 2020 were informed of the purpose, benefit, risk, and all aspects of the informed **consent** associated with the proposed study. HIV-positive mothers/infant caregivers were asked to provide signed consent. Those, who signed consent forms to participate in the study were recruited to participate in the interview at the respective health care facility. The registers of all HIV-tested mothers attending ANC clinics were recorded and the list of those who were HIV positive was recorded as well. From each HIV-positive mother/infant's caregivers, the exposed infant was determined whether received early infant diagnosis or not. Each HIV-positive mother/infant's caregiver was privately interviewed to elicit information on education, partner's education, HIV knowledge, knowledge about EID, disclosure of HIV status, male partner involvements, distance to health facilities, and attitude towards EID. A questionnaire was prepared in both English and Swahili. The criteria for the selection of health care facility were based on the inclusion of early infant diagnosis of HIV among HIV-exposed infants.

All the required data were retrospectively traced through registers, patient files, HEI cards, and their contacts. Records of infants who were born to HIV-positive mothers at PMTCT facilities delivered babies from June 2019 to May 2020 were also reviewed.

For secondary data collection, data were collected from Health system information tools like MC cohort registers, CTC2 cards, and HEI cards. Data were collected using data abstraction form as a data collection tool. The information to be included in the data abstraction form were, the infant's date of birth (DoB), a time when HIV- exposed infant was tested for HIV, time when the HIV-positive diagnosed infant were initiated on ART, ART status of the infant's caregiver, availability of supplies like DBS kits, availability of trained health caregiver for DBS collection.

The records of exposed infants born from HIV-positive mothers were conveniently collected continuously until the required number of 470 was obtained. Data abstraction form comprised of the questions on the socio-demographic, health system, and infant caregiver's factors associated with the uptake of early infant diagnosis of HIV among HIV exposed infants in Mbeya City Council.

3.6. Study variables and measurement

3.6.1 Dependent variables (Outcome variable)

The dependent variable was the uptake of early infant diagnosis of HIV exposed infants within 8 weeks of birth. This is a binary outcome in which the results were either Yes or No and coded 0 or 1 respectively. The outcome variable was measured by reviewing mother to child cohort register and HIV-exposed infant cards (HEI). For the infant's taken dried blood spots (DBS) within two months of age, the response was "Yes" coded 1 while infants taken DBS after two months of age, a response was "No" and coded 0.

3.6.2 Independent variables

Independent variables were the age of the infant-caregiver (in years), Marital status (married, single, cohabiting, divorced and widow), educational level of infant-caregiver (None, primary, secondary college and above), occupation status of infant-caregiver (Employed or Unemployed), HIV status of exposed infant-caregiver (Positive or Negative), ART status of infant-caregiver (Initiated or not initiated), disclosure of HIV status of infant-caregiver (Disclosed or not disclosed), Male partner involvement (Yes or No), distance to health facility (kilometer), availability of EID services (available or not available), availability of trained health care workers trained for DBS sample collection (Available or not available), availability of supplies (available or not available), availability of sample transport system (available or not available), Quality of DBS (good or poor) and presence of result feedback system (present or absent). The quality of DBS was assessed through checking of the specimen collection, labelling, packaging, and data entry, as well as damage or loss of specimens.

3.7. Data validity and reliability

The process of data collection, coding, entry, and analysis was conducted in a way to ensure data quality, validity, and reliability. This included the provision of training and adequate supervision to research assistants to ensure the quality and completeness of the collected data. To ensure the validity

of the study, the English version of the questionnaire was translated into the indigenous language (Kiswahili) for better understanding by both data collectors and study participants. Content and construct validity of the structured questionnaire were determined to ensure relevance and representativeness of the tool. The identified irrelevant questions in the questionnaire were modified and omitted accordingly to ensure the validity and reliability of the study.

3.8. Training of the research assistants

The principal investigator pioneered the process of data collection with minimal assistance from **two** research assistants. The research assistants were midwife nurses, lab technicians, and statisticians with experience in data collection working in the selected health care facilities providing early infant diagnosis to exposed infants. The principal investigator provided training to research assistance before commencing the process of data collection. The principal investigator provided training on the objective of the research, anticipated study benefits, familiarization of the data collection methods, tools, and techniques for maintaining good rapport with the study participants. In addition, participants were trained on the ethical principles for conducting this study.

3.9. Pre-testing of data collection Instruments

A questionnaire with closed-ended questions was pretested to mothers/caregivers of the exposed infants in Vwawa Hospital located in Songwe Region, while data were collected in the selected four health care facilities located in Mbeya City Council. The pre-testing was done to 10 mothers/caregivers of the exposed infants before actual data collection. The health facility used for pretesting of the questionnaire was not included in the study to ensure the reliability and validity of the tool. In addition to that, the questionnaires that were used for pretesting were not included in the study. Finally, the questions were adjusted accordingly based on the pretest results.

3.10 Data management and analysis

Data were entered, cleaned, coded, and entered in Microsoft Excel and imported to SPSS version 24 for analysis. Data were summarized in percentages, tables, and graphs. Crude and adjusted odds ratios with 95% confidence intervals (CIs) using logistic regression analysis were computed to identify the factors associated with the uptake of early infant diagnosis of HIV among HIV exposed infants in

Mbeya City Council. Variables having a *P*-value less than 0.05 in the multivariate binary logistic regression model were considered statistically significant. Adjusted Odds ratios with a 95% confidence interval were used for the interpretation of the factors associated with the uptake of early infant diagnosis of HIV among HIV exposed infants in Mbeya City Council.

3.11 Ethical considerations

Permission to conduct the study was obtained from the Institutional Review Board of the Muhimbili University of Health and Allied Sciences with the reference number (Ref. DA.282/298/01C).

Permission to conduct the study was requested from all appropriate authorities starting from Mbeya Research Ethical Committee, Mbeya Regional Medical Officer, and health care facilities where data was collected. In addition, written consent was obtained from the study participants. Voluntary participation was highly encouraged, and the participants were assured of confidentiality. Privacy and confidentiality were highly maintained by avoiding unauthorized persons from accessing study information. Anonymity was maintained by using the participant's ID. No names of the study participant were recorded. The details of the study were clearly explained to the study participants. The details of the consent included the purpose of the study and the benefits associated with the study. Data collected were saved in a password-protected computer to avoid access from unauthorized personnel. No harm was expected from this study as there was no invasive procedure applied.

CHAPTER FOUR

RESULTS

4.1. Caregiver's socio-demographic, health system, and HIV related characteristics (n=420)

A total of 420 caregivers/infants pairs were included in this study. The median, mode and mean, age of the infant caregivers were 29.0 years, 28 years, and 29 years respectively, with a standard deviation of 5.79. The age maximum range was 50 and the minimum was 18 which gave the range of 32.

Table 1 shows that most (40.5%) of the infant's caregivers were in the age group of 25-30 Years old, (71.0%), were married, (64.8%) had primary education, and (47.4%), were doing business.

The information of the health system factors from table 2, revealed that the distance from the health care facility **was less** than 5km by 76.2%, the supplies were available by 98.6% and the DBS samples were quality by 88.3%. In addition, the sample transportation system was effective by 76.7% the training for DBS sample collection was adequate by 97.1% and the majority of infant's caregivers (97.1%) mentioned less than one hour as the waiting time for ANC services.

