COLLEGE OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

HIV SEROCONVERSION AND ASSOCIATED FACTORS AMONG BOOKED SERONEGATIVE PREGNANT WOMEN IN KOBO TOWN AND RAYA KOBO WOREDA, NORTH WOLLO, ETHIOPIA: INSTITUTION BASED CROSS-SECTIONAL STUDY.

BY: DAWIT SISAY (BSc)

A THESIS REPORT SUBMITTED TO THE GRADUATE STUDIES PROGRAM OF ADDIS ABABA UNIVERSITY IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER IN PUBLIC HEALTH.

DECEMBER 2020

ADDIS ABABA, ETHIOPIA

DECLARATION

I, the undersigned, declare that this is my original work and has not been presented in this or any other university for a degree and all sources of materials used for this thesis have been fully acknowledged.

PRIMARY INVESTIGATOR

Dawit Sisay Dessale _____ _____

Full Name Signature Date

APPROVED BY THE BOARD OF EXAMINATION

This thesis, by Dawit Sisay, is accepted in its present form by the board of examiners as fulfilling for the Degree of Masters in Reproductive, Family and Population Health.

PRIMARY ADVISOR

Mulugeta Betre Gebremariam (AssocProf.-Dr.) _____ _____

Full Name Signature Date

SECONDARY ADVISOR

Ewunetu Firdawek (PhD) _____ _____

Full Name Signature Date

EXTERNAL EXAMINER

_____ _____ _____

Full Name Signature Date

INTERNAL EXAMINER

_____ _____ _____

Full Name Signature Date

CHAIRMAN, DEPARTMENT GRADUATE COMMITTEE

_____ _____ _____

Full Name Signature Date

ACKNOWLEDGMENT

This study would not have been successful without the genuine support of the following people and institutions, and I would like to express my deepest appreciation and would like to thank them all for their unreserved support. First, I would like to express my thanks to Addis Ababa University, College of Health Sciences, and of the Graduate Studies Program for giving me this chance and support to prepare this thesis. Foremost, I would like to express my deep and sincere gratitude to my advisors, Mulugeta Betre Gebremariam (Assoc, Prof.-Dr) and Ewnetu Firdawek (PhD) for their guidance, enthusiastic encouragement, valuable scientific comments, and critiques starting from inception to completion of this study. My heartfelt gratitude also goes to the study participants, data collectors, supervisors, and staff in the various health centers for facilitating the data collection process. I would like to express my heartfelt thanks to my friends; both in and out of the postgraduate program contexts who have supported me as I undertook this life-changing experience. My heartfelt gratitude goes to my family members for their support and belief in my dreams and goals, their constant encouragement often being the driving force in my journey. Lastly, my special thanks go to Kobo Town, and Raya Kobo Woreda Health Office for providing rapid HIV diagnostic kits, the study would not have been possible without them.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURE

ACCRONOMYS AND ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
ANC	Ante Natal Care
AOR	Adjusted Odds Ratio
ART	Anti Retroviral Therapy
ARV	Anti Retro Viral
CI	Confidence Interval
COR	Crude Odds Ratio
EC	Ethiopian Calendar
HC	Health Center
HIV	Human Immunodeficiency Virus
MTCT	Mother To Child Transmission
NGO	Non Governmental Organizations
PMTCT	Prevention of Mother To Child Transmission
SDG	Sustainable Development Goals
SPSS	Statistical Package for Social Sciences
SSA	Sub Saharan Africa
STI	Sexual Transmitted Infections
UNAIDS	United Nations Program on HIV/AIDS
VCT	Voluntary Counseling and Testing
WHO	World Health Organization

ABSTRACT

Background: Under the current practice, pregnant women who were Human Immunodeficiency Virus (HIV) negative on the first test are considered to be HIV negative throughout. A repeat HIV test three months later would identify HIV seroconversion and ensure early intervention to prevent mother to child transmission of the virus. The objective of this study is therefore to measure the magnitude of HIV seroconversion and to identify factors associated with HIV seroconversion among booked first-time test seronegative pregnant women.