The information of the Infant caregivers HIV related factors from table 3, revealed that most of the infant caregivers (72.4%), were HIV positive, (95.0%) disclosed their HIV status, (81.4%) had HIV negative male Partner, (97.1%) had good ART adherence, and (70.5%), mentioned their male to have high involvement in early infants diagnosis services. In addition to that, Most of the participants (94.3%) had good caregiver knowledge on MTCT and (81.9%) had HIV diagnoses between 4 to 6 weeks of age.

Table 2: Infants care- givers, social demographic factors (n=420)

Variable and Variable Category	Frequency (n)	Percent (%)
Caregivers age in category		
18-24 Years	97	23.1
25-30 Years	170	40.5
31-35 Years	87	20.7
36 years and above	66	15.7
Marital Status		
Married Caregivers	298	71.0
Unmarried Caregivers	122	29.0
Caregivers level of education		
Primary education and above	272	64.8
Care givers with no formal education	148	35.2
Caregivers Occupation status		
Peasants	44	10.5
Doing business	199	47.4
Employed	110	26.2
No job/House mother	67	15.9

Table 3: Health system-related factors (n=420)

Variable and Variable Category	Frequency (n)	Percent (%)
Distance to the health facility Centre		
Less than 5km	320	76.2
5km and more	100	23.8
Availability status of Supplies		
Availability	414	98.6
Unavailability	6	1.4
The quality of the DBS sample		
Good	371	88.3
Poor	49	11.7
Sample transportation system		
Early sample	322	76.7
Delayed sample	98	23.3
Training for DBS sample collection		
Adequate training for DBS sample collection	408	97.1
Inadequate training for DBS sample collection	12	2.9
Waiting time for ANC services		
<1hour waiting time for ANC services	408	97.1
≥1 hour waiting time for ANC services (1)	12	2.9

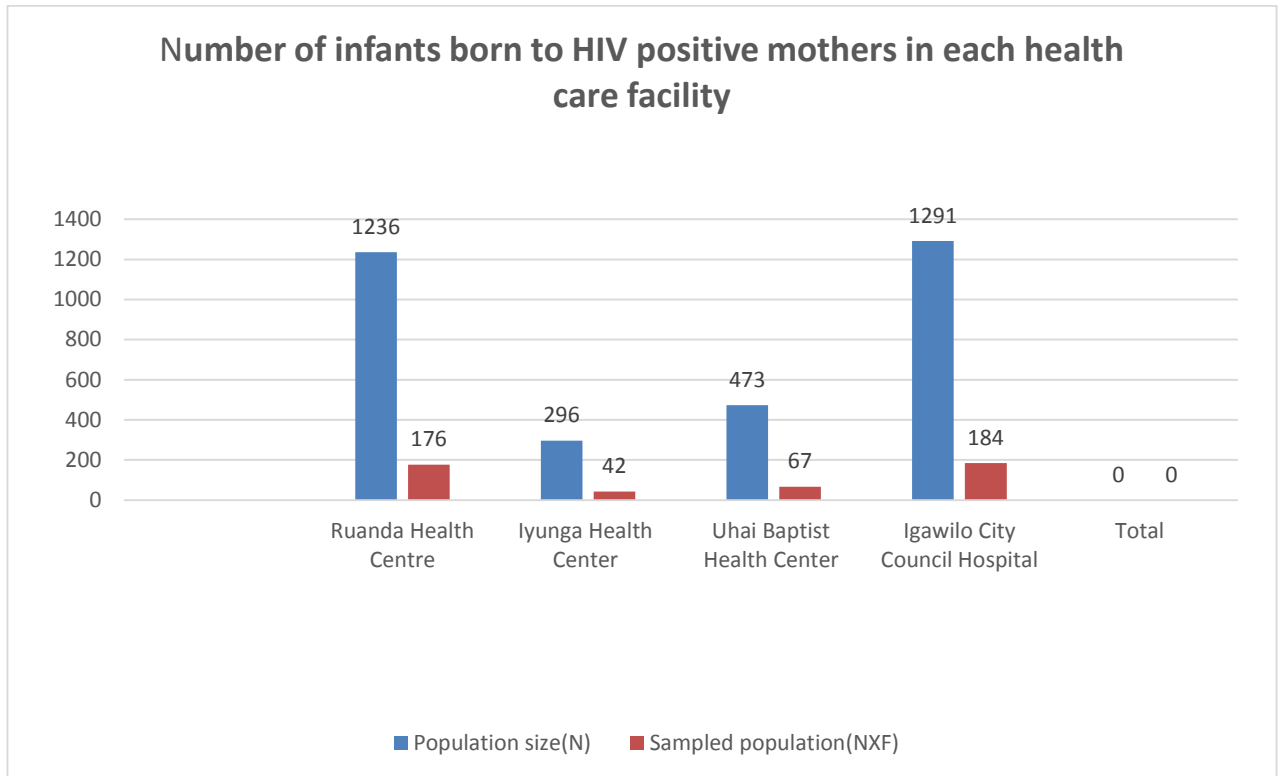
Table 4: Infant caregivers HIV related factors (n=420)

Variable and Variable Category	Frequency (n)	Percent (%)
Caregivers HIV status		
HIV Positive caregivers	408	72.4%
HIV Negative caregivers	12	27.6%
Disclosure of HIV status		
Disclosed HIV status Caregivers	399	95.0%
Non-Disclosed HIV status Caregivers	21	5.0%
HIV status of male partner		
HIV positive male Partner	78	18.6%
HIV negative male Partner	342	81.4%
Caregivers ART adherence status		
Good ART adherence	408	97.1%
Poor ART adherence	12	2.9%
Male Partner involvement in EIDs		
High male partner involvement in EIDs	296	70.5%
Low male partner involvement in EIDs	124	29.5%
Caregivers knowledge on MTCT of HIV		
Good caregivers knowledge on MTCT	396	94.3%
Poor caregivers knowledge on MTCT	24	5.7%
Period for infants HIV diagnosis		
HIV diagnosis between 4 to 8 weeks of age	322	76.7%
HIV diagnosis more than 8 weeks of age	98	23.3%

4.2. The number of infants born to HIV positive mothers from the selected health care facilities

The results from graph 1, below show, the total number of infants born to HIV-positive mothers from the selected health care facilities in Mbeya Municipal Council, which are Ruanda health center, Iyunga health center, Uhai Baptist health center, and Igawilo City Council Hospital. The highest total

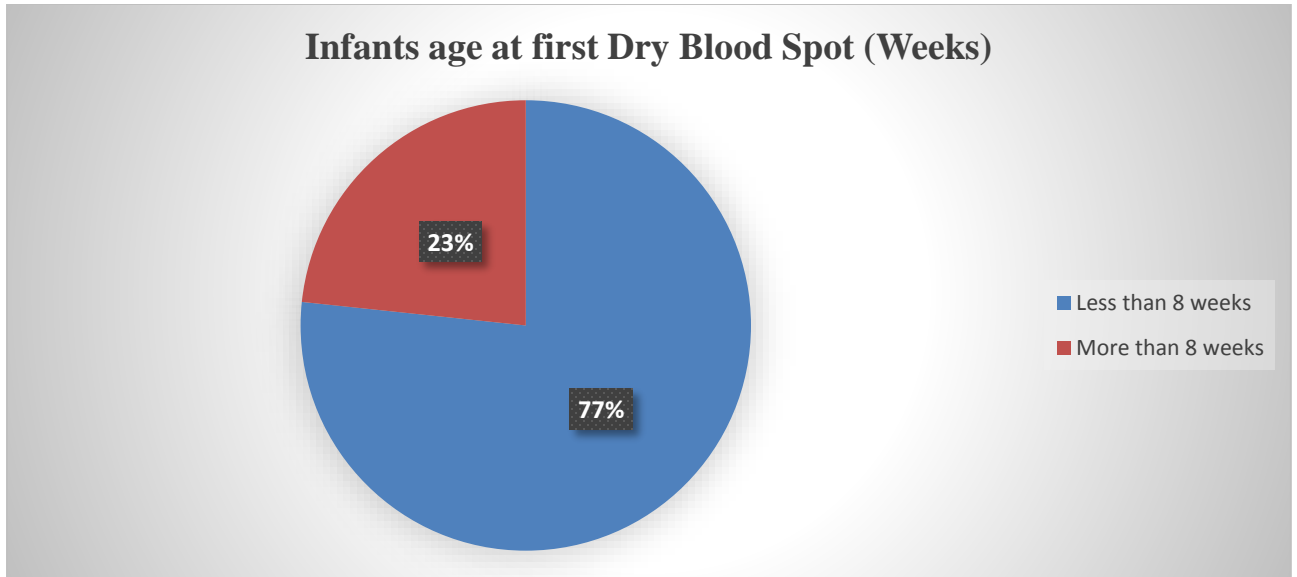
population size of 1291 and sampled population of 184 were recorded from Igawilo City Council Hospital. The reason for this could be because Igawilo City Council Hospital is a City hospital and found in a place where the population is higher compared to other facilities



Graph 1: The total number of infants born to HIV positive mothers in each health care facility

4.3. The proportions of early infant diagnosis uptake among HIV exposed infants in Mbeya City Council.

Graph 2 shows the proportion of early infant diagnosis uptake among HIV exposed infants, which is calculated from the first infant's date of birth from an HIV exposed mother to the age at first Dry Blood Spot (DBS) and PCR testing. From this study, more than three-quarters of the infants 322 (76.7%) had infant diagnosis of HIV/AIDS in less than 8 weeks and 98 (23.3%) had infant diagnosis of HIV/AIDS in more than 8 weeks from birth.



Graph 2: The proportion of early infant diagnosis uptake among HIV exposed infants

4.4. Infant caregiver's socio-demographic factors associated with early infant diagnosis of HIV

The results of Table 3 show that infants from caregivers with 25-30 years old, 31-35 years old, and 36 years old and above were less likely to practice early infants diagnosis (EID) services with (AOR: 0.617 (0.037-0.934), (AOR: 0.614 (0.097-0.815), and (AOR: 0.569 (0.033-0.846) respectively. The probability value were 0.041, 0.026, and 0.008 respectively.

Likewise, caregivers who were not married were less likely to practice early infants diagnosis (EID), with (AOR: 0.322 (0.064-0.723), compared to caregivers who were married. The association between caregiver's marital status and uptake of Early Infants Diagnosis (EID) was statistically significant, due to the probability value being 0.032 less than 0.05.

Caregivers/mothers' non-formal education level were less likely to practices early infants diagnosis services (EID) with (AOR: 0.397(0.017-0.927), compared to caregivers with primary education and above. The association between caregiver's level of education and uptake of Early Infants Diagnosis (EID) was statistically significant, due to the probability value being 0.018 less than 0.05.

Table 5: Bivariate and multivariable analysis between Infant care giver's socio-demographic factors associated with early infant diagnosis of HIV

Independent Variables	Crudes Odds Ratio (COR)	Adjusted Odds Ratio (AOR)	P-value
Caregivers age group			
18-24 Years	1	1	
25-30 Years	0.652 (0.087-0.845)	0.617 (0.037-0.934)	0.041
31-35 Years	0.737 (0.046-0.876)	0.614 (0.097-0.815)	0.026
36 years and above	0.462 (0.088-0.938)	0.569 (0.033-0.846)	0.008
Caregivers marital status			
Married Caregivers	1	1	
Unmarried Caregivers	0.368 (0.089-0.789)	0.322 (0.064-0.723)	0.032
Caregivers level of education			
Primary education and above	1	1	
Caregivers with no formal education	0.408 (0.035-0.985)	0.397(0.017-0.927)	0.018
Caregivers Occupation status			
Peasant	1	1	
Doing business	0.293 (0.050- 3.064)	0.262 (0.044-2.995)	0.335
Employed	1.262 (0.104-5.955)	1.214 (0.208-5.897)	0.391
No job/house mother	0.206 (0.035-1.418)	0.113 (0.054-3.751)	0.386
AOR= (Adjusted Odds Ratio for confounders) COR=Crude Odds Ratio Reference category=First			

4.5. Health system factors associated with early infant diagnosis of HIV

The results of table 4 show that mothers/caregivers whose distances to the health care facilities were 5km and more were less likely to practices early infant diagnosis, compared to caregivers whose distances to the health care facilitates were less than 5km with (AOR:0.250 (0.034-0.834). The association between distances to the health care facilitates and uptake of Early Infants Diagnosis (EID) was statistically significant, as the probability value being 0.037 less than 0.05.

Unavailability of supplies was less likely to be associated with early infant diagnosis with (AOR: 0.589 (0.062-0.712)). The association between availability status of supplies and uptake of Early Infants Diagnosis (EID) was statistically significant with the probability value being 0.014 less than the probability value of 0.05.

The delayed sample transport system was less likely to be associated with early infant diagnosis with (AOR: 0.685(0.210-0.876)), compared to the early sample transport system. The association between sample transportation system and uptake of Early Infants Diagnosis (EID) was statistically significant with the probability value being 0.047 less than the probability value of 0.05.

Poor quality of the DBS sample was less likely to be associated with early infant diagnosis with (AOR: 0.595 (0.076-0.927)), compared to good quality of DBS sample. The association between the quality of the DBS sample and uptake of Early Infants Diagnosis (EID) was statistically significant with the probability value being 0.001 less than the probability value of 0.05.

Caregivers whose waiting time at the facility was one hour and above were less likely to practices early infant diagnosis compared to those whose, waiting time was less than one hour with (AOR: 0.417 (0.082-0.422)). The association between waiting time and uptake of Early Infants Diagnosis (EID) was statistically significant with the probability value being 0.049 less than the probability value of 0.05.

Table 6: Bivariate and multivariable analysis between Health system factors associated early infant diagnosis of HIV

Predictor Variables	Crudes Odds Ratio (COR)	Adjusted Odds Ratio (AOR)	P- value
Distance to the health facility Centre			
Less than 5km distance to the HFs	1	1	
5km more to the HFs	0.292(0.053-0.616)	0.250 (0.034-0.834)	0.037
Availability status of Supplies			
Availability of supplies	1	1	
Unavailability of supplies	0.334(0.275-0.538)	0.589 (0.062-0.712)	0.014
The quality of DBS sample			
Good quality of DBS sample	1	1	
Poor quality of DBS sample	0.738(0.153-0.875)	0.595 (0.076-0.927)	0.001
Sample transportation system			
Early sample transport system	1	1	
Delayed sample transport system	0.712 (0.274-0.898)	0.685(0.210-0.876)	0.047
Training for DBS sample collection			
Adequate training for DBS sample collection	1	1	
Inadequate training for DBS sample collection	1.783 (0.374-3.743)	1.685(0.317-3.223)	0.147
Waiting time for ANC services			
<1hour waiting time for ANC services	1	1	
≥1 hour waiting time for ANC services	0.447(0.105-0.438)	0.417 (0.082-0.422)	0.049

AOR= (Adjusted Odds Ratio for confounders)

COR=Crude Odds Ratio

Reference category=First

4.6. Infant caregiver's HIV related factors associated with early infant diagnosis of HIV

Table 5 shows that infant caregivers who did not disclose their HIV status were less likely to practice early infants diagnosis (EID) with (AOR: 0.354 (0.245-0.742), compared to those, whose caregivers,

disclosed their HIV status. The association between disclosure of HIV status and uptake of Early Infants Diagnosis (EID) was statistically significant, with the probability value being 0.013 less than 0.05.