Methods: An institution-based cross-sectional study was conducted among HIV negative pregnant women in Kobo Town and Raya Kobo Woreda, North Wollo, Ethiopia from June to July 2020. Data were collected using a questionnaire through face-to-face interviews along with a client card review. HIV re-testing was performed to know the current HIV status of pregnant women. The collected data were entered into Epi data version 4.4.1 and were exported and analyzed by SPSS version 25. A p-value < 0.25 in the bivariate analysis were entered in the multivariable logistic regression analysis and a p-value of < 0.05 was taken as statistically significant.

Result: From a total of 494 pregnant women who were screened and reported negative for HIV at first ANC, six (1.2%) were HIV seropositive during retesting. Upon multivariable logistic regression, pregnant women who have had a reported history of sexually transmitted infections [AOR=7.98; 95% CI (1.206, 52.818)], participants' partners reported travel history for work frequently [AOR=6.00; 95% CI (1.093, 32.993)], and sexually abused pregnant women [AOR=7.82; 95% CI (1.194, 51.243)] were significantly associated with HIV seroconversion.

Conclusion: The notable seroconversion rate found in this study implies that it is not enough to test pregnant mothers once during the first antenatal care clinic. Rescreening of pregnant women after the booking is a beneficial strategy to allow the timely provision of ART prophylaxis to HIV seroconverting women and their exposed babies for the elimination of mother to child transmission of HIV. Further expanded and large scale study should be conducted to understand the magnitude and the factors of HIV seroconversion during pregnancy at various levels.

Keywords: Human Immunodeficiency Virus, Pregnancy, Seroconversion, Booking, Kobo, Vertical transmission.

1. INTRODUCTION

1.1. Background

Vertical transmission of the Human Immunodeficiency Virus (HIV) is still the most important public health problem in the globe especially in less developed countries(1). Without any intervention, the risk of mother-to-child transmission (MTCT) of HIV can range from 15%-45%, but through appropriate interventions, the risk may get reduced to < 5%(2).

Several approaches have been developed over the last three decades to prevent mother-to-child transmission (PMTCT) of HIV, including early identification of HIV-infected pregnant women and initiating them on antiretroviral (ARV) therapy(3). As a result, around 1.4 million new HIV infections are averted between 2010 and 2018 due to the implementation of PMTCT services(4). Despite the readily available highly effective preventive interventions, an estimated 180 000 new infant HIV infections occurred in 2017, the vast majority (90%) occurred in sub-Saharan Africa(5, 6).

Integration of voluntary counseling and testing (VCT) of HIV in antenatal care (ANC) and initiation of ART for chronic HIV-infected pregnant women has been a highly effective strategy. However, those women who have had acquired HIV infection or seroconvert during pregnancy may not be detected and treated. So the contribution of MTCT of HIV from newly acute maternal HIV infection may increase as programs reduce MTCT of HIV among chronically infected women(7-9).

In resource-limited countries including, Ethiopia, HIV is diagnosed based on a rapid serological test, which is unable to detect the infection in the window period. Polymerase chain reaction (PCR) can identify the viral particles in the patient's blood, and serum and it's confirmatory, but it's not feasible as routine in ANC setting. For women who are newly infected or seroconvert during pregnancy, there is another window of opportunity in late pregnancy. Recently repeat HIV testing in late pregnancy is recommended as a standard of care as it increases ARV provision for newly infected or seroconverting pregnant women to improve the health of the women and the child(8, 10-13).

Prevention of vertical transmission and initiation of antiretroviral treatment for HIV-infected pregnant women is undertaken by the Government of Ethiopia to alleviate the consequences of the disease in the general population, particularly in children(14).