Infants with HIV-positive caregivers, whose male partners were HIV negative, were less likely to practice early infants diagnosis (EID) with (AOR: 0.752 (0.562-0.980)), compared to those, whose male partners were HIV positive. The association between male partner HIV status and uptake of Early Infants Diagnosis (EID) was statistically significant, due to the probability value being 0.045 less than 0.05.

Infants with HIV-positive caregivers, with poor ART adherence, were less likely to practice Early Infants Diagnosis (EID) with (AOR: 0.497(0.272-0.917)), compared to HIV-positive caregivers, with good ART adherence. The association between ART adherence and uptake of Early Infants Diagnosis (EID) was statistically significant, due to the probability value being 0.023 less than 0.05.

Infants, whose caregivers mentioned to have low male partner involvement in EIDs were less likely to take Early Infants Diagnosis (EID) with (AOR: 0.297 (0.035-0.872)), compared to infants, whose caregivers mentioned to have high male partner involvement in EIDs. The association between male partner involvement and uptake of Early Infants Diagnosis (EID) was statistically significant, due to the probability value being 0.037 less than 0.05.

Table 7: Bivariate and multivariable analysis between HIV related factors associated with early infant diagnosis of HIV

Independent Variables	Crudes Odds Ratio (COR)	Adjusted Odds Ratio (AOR)	P-value
Caregivers HIV status			
HIV Positive caregivers	1	1	
HIV Negative caregivers	1.345 (0.097-3.746)	1.117 (0.032-3.324)	0.122
HIV discloser status of male partner			
Disclosed HIV status Caregivers	1	1	
Non-Disclosed HIV status Caregivers	0.233 (0.463-0.579)	0.354 (0.245-0.742)	0.013
HIV status of male partner			
HIV positive male Partner	1	1	
HIV negative male Partner	0.624 (0.403-0.805)	0.752 (0.562-0.980)	0.045
Caregivers ART adherence status			
Good ART adherence	1	1	
Poor ART adherence	0.511 (0.242-0.971)	0.497(0.272-0.917)	0.023
Male Partner involvement in EIDs			
High male partner involvement in EIDs	1	1	
Low male partner involvement in EIDs (1)	0.313(0.042-0.697)	0.297 (0.035-0.872)	0.037
Caregivers knowledge on MTCT of HIV			
Good caregivers knowledge of MTCT	1	1	
Poor caregivers knowledge on MTCT	1.712 (0.274-9.898)	1.034 (0.310-9.776)	0.147
Period for infants HIV diagnosis			
HIV diagnosis between 4 to 6 weeks of age	1	1	
HIV diagnosis more than 6 weeks of age	1.848 (0.529-4.496)	1.822 (0.446-4.446)	0.188

AOR= (Adjusted Odds Ratio for confounders)

COR=Crude Odds Ratio

Reference category=First

CHAPTER FIVE

DISCUSSION

5.1. Proportion of Early Infants Diagnosis

The proportions of early infant diagnosis uptake among HIV exposed infants in Mbeya City Council found in this study was 76.7%, which is relatively larger compared to the proportions 75.6% found in the previous study done in Mbeya (Mwashiuya and Abade, 2018). The proportion of EID found in this study is higher than 51% proportion of HIV-exposed infants, who received early infant diagnosis tests (EID) within 2 months of life as previously reported by Gamaliel, 2012 (Gamaliel, 2012). This proportion was also higher than 57.1%, the proportion of EID uptake among HIV-exposed infants in Muheza District, North-East Tanzania (Bwana *et al.*, 2018). The differences in the proportions of early infant diagnosis uptake among HIV exposed infants between this study and other previous studies could be due to differences in the study methodology, such as differences in the nature and types of the study populations, sample size, study design, socio-demographic and clinical characteristics of the study participants.

The proportions of early infant diagnosis uptake among HIV exposed infants in Mbeya City Council, is important especially for reducing infant mortality, newly HIV infection from their mothers, and HIV progression among HIV exposed infants born from HIV positive mothers, by ensuring virological tests within the recommended period and increasing ART access for treatment among HIV-infected pregnant and breastfeeding women.

5.2. Infant caregiver's socio-demographic factors associated with the uptake of EID

5.2.1. Age

The study found that caregivers in the lower age group were more likely to practice Early Infants Diagnosis of HIV-exposed infants. This could be due to low understanding of the benefit of early infant's diagnosis and low perceived risk associated with late infant's diagnosis among those of lower ages. This finding is in contrast with previously reported by the study done in Rural Kenya 2013, which found that young women (≤ 27 years) were more likely to delay and even drop out of the EID programs of their babies (Hassan *et al.*, 2012). These findings are also supported by the previous

findings, which reported that the age of caregivers is among the barriers which set back the testing coverage of those exposed infants (Dadi and Mogas, 2018). The probable reason for the differences could be the fact that this study recruited participants with a low age group compared to the age groups from previous studies. Therefore, interventions designed to impart knowledge on the importance of early infants diagnosis to HIV-positive mothers and caregivers of both lower and higher age is highly recommended for reducing infant mortality, newly HIV infection from their mothers, and improving HIV progression among HIV exposed infants born from HIV positive mothers. This is important because, efficient uptake of EID requires timely presentation of HIV-exposed infants, same-day DBS samples collection, and prompt release of results after DBS testing at the testing laboratory.

5.2.2. Marital Status

The study found that married couples are highly associated with Early Infants Diagnosis of HIV-exposed infants. The reason for this could be knowledge sharing on the importance of early infant diagnosis, and both couples are aware and plan accordingly to practices early infants diagnosis of HIV exposed infants. The findings from this study are similar to the previous findings as reported by Chi *et al.*, 2020, which demonstrated that a couples-based framework may be useful for the prevention of HIV during pregnancy and breastfeeding and hence leading to the improved health outcome among HIV exposed infants born from HIV positive mothers(Chi *et al.*, 2020). This finding indicates, the need for an intervention designed to ensure, even, those not married are adopting the practices of early infants diagnosis of HIV exposed infants born from HIV positive caregivers and ultimately, helping to improve health outcomes.

5.2.3. Education status

Education in this study was found to be associated with the uptake of early infant diagnosis of HIV among HIV-exposed infants. HIV exposed infants with HIV positive mothers/caregivers, who completed primary school and above were more likely to practices early infant diagnosis. Caregivers with low education experience a lack of familiarity with the benefits of early infant diagnosis, and hesitate to practice early infant diagnosis, as a result, more infants are not presented on time at facilities for early infant diagnosis.

The findings from this study, are similar, to the previous findings, which reported that HIV exposed infants living with the head of household with secondary education and above had higher chances of

accessing EID (Dionne-Odom *et al.*, 2016). This finding is also supported by a previous study of more than 10,000 women in Tanzania which reported that understanding of PMTCT and MTCT in women coincides with education levels (Haile, Teweldeberhan, and Chertok, 2016). These findings suggest the need for educational campaigns to create awareness on the importance of Early Infants Diagnoses (EID), such as early HIV laboratory test and PMTCT services among HIV positive mothers/caregivers, which in turn, enhance knowledge on EID, MTCT, and PMTCT services and understanding of different instructions provided by health care workers on the proper use of medication and the important care needed to the exposed infants.

5.3. Infant mothers/caregiver's HIV related factors

5.3.1. Caregivers/mothers HIV status

Caregivers' HIV status was found to be associated with the uptake of early infant diagnosis of HIV among HIV exposed infants. HIV exposed infants born to mothers with known HIV status, were more likely to practice early infant diagnosis. Knowing HIV status reduces the fear of negative consequences of disclosure among couples and this helps both couples to easily express their HIV serostatus without any stress and plan accordingly to access early infant's diagnosis (EID) service. The finding of this study, concur with the previous findings from the study done by Samson *et al.*, 2018, which revealed that, if a mother's HIV status is not known, it may delay identification of the exposed infants and hence no connection to EID care point for exposed infant services (Samson *et al.*, 2018). These findings are also similar, to the findings reported by Dionne-Odom *et al.*, 2016, which demonstrated that late Maternal diagnosis of HIV may account for the low uptake of early infant diagnosis (Dionne-Odom *et al.*, 2016). These findings are further, supported by the Ministry of Health, Community, Development, Gender, Elderly and Children's of 2019, which states that HIV exposed infants with mothers/caregivers with late presentation of EIDs, the uptake of early infant diagnosis is very low (MOHCDGEC, 2019). These findings suggest the need for an education campaign to pregnant women, mothers, and caregivers of HIV exposed infants on the importance of early testing of their HIV status, to ensure early ART initiation and ultimately suppressed viral load. This will also be in line with UNAIDS target of ensuring 95% of the world population are tested with HIV and know their status, 95% are initiated with ART and 95% are virological suppressed by the end of 2030 (UNAIDS, 2019)

5.3.2. Caregivers ART status

Caregiver's ART status among HIV-positive caregivers was found to be associated with the uptake of early infant diagnosis of HIV among HIV exposed infants. Caregivers/mothers with good ART adherence were more likely to practice early infant diagnosis. These findings are similar, to the findings were done by Cook *et al.*, 2011, which reported that good ART adherence by the mother of the HIV exposed infant increases the chance of acceptance of EID services and this study revealed that, three-quarters of HIV-infected women in rural Mozambique did not bring their infant for EID services (Cook *et al.*, 2011).

These findings are also similar, to the study done by E.A. *et al.*, 2016, which reported that poor adherence to antiretroviral therapy, is significantly associated with non-completion of the PMTCT cascade (E.A. *et al.*, 2016). These findings suggest the need for an education campaign to pregnant women, mothers, and caregivers of HIV exposed infants on the importance of ensuring good ART adherence for effective viral load suppression and ultimately improved health outcomes among HIV exposed infants.

5.3.3. Disclosure of HIV status

Disclosure of HIV status was found to be associated with the uptake of early infant diagnosis of HIV among HIV exposed infants. Disclosure of HIV status among couples reduces the fear of negative consequences such as intimate partner violence (IPV), stigmatization, and marital separation. This motivates and encourages both couples to plan together and access early infant's diagnosis (EID) service. HIV exposed infants born to mothers, who disclosed their HIV status were more likely to practice early infant diagnosis. These findings are similar, to previous findings conducted in Kenya, which revealed that, when women have disclosed their HIV status and their male partners are involved in antenatal care, there will be improved uptake of early infant diagnosis of HIV among HIV exposed infants (Walcott et al, 2013). These findings imply that HIV positive women who have disclosed their diagnosis to their partners, family, or friends are generally more likely to accept PMTCT interventions such as initiation of ARV for themselves and prophylaxis for their infant, feeding options for infants, and early diagnosis for their infants (Unicef, 2016). These findings are also supported by the previous findings which revealed that disclosing HIV status to partners enabled the mother to release emotions by receiving psychological and material support like transport to the hospital (Kirsten *et al.*, 2011).

Also, this finding is supported by the previous finding, which reported that, if there is no HIV disclosure to fathers and caregivers other than mothers, this can lead to poor understanding of the importance of follow up of HIV exposed infants for EID and lack of disclosure of HIV status of the mother to her partner is associated to low uptake of EID since it hinders male involvement in PMTCT services respectively (Ciaranello *et al.*, 2011 and Nyondo, et, al, 2014,). Therefore, disclosing the HIV status is highly recommended among HIV-positive mothers/ caregivers to ensure early uptake of EIDs, such as early HIV PCR laboratory test, which results in early initiation of ARV and prophylaxis and early diagnosis of exposed HIV infants.

5.3.4. Male partner Involvement

Male partner involvement in EID services was found to be associated with the uptake of early infant's diagnosis of HIV. The reason for this could be, male partner involvement enhance support among couples to one another, and increase the chance for effective utilization of early infant diagnosis (EID) services among infants born to HIV-positive mothers and ultimately reducing early infants mortality and morbidity. This finding is also supported by various studies, which previously concluded that lack of male partner support, fear of disclosure of partner HIV status results, fear of violence, abandonment, and stigmatization may facilitate both poor ART initiation and adherence (Nyondo, Chimwaza and Muula, 2014, UNAIDS, 2017 and Kiilu *et al.*, 2019). These findings suggest, the importance of male partner involvement in EID services, which enhance and provide support to one another to create a chance for effective utilization of PMTCT service. It is a crucial step in reducing human immunodeficiency virus (HIV)-related infant mortality.

5.4. Health system factors associated with uptake of early infant diagnosis of HIV.

5.4.1. Distance to the health facility

The short distance of less than 5km from the health care facilities was found to be associated with the uptake of early infant's diagnosis of HIV among HIV-exposed infants. HIV exposed infants born to mothers, whose residences were less than five kilometres from the health care facilities were more likely to practices early infant diagnosis. The reason for this could be, infants caregivers residing in

more than five kilometers distance from the health care facilities, anticipate, the cost and hours, expect to spend for accessing EID services, they finally decide to postpone and delay initiate early infants diagnosis. These findings are similar to the previous findings, which reported that long distances to health facilities are negatively impacting the adherence to ART as well as EID programs especially among newly HIV diagnosed women (Bain, Nkoke, and Noubiap, 2017). The public health importance of this finding is that the Government and other key stakeholders on HIV/AIDS programs need to establish more health care facilities nearby clients to reduce the distance to the health care facilities and therefore, facilitating more HIV-positive pregnant and breastfeeding women to be identified, initiated with ART and their infants provided with prophylaxis, and above all their exposed infants receive timely EID testing services.

5.4.2. Availability of supplies and training for DBS sample collection

Availability supplies and adequate training for DBS sample collection were found to be associated with the uptake of early infant's diagnosis of HIV among HIV exposed infants. HIV exposed infants born to mothers, whose mentioned availability of supplies and training for DBS sample collection were more likely to practices early infant diagnosis. On-time availability of supplies may enhance on-time infant diagnosis and early access to EID services due to less turnaround time of the laboratory PCR test result.

These findings are is supported by the previous study done in Kenya, which demonstrated that stock out of supplies, limited laboratories that can perform PCR analysis, weak infrastructures for EIDs, and inadequate health personnel trained in DBS techniques are the challenges for effective EID services execution in many countries in sub-Saharan Africa (Cherutich *et al.*, 2008). These findings are also supported by the previous findings conducted at Muheza which revealed that stock out of laboratory materials like DBS kits and training on DBS techniques are the major barriers for the uptake of EID (Bwana *et al.*, 2018). This finding suggests, the importance of training on DBS and availability of laboratory supplies for EID services for ensuring effective and efficient EID services and therefore, improving rates of testing, result receipt, and linkage to care and ultimately leading to the impacts on the health of HIV-exposed infants and the value of EID programs in resource-limited settings, particularly in Mbeya Region.