1.2. Statement of the problem

Globally, 36.9 million people are living with HIV; out of these, 1.8 million peoples are newly infected cases(15). In sub-Saharan Africa (SSA), 25.8 million peoples are living with HIV, which can cause Acquired Immune Deficiency Syndrome (AIDS)(16). In 2017, about 1.8 million children below the age of 15 years were living with HIV, of which 180,000 were newly diagnosed cases, which means that there is a high risk of HIV exposure to unborn babies and infants(15).

Ethiopia is one of the countries seriously affected by HIV. According to the Ethiopian Demographic and Health Survey 2016, the national HIV prevalence is 0.9%(17). The epidemic of HIV varied by sex, geographic area, and population group(18). Besides the dominant heterosexual transmission, mother to child transmission of HIV constitutes more than 90% of pediatrics HIV and occurs in utero, during labor and delivery, and breastfeeding(3, 19).

HIV prevalence among children aged 0-14 in urban Ethiopia is 0.3%, indicating about 19,000 children aged 0-14 years living with HIV(20). According to a 2018 systematic review and meta-analysis, the pooled prevalence of HIV among pregnant women in Ethiopia was 5.74%(21). Also, a recent meta-analysis in Ethiopia showed that 9.9% of infants were infected with HIV from their mothers since they did not receive any intervention, which proves that HIV is still a most important public health problem in the country(22).

The risk of HIV acquisition is higher among pregnant women(23). The risk will be higher due to pregnant women's or their respective partner's sexual behavior(24). Also, hormonal and immunological changes during pregnancy may increase the risk of contracting HIV since progesterone hormone increases and thus affects the mucosa of the genital tract, increasing the transmission(24, 25). Also, in pregnancy, HIV causes extra physical, immunological, and psychological stress, which in turn increases maternal and infant morbidity and mortality(26).

Several studies do point out that there is a high rate of HIV seroconversion among pregnant women who are HIV negative during the initial test(27, 28). Factors contributing to HIV seroconversion include a history of sexually transmitted infections, polygamous marriage, recent alcohol use, age of the women, and partner with a history of STI, multiple sexual partners, HIV positive partner, secondary school level education, shorter relationship, older male partner, occupational status, and knowledge of HIV infection (27-34).

The current PMTCT has been usually focused on infants born to HIV-positive women; however primary prevention for women who are HIV negative during early pregnancy is often neglected. HIV seronegative pregnant women in the early stage of pregnancy are at continued risk of seroconverting throughout pregnancy(35). Because of the aforementioned policy, women who are seroconverting during pregnancy do not receive interventions, as they are believed to be HIV negative. These specific categories of pregnant women will also do not receive counseling on the best method of infant feeding, which increases the vertical transmission of HIV. According to UNAIDS, there is a vision to eradicate mother-to-child transmission of HIV by 2030, and it is vital to identify and treat seroconverting pregnant women to achieve this vision(36).

Despite recommendations(14), data are not systematically collected and reported on the implementation of this recommendation in Ethiopia, and in the study area, pregnant women are tested for HIV only once during their first ANC visit, conversely, retesting of HIV seronegative pregnant women in late pregnancy or during labor and delivery is not done. Due to limited data on HIV seroconversion, therefore, this study had sought to measure the magnitude of HIV seroconversion and to identify its associated factors among booked seronegative pregnant women by using a repeat HIV test strategy at late pregnancy.

1.3. Significance of the study

Identification of seroconverting pregnant women and a good understanding of co-factors of HIV seroconversion are vital in the MTCT of HIV control programs. This study is also imperative to capture the newly infected HIV women and recommend them for HIV care during pregnancy to prevent MTCT of HIV to improve the quality of health of the women and the child alike from the earliest possibility. Again, information from this study could be vital to develop strategies to decrease HIV acquisition during this period, and it is essential to maximize available resources for HIV prevention. This study may also provide some clue on what should be the best approach to prevent MTCT of HIV to minimize the risk of vertical transmission of HIV from seroconverting women. Finally, the study may be considered very important in providing pieces of information for government policymakers, program planners, and non-governmental organizations (NGOs) to develop relevant interventional strategies, and it may encourage other researchers and policymakers to carry out more extensive research in this particular area.