5.4.3. Quality of DBS Sample

The quality of DBS samples was found to be associated with uptake of early infant's diagnosis of HIV among HIV exposed infants. HIV exposed infants born from mothers, whose reported high quality of dry blood samples was more likely to practice early infant diagnosis. Lack of quality check especially in specimen collection, labelling, packaging, and data entry, as well as damage or loss of specimens and assay failures in the laboratory may contribute to increasing turnaround time for results, which leads to negative impact among infants caregivers on the decision to practice early infant diagnosis. These findings are similar to the previous study done by Bwana *et al.*, 2018, which reported that the low quality of the DBS sample collected and lack of information of the age when the first HIV test to the exposed infants may affect the EID (Bwana *et al.*, 2018). These findings are also supported by the previous study done by E.A. *et al.*, 2016, which revealed that lack of quality check especially such as errors in specimen collection, labelling, packaging, and data entry, as well as damage or loss of specimens and assay failures in the laboratory may contribute to delay in uptake of early infant diagnosis (E.A. *et al.*, 2016). These findings indicate the high need for continuous on job training and workshops especially in PMTCT and EID services to health personnel to attain an HIV-free generation.

5.4.4. Sample transportation system

A delayed transportation system was found to be associated with delayed uptake of early infant's diagnosis of HIV among HIV exposed infants, due to long time waiting for the results leads to others delay practice early infant diagnosis, knowing that, it takes a long time to get back results. This finding is supported by the previous study done by Finocchiaro-Kessler *et al.*, 2018, which demonstrated that, despite the introduction of transport system for EID results from all health care facilities, still there is a problem of the delayed transportation system of DBS samples, which is caused by long distance from the EID samples testing laboratory on HIV exposed babies. (Finocchiaro-kessler *et al.*, 2018). The public health implication of this finding is that there is a need for the Government, Policymakers, EIDs program partners, and implementers to ensure that an effective and efficient sample transportation system of DBS samples is put in place to facilitate uptake of early infant's diagnosis of HIV among HIV exposed infants.

5.4.5. Waiting times for ANC services

Less than one hour waiting time for ANC services was found to be associated with early infant's diagnosis of HIV among HIV exposed infants. HIV exposed infants born from mothers, whose waiting times were less than one hour were more likely to practice early infant diagnosis. The reason for this finding is that long waiting time has also a negative impact on the decision to practice early infant diagnosis among caregivers.

The findings from this study are similar to the previous findings, which reported that long waiting time for antenatal care services is negatively impacting the adherence to ART among HIV-diagnosed women (Bain, Nkoke, and Noubiap, 2017). This study indicated the need for the health care facilities providing HIV care and treatment to HIV positive mothers and their infants to improve early infant diagnosis services by providing capacity building in terms of training of more health care providers on DBS sample collection techniques and establishing more facilities providing HIV care and treatment particularly Early Infants Diagnosis Services focused on reducing waiting times for ANC services and hence improve the quality of maternal ANC services.

5.5 Limitation of the Study

One of the major limitations for this study is that the conclusion on the health system factors was made without interviewing health care providers, in which their views and ideas could contribute and increase the strength of the study findings. However, this limitation was mitigated through the justification of the inclusion and exclusion criteria. This increased the validity and strength of the study, because, only relevant study participants were included to justify the finding of the study. The limitations were also mitigated by the inclusion of only secondary data with complete records found in the source document and the inclusion of a statistically significant value for the association between independent variables and the outcome variable.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The proportions of early infant diagnosis uptake among HIV exposed infants in Mbeya City Council found in this study was 76.7%. This is better uptake of EIDs (76.7%), compared with the proportions found in other previous studies. The major factors associated with late uptake of early infant diagnosis of HIV among HIV exposed infants were lower age, being unmarried, low level of education among caregivers, suboptimal ART adherence, non-disclosure of HIV status, unknown male partner HIV status, long distance to the health care facilities, unavailability of supplies, delayed sample transportation system and poor quality of DBS samples

6.2. Recommendation

- Interventions designed to impart knowledge on the importance of early infants diagnosis to HIV positive mothers and caregivers of both lower and higher age is needed to reduce infant mortality and new HIV infection among HIV exposed infants born from HIV positive mothers.
- Interventions on the good practices of early infant diagnosis are suggested to be adopted to both married and unmarried HIV-positive caregivers and ultimately, improve their health outcomes.
- The education campaign is recommended to create awareness on the importance of Early Infants Diagnoses (EID) such as early HIV laboratory test, PMCTC services, proper use of medication, and important care needed to the exposed infants among HIV positive mothers/caregivers and the
- An education campaign to pregnant women, mothers, and caregivers of HIV exposed infants on the importance of early testing of their HIV status, to ensure early ART initiation and ultimately achieving viral load suppression.
- An education campaign to pregnant women, mothers, and caregivers of HIV exposed infants on the importance of good ART adherence for effective viral load suppression.
- An education campaign is recommended on the importance of HIV status disclosure among partners, family, or friends. This is a key to ensure early infants diagnosis, early acceptance of PMCTC services like the initiation of ARV and prophylaxis for their infants.
- Behavior change intervention is recommended among males to impart knowledge and awareness on the importance of partner support in reducing human immunodeficiency virus (HIV) and related infant mortality.

- The Government and other key implementing partners on HIV/AIDS programs need to establish more health care facilities nearby clients to reduce the distance to the health care facilities for effective, efficient, and timely EID testing services.
- More laboratory supplies for EID services need to be supplied to ensure effective and efficient EID services and therefore, improving rates of testing, result receipt, and linkage to care and ultimately improved health outcomes among HIV exposed infants and their mothers
- Continuous on the job training, mentorship, and supportive supervision on the Quality Management System (QMS) is highly needed among health care workers to improve quality checks such as errors in specimen collection, labelling, packaging, and data entry, as well as damage or loss of specimens and assay failures in the laboratory, which always contributes to delay in uptake of early infant diagnosis
- The Government, Policymakers, EIDs program partners, and implementers need to ensure an effective and efficient sample transportation system of DBS samples is put in place to facilitate uptake of early infant's diagnosis of HIV among HIV exposed infants.
- Capacity building to health care providers on the training of more health care providers on DBS sample collection techniques and establishing more facilities providing HIV care and treatment focused on reducing waiting times for ANC services and hence improve the quality of maternal ANC services.

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APPENDICES

Appendix 1: Consent Form English Version

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES (MUHAS)

DIRECTORATE OF RESEARCH AND PUBLICATIONS



STUDY ON FACTORS ASSOCIATED WITH UPTAKE OF EARLY INFANT DIAGNOSIS OF HIV AMONG HIV EXPOSED INFANTS IN MBEYA CITY COUNCIL, MBEYA REGION, TANZANIA.

Dear Sir/Madam You are hereby invited to participate in a study conducted by **Iman Eliud Mwakabanje** who is a student at Muhimbili University of Health and Allied Sciences. Iman Mwakabanje is conducting this study for his Master's Dissertation. Your participation in this study is entirely voluntary. You should read the information below and ask questions about anything you do not understand, before deciding whether or not to participate in the study. You are being asked to participate in this study because you are a CLIENT at.....hospital/Health facility in the Mbeya city council.

Purpose of the study

The purpose of this study is aimed at assessing factors associated with uptake of early infant diagnosis of HIV among HIV exposed infants in Mbeya city council, Mbeya region. We hope to use all the information from this study to understand the prevalence and factors associated with uptake of early infant diagnosis of HIV among HIV-exposed infants. You will be informed of the findings through the planned means of results dissemination through publication and thesis for academic purposes.