2. LITERATURE REVIEW

2.1. The magnitude of HIV seroconversion during pregnancy

Among the sustainable development goals (SDG), Goal three focuses on to ensure healthy lives and promote wellbeing for all ages(37). Preventing new HIV infection could be an imperative strategy to achieve this goal. To do this, HIV-negative pregnant women are considered as key populations at high risk for HIV acquisition requiring urgent attention to develop effective interventions to detect HIV seroconversion in pregnancy and provide appropriate treatment to decrease the rate of vertical transmission(38).

A series of recent studies across the globe have indicated that there is a high risk of HIV seroconversion during pregnancy. A prospective cohort study conducted in Nigeria showed out of 400 seronegative pregnant women in the initial test one woman become seroconvert making the seroconversion rate of 0.25%(39). In another prospective cross-sectional study in Benue State University Teaching Hospital, Makurdi, Northcentral, Nigeria out of 405 HIV-negative pregnant women in the early index of pregnancy 10 women become HIV positive during labor indicating the magnitude of HIV seroconversion was 2.5%(40). The difference might be explained by Benue State have constituted the highest HIV burden in the country. The main limitations of both studies are difficult to identify whether the seroconversion is due to acute HIV infection or genuine seroconversion due to the window period and they didn't assess the partner's sexual and behavioral factors associated with HIV seroconversion.

In the cross-sectional study conducted in Bugando Medical Center in Tanzania, from a total of 400 HIV-negative pregnant women, the magnitude of HIV seroconversion following retesting was 5.3%(27). Nevertheless, in a prospective study done in the north of Durban in Thekwini district South Africa, the magnitude of new HIV infection among pregnant women following retesting was 0.68%(30). The difference may be due to all the study participants in South Africa received community-based combination HIV prevention intervention which can help them to mitigate risky sexual behaviors. The main limitations of these studies are HIV was diagnosed by the rapid serological test which is not detecting the women in the window period may underestimate the actual seroconversion rate.

A hospital-based cross-sectional study done in St.Petersburg Russia reveals the magnitude of HIV seroconversion among HIV-negative pregnant women was 0.4%(41). In contrast with this, in a study conducted in Swaziland, the magnitude of new HIV infection was 13.8%(42). This gap

could partly be explained by the very fact that Swaziland constitutes the highest HIV burden in the globe than any other country.

A retrospective study conducted in Kenya, the overall magnitude of HIV seroconversion among seronegative pregnant women was 2.6%(34). Similarly, another retrospective study in Kenya has found that the magnitude of HIV seroconversion among pregnant women following retesting was 1.5%(43). In contrast with this finding, in another prospective cohort study conducted in Kenya, the overall magnitude of HIV seroconversion among discordant couples during pregnancy was 10.8%(44). These variations may be due to the study participants were discordant couples that may increase the risk of HIV acquisition. The limitations of these studies are they didn't consider women and partner sexual and behavioral factors of HIV seroconversion.

A cross-sectional study done in South Africa showed among 2377 booked HIV seronegative pregnant women 72 become seroconvert yielding the magnitude of HIV seroconversion of 3%(13). Another prospective study conducted in South Africa has found that the magnitude of HIV seroconversion among HIV negative pregnant women was 3.4%(45). Similarly, the cross-sectional study done in South Africa has found that the magnitude of HIV seroconversion among booked seronegative pregnant women in the initial test was 2.2%(46). The results found in these three studies are more or less similar this may be due to similarities of the study participants regarding socio-demographic characteristics. The main limitations of these studies are they didn't assess the partners sexual and behavioral factor and the test they used to diagnose HIV infection were the rapid serological test, this may underrate the definite seroconversion rate.

Finding from a different part of Africa also has revealed that the prevalence of HIV seroconversion among HIV negative pregnant women following retesting in Tanzania, Cameroon, Malawi, and Zambia was 2%, 2.1%, 1%, and 0.5% respectively(33, 47-49). The difference could be explained by dissimilarities in the socio-demographic and sexual risk behaviors among study participants and differences in the overall HIV burden among the countries. The limitations of these studies are they did not study the male partners' or husband's risk factors associated with HIV seroconversion except in Malawi.

A cross-sectional study conducted in Nigeria showed out of 235 seronegative pregnant women 5 become seroconvert making the magnitude of HIV seroconversion 2.1%(50). In other hospital-based cross-sectional studies done in Nigeria, the magnitude of HIV seroconversion was 1.2%(31). Similarly, other cross-sectional study reports that the magnitude of HIV

seroconversion among HIV negative pregnant women in the early ANC following retesting later was 3.91%(51). Also, an institution-based cross-sectional study conducted in Nigeria revealed out of 502 booked seronegative pregnant women 15 women become seroconvert yielding the magnitude of HIV seroconversion 3%(28). The major limitations of these studies are they did not study in multi-center and the study can't differentiate true seroconversion from new infection.

2.2. Factors associated with HIV seroconversion

2.2.1. Socio-demographic factors associated with HIV seroconversion

Studies have indicated that factors associated with HIV seroconversion are attributed to the participant's socio-demographic characteristics. Related to the participant age, the HIV incidence is higher among old age pregnant women as compared to their younger counterparts(13, 48). However, this finding is contrary to the finding from elsewhere showed younger pregnant women have a greater risk of acquiring HIV than their older counterparts(29, 52-55).

Concerning marital status, married pregnant women have a greater risk of acquiring HIV than their unmarried counterparts(34). Opposing this finding, a study conducted in Tanzania reveals unmarried pregnant women are more likely to be infected by HIV than married ones(27). Similar findings from Rakia Uganda report never married and previously married (separated, widowed, divorced) pregnant women are at risk of acquiring HIV than married pregnant women(35). Another study conducted in South Africa shows single pregnant women were at a 2.5 times higher risk of seroconverting than married pregnant women(13).

The occupational status also was found associated with HIV seroconversion. HIV seroconversion is higher among employed pregnant women than their unemployed counterparts(33, 34). However, this finding contrasts with another study done in South Africa which shows HIV incidence is higher among unemployed pregnant women than employed ones(45, 55).

Related to educational status, the result from South Africa indicates pregnant women with tertiary educational levels have a lower risk of HIV acquisition as compared to their counterparts(13). However, the finding is contrary to other studies conducted in South Africa, pregnant women with a secondary level of education were more likely to acquire HIV than their counterparts(56).

Related to pregnant women partners' educational status, a study done in Mozambique reveals pregnant women whose partner had higher education levels have a greater risk of HIV than

pregnant women whose partner had lower education levels(52). This finding is inconsistent with the study conducted in Zimbabwe showed a lack of education in the partners of pregnant women 2.8 times more likely infected by HIV(57). Pregnant women with older partners are more likely to get HIV than pregnant women with younger partners (32).

2.2.2. Obstetric factors associated with HIV seroconversion

The number of pregnancies also associated with HIV risk. Studies in Malawi and South Africa report pregnant women who had two or more pregnancies to have a greater risk of HIV acquisition(48, 56). However, this finding is contrary to the finding from Swaziland which indicates the first-time pregnant women were more likely to get HIV infection than women with two or more pregnancies(42). Pregnant women with a low number of children are more likely to have HIV than pregnant women with a high number of children(52). Pregnant women presenting late (>20 weeks gestational age) for the first ANC had more than a six-fold increased risk of HIV infection compared to pregnant women presenting early(29).

2.2.3. HIV infection knowledge related factors associated with HIV seroconversion

A hospital-based cohort study conducted in Fako Division, South West Region, Cameroon showed pregnant women who do not know about mother to child transmission of HIV have 5.4 times at risk of acquiring HIV than pregnant women who know about mother to child transmission of HIV(33).