Voluntary participation

Please note that your participation in this study is voluntary and you have the right to refuse to consent. If you agree to join this study, you will be required to sign this consent form and answer the question that you will be asked by the interviewer.

Benefits

There are no direct benefits to participating in the study. However, the findings from the study will derive factors associated with uptake of early infant diagnosis of HIV among HIV exposed infants in Mbeya city council, Mbeya region. This will help the administration, policymakers, and health system, in general, to put in place the best system to know and add values and capacity in the control and prevention of HIV infections from mother to child.

Risks and discomfort

There are no risks or discomforts involved in this study.

Compensation for time

You will not receive any payment or other compensation for participation in this study. There is also no cost to you to participate in the study.

Confidentiality

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. We will not use your name in any of the information we get from this study in any way we think is best for publication or education. Any information we use for publication will not identify your name.

Consent form

I confirm that I have read carefully and I have understood the information provided and consent to participate in the study. I am aware that I can freely withdraw from this study anytime I wish to do so. Whom to contact if you have any questions about the study If you ever have questions about this study, you should contact the Principal Investigator Iman Mwakabanje, from Muhimbili University of Health and Allied Sciences, P.O.Box 65001, Dar-es-salaam. If you ever have questions about your rights as a participant, you may call;

Dr. Innocent Semali, Research Supervisor, P.O. Box 65001, Dar es Salaam. Tel: 0754269838.

Mr. Iman Eliud Mwakabanje, Principal Investigator, P.O. Box 65001, Dar es Salaam. Tel: 0755478061.

Do you agree? Yes..... No.....

Participant agrees The participant does not agree.

I..... Have read the contents of this consent form and my questions have been adequately answered. I, therefore, agree to participate in this study.

Signature of the participant Date

Signature of the interviewer Date

Appendix 2: Ridhaa ya kushiriki katika utafiti (Kiswahili Version)

CHUO KIKUU CHA SAYANSI ZA AFYA MUHIMBILI KURUGENZI YA UTAFITI NA MACHAPISHO



Habari, Nakukaribisha kushiriki katika Utafiti unaofanywa na Iman Eliud Mwakabanje mwanafunzi kutoka katika Chuo kikuu cha Sayansi za Afya cha Muhimbili. Iman Elliud Mwakabanje anafanya utafiti huu kwa ajili ya Shahada yake ya Uzamili. Kushiriki kwako katika utafiti huu ni kwa hiari; Unatakiwa kusoma taarifa zote katika fomu hii na kama kuna swali kuhusu jambo lolote ambalo halikueleweka unaweza kuuliza kabla hujaamua kushiriki au kutokushiriki katika utafiti huu.

Madhumuni ya utafiti

Dhumuni la utafiti huu ni kuangalia sababu zinazopelekea watoto wachanga waliozaliwa na wamama walioathirika na virusi vya ukimwi kuchelewa kupimwa Virusi Vya UKIMWI mapema katika Wilaya ya Mbeya jiji, mkoa wa Mbeya.

Ushiriki

Ushiriki wako katika utafiti huu ni wa hiari na una haki ya kukataa kushiriki katika utafiti. Kama umekubali kushiriki utatakiwa kuweka sahihi yako katika fomu hii na kujibu maswali utakayokuwa unaulizwa na msahili.

Faida

Hamna faida ya moja kwa moja kwa wewe kushiriki katika utafiti huu. Ila matokeo ya utafiti huu yatasaidia watawala katika sekta ya afya, watunga sera na mfumo mzima wa afya kuweza kubaini sababu zinazopelekea ucheleweshaji wa upimaji wa VVU kwa Watoto waliozaliwa kwa akina mama wenye VVU. Hii pia itapelekea kujua na kuongeza thamani na uwezo kupambana na kuzuia maambukizi ya UKIMWI kutoka kwa mama kwenda kwa mtoto.

Malipo

Hakutakuwa na malipo yoyote kutokana na ushiriki wa utafiti huu na pia kama mshiriki hutakuwa na gharama zozote za yeye kushiriki katika utafiti huu.

Usiri

Taarifa zote zitakazo kusanywa zitashughulikiwa kwa usiri wa hali ya juu na pia zinatolewa kwa ruhusa yako maalum kutokana na taratibu na sheria. Jina lako halitatumika mahali popote katika utafiti huu.

Mawasiliano

Kwa mawasiliano zaidi kuhusu utafiti huu Unaweza kuwasiliana na mtafiti mkuu, Mr. Iman Eliud Mwakabanje, S.L.P 65001, Dar es Salaam. Namba ya simu, 0755478061, au kama kuna maswali kuhusu haki zako kama mshiriki unaweza kuwasiliana na; Dr. Innocent Semali, Msimamizi wa huu Utafuti, S.L.P 65001, Dar es Salaam. Namba ya simu, 0754269838.

Nakiri kwamba nimesoma maelezo yote kwa umakini na nimeelewa kila kilichoandikwa katika fomu hii. Ninaelewa kwamba ninaweza kujitoa muda wowote nitakaotaka kujitoa.

Je Unakubali Kushiriki? Ndio..... Hapana.....

Mshiriki amekubali..... Mashiriki amekataa.....

Mimi, Nimesoma maelezo yote katika fomu hii na maswali yangu yameweza kujibiwa. Nakubali kushiriki katika utafiti huu.

Sahihi ya Mshiriki..... Tarehe

Sahihi ya Msahili Tarehe

Appendix 3: QUESTIONNAIRE

Questionnaires for collection of information related to factors associated with uptake of early infant diagnosis at Mbeya city council, Mbeya region from July 2019 to June 2020.

SN..... District:

SECTION A: Socio-demographic information

1. Age of the mother at the time of conception of that child yrs.
2. Marital status
 - a) Single
 - b) Cohabiting
 - c) Divorced
 - d) Widowed
 - e) Married
3. Education level of the mother
 - a) None
 - b) Primary school
 - c) Secondary school
 - d) Higher levels
4. Occupation of the mother
 - a) Peasant
 - b) Doing business
 - c) Employed
 - d) No job/house mother
5. Income of the mother in Tsh per day

SECTION B. Health care system factors

5. Distance to the health facility Centre

1. less than 5km
 2. 5km and above
6. How long did you wait to get health services at ANC?
- a) One hour or less
 - b) 2 hours
 - c) Three hours or more
7. Pay for Early Infant Diagnose services
- a) Yes
 - b) No
8. When was she diagnosed as HIV+?
- a) Before that pregnant
 - b) At first-trimester
 - c) During 2nd to 3rd-trimester
 - e) During labor/delivery
 - f) During breastfeeding
9. Was the pregnant mother on ART during that pregnancy?
- a) Yes
 - b) No
10. Did the health care workers tell you the time of testing your baby for HIV?
- a) Yes
 - b) No
11. **Weather attended training for DBS sample collection**
- a) **Yes**
 - b) **No**
12. Availability **EID service**
- a) **Always available**
 - b) **Sometime available**
- 13 Distance from health facility to PCR laboratory for testing DBSKm

SECTION C. Infant caregiver HIV related factors

14. Parity of the mother
15. Infant Caregivers HIV status
 - a) Positive
 - b) Negative
16. Number of visits to ANC
 - a) ≥ 4 visits
 - b) < 4 visits
17. Maternal ART adherence
 - a) Good
 - b) Poor
18. Did the mother disclosed her HIV status to her male partner?
 - c) Yes
 - d) No
19. Male partner HIV status:
 - a) Negative
 - b) Positive
 - c) Unknown
20. Relationship of the guardian to the exposed infants
 - a) Mother
 - b) Father
 - c) Grandmother
 - d) Aunt
21. Place of delivery
 - a) Home
 - b) Health facility
22. Knowledge of guardian about MTCT of HIV (Ask do you know how a child can be transmitted with HIV from the mother?)
 - a) Good
 - b) Poor
23. When was HIV diagnosis performed on that infant?

- a) Less than 8 weeks of age
- b) More than 8 weeks of age

Appendix 4: Dodoso

Dodoso la kukusanyia taarifa za visababishi vinavyopelekea mtoto aliyezaliwa kwa mama mwenye VVU kushindwa kupatiwa huduma ya upimaji wa mapema katika Wilaya ya Mbeya jiji, mkoani Mbeya toka Julai 2019 hadi Juni 2020.

SN..... Wilaya: Kituo

SEHEME A: Taarifa za kijamii na demographia

1. Umri wa mama alipokuwa na ujauzito wa mtoto huyu

2. Hali ya ndoa

- a) Sijaolewa
- b) Naishi na mchumba
- c) Tumeachana
- d) Mjane
- e) Nimeolewa

4. Kiwango cha elimu cha mama au mlezi wa mtoto

- a) Sikusoma
- b) Elimu ya msingi
- c) Elimu ya sekondari
- d) Elimu ya juu

4. Kazi ya mama

- a) Mkulima
- b) Mfanya biashara
- c) Nimeajiriwa
- d) Sina kazi/mama wa nyumbani

5. Wastani wa kipato kwa siku Tsh

SEHEMU B. Visababishi katika mfumo wa afya

6. Umbali kutoka kituo cha kutolea huduma ya afya -----Km

7. Unachukuwa muda gani kupata huduma ya mama kituoni?

- a) Saa moja au chini ya hapo
- b) Masaa mawili
- c) Masaa matatu na Zaidi

8. Mama mwenye mtoto huyu alikutwa na maambukizi ya VVU tangu lini?

- a) Kabla ya ujauzito huu
- b) Miezi mitatu ya kwanza ya ujauzito
- c) Kati ya theluthi ya pili hadi theluthi ya tatu
- d) Wakati wa uchungu/Kujifungua
- e) Wakati wa kunyonyesha

9. Je mama mwenye mtoto huyu alianzishiwa dawa ya kufubaza VVU?

- a) Ndiyo
- b) Hapana

10. Je wahudumu wa afya walikujulisha umri mwanao atakapotakiwa kupimwa VVU?

- a) Yes
- b) No

11. Je kulikuwa na wahudumu waliopatiwa mafunzo ya kukusanya sampuli za damu kavu kwenye kituo cha huduma wakati mtoto huyu anazaliwa?

- a) Ndio
- b) Hapana

12. Je vifaa vya kukusanyia damu kavu vilikuwepo kituoni wakati wa kuzaliwa huyu mtoto?

- a) Yes
- b) No

13. Umbali toka kituo cha kutolea huduma ya afya hadi maabara inayopima damu kavu

.....Km

SEHEMU C. Visababishi kwa mlezi/mzazi wa mtoto

14. Mtoto huyu alikuwa wa ngapi katika tumbo la mama yake

15. Hali ya maambukizi ya VVU ya mama/mlezi

- a) Ana maambukizi ya VVU
- b) Hana maambukizi ya VVU

16. Idadi ya mahudhurio ya kiliniki

- a) Manne au zaidi
- b) Chini ya mahudhurio manne

17. Hali ya ufuasi wa dawa

- a) Mzuri

b) Chini

18. Je mama aliweka wazi hali yake ya maambukizi ya VVU kwa mwenza wake?

a) Ndio

b) Hapana

19. Hali ya maabukizi ya VVU ya mwenza :

a) Hana maambukizi

b) Ana maambukizi

c) Haijulikani

20. Uhusiano wa mtoto na mlezi wake

a) Mama

b) Baba

c) Bibi

d) Shangazi/ mama mdogo/ mjomba

21. Sehemu alipojifungulia

a) Nyumbani

b) Kituo cha afya

22. Uelewa wa mama namna mtoto anavyoweza kuambukizwa VVU toka kwa mama (Muulize mama kama aeleze anavyojua namna na wakati mtoto anapoweza kuambukizwa VVU toka kwake).

Kisha kisha mawazo yake yaweke katika makundi mawili hapo chini

a) Mzuri

b) Chini

23. Je katika umri upi mtoto alipimwa VVU kwa mara ya kwanza?

a) Kati ya wiki nne hadi sita

b) Zaidi ya wiki sita

c) Hakupimwa kabisa



UNITED REPUBLIC OF TANZANIA
 MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
 MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES



**OFFICE OF THE DIRECTOR - RESEARCH AND
 PUBLICATIONS**

Ref. No.DA.282/298/01.C/

Date: 10/06/2021

MUHAS-REC-06-2021-691

Iman Eliud Mwakabanje,
 Master of Public Health – Distance Learning,
 School of Public Health and Social Sciences,
 MUHAS

**RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED:
 FACTORS ASSOCIATED WITH UPTAKE OF EARLY INFANT DIAGNOSIS
 OF HIV AMONG HIV EXPOSED INFANTS IN MBEYA CITY COUNCIL,
 MBEYA REGION, TANZANIA.**

Reference is made to the above heading.

I am pleased to inform you that the Chairman has on behalf of the University Senate, approved ethical clearance of the above-mentioned study, on recommendations of the Senate Research and Publications Committee meeting accordance with MUHAS research policy and Tanzania regulations governing human and animal subjects research.

APPROVAL DATE: 10/06/2021

EXPIRATION DATE OF APPROVAL: 10/06/2022

STUDY DESCRIPTION:

Purpose:

The purpose of this Cross sectional study is to determine infant care giver's demographic factors, health system factors and infant's HIV related factors associated with the uptake of early infant diagnosis of HIV among HIV exposed infants in Mbeya City Council.

The approved protocol and procedures for this study is attached and stamped with this letter, and can be found in the link provided:
<https://irb.muhas.ac.tz/storage/Certificates/Certificate%20-%20746.pdf> and in the MUHAS archive



UNITED REPUBLIC OF TANZANIA
 MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
 MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
**OFFICE OF THE DIRECTOR – POSTGRADUATE
 STUDIES**



In reply quote:

Ref. No. HD/MUH/T.477/2018

16th June, 2021

The Regional Medical Officer,
 P.O. Box 754,
 MBEYA

forwarded for consideration
/A. M. M. M.
18/6/21
 REGIONAL MEDICAL OFFICER
 MBEYA

Re: INTRODUCTION LETTER

The bearer of this letter is Iman Eliud Mwakabanje, a student at Muhimbili University of Health and Allied Sciences (MUHAS) pursuing MPH-Distance Learning.

As part of his studies he intends to do a study titled: "*Factors Associated with Uptake of Early Infant Diagnosis of HIV Among HIV Exposed Infants in Mbeya City Council, Mbeya Region, Tanzania.*"

The research has been approved by the Chairman of University Senate.

Kindly provide him the necessary assistance to facilitate the conduct of his research.

We thank you for your cooperation.

[Signature]
 Ms. Sharifa Kooibye
 For: DIRECTOR, POSTGRADUATE STUDIES

cc: Dean, School of Public Health and Sciences, MUHAS
 cc: Iman Eliud Mwakabanje