2.2.4. Sexual and behavioral factors associated with HIV seroconversion

Among married pregnant women, those in polygamous relationships have 19% more likely to have HIV than pregnant women with monogamous relation(34). This also is supported by a study conducted in Tanzania, pregnant women with polygamous marriages were 31 times more likely to acquire HIV infection than their counterparts(27).

The study conducted in Lesotho reveals pregnant women with more than one sexual partner 3.38 times higher risk of acquiring HIV infection than pregnant women with only one sexual partner (29). In other prospective studies conducted in Rakaia Uganda, pregnant women with multiple sexual partners have an increased risk of HIV infection than their counterparts(35).

Related to condom utilization, those pregnant women not using a condom during sexual intercourse are more likely to acquire HIV than their counterparts(57). However, this finding is inconsistent with a study conducted in Rakai Uganda, which shows pregnant women using the condom during sexual intercourse have a greater risk of acquiring HIV infection(35).

The study conducted in Mozambique and Zimbabwe reports young age at sexual debut is associated with HIV acquisition during pregnancy(58, 59). Pregnant women within the relationship but not living with their partner also doubled the risk for HIV infection than pregnant women living together with their partner(52). However, this is inconsistent with the study conducted in Nigeria shows pregnant women living with their partners are at high risk for HIV infection(28). The result from Tanzania also shows pregnant women living with a separate house from their partner 4.7 times and pregnant women with mobile (traveling) partner 7.3 times more likely to acquire HIV infection(27). Similar to this finding, a study conducted in Uganda and Zimbabwe showed pregnant women living separated from their partners are more likely to get HIV infection than pregnant women living with their partner(53).

Pregnant women who do not know their partner's HIV status had a greater risk for HIV infection than pregnant women who knows their partner's HIV status(58, 60). Pregnant women in a shorter relationship with their partners have an increased risk of HIV infection than their counterparts(29, 32).

Pregnant women with known HIV infected partners were significantly associated with HIV acquisition(30). Those pregnant women suspected that their partners had other sexual partners were 3.8 times at risk of acquiring HIV infection and also those pregnant women that reported having been sexually abused 3.1 times higher risk of HIV acquisition than pregnant women not reported having been sexually abused(59).

The study conducted among African women indicates pregnant women with a new partner in the last 3 months have 3.91 times more likely to acquire HIV infection than pregnant women without a new partner(54). Another study conducted in Uganda and Zimbabwe reports pregnant women with recent alcohol use is significantly associated with HIV acquisition(53).

2.2.5. Clinical factors associated with HIV sero-conversion

Pregnant women with a history of sexually transmitted infections were three times more likely to acquire HIV infection than pregnant women without a history of STI(32). Pregnant women with

a history of urethral discharge during pregnancy were 3.7 times more likely to get infected with HIV compared to pregnant women not experiencing a urethral discharge(29). Pregnant women with a history of genital ulcers were two times more likely to acquire HIV infection than their counterparts(35). Pregnant women with a history of syphilis during pregnancy were nine times more likely to get HIV infection than pregnant women without a history of syphilis(32). This study is consistent with other studies conducted elsewhere that show pregnant women with a history of syphilis significantly associated with HIV acquisition(27, 47).

The study conducted in Nigeria also shows pregnant women whose partners had penile discharge are significantly associated with HIV acquisition than pregnant women whose partners had not experienced penile discharge(28).

In summary, there is a high rate of HIV seroconversion during pregnancy. Therefore retesting HIV negative pregnant women in late pregnancy is important to identify seroconverting pregnant women and initiate ART prophylaxis and other interventions to prevent mother to child transmission of HIV. Socio-demographic, obstetric, HIV infection knowledge, sexual and behavioral, and clinical factors were found to be risk factors for HIV seroconversion.

2.2.6. Conceptual framework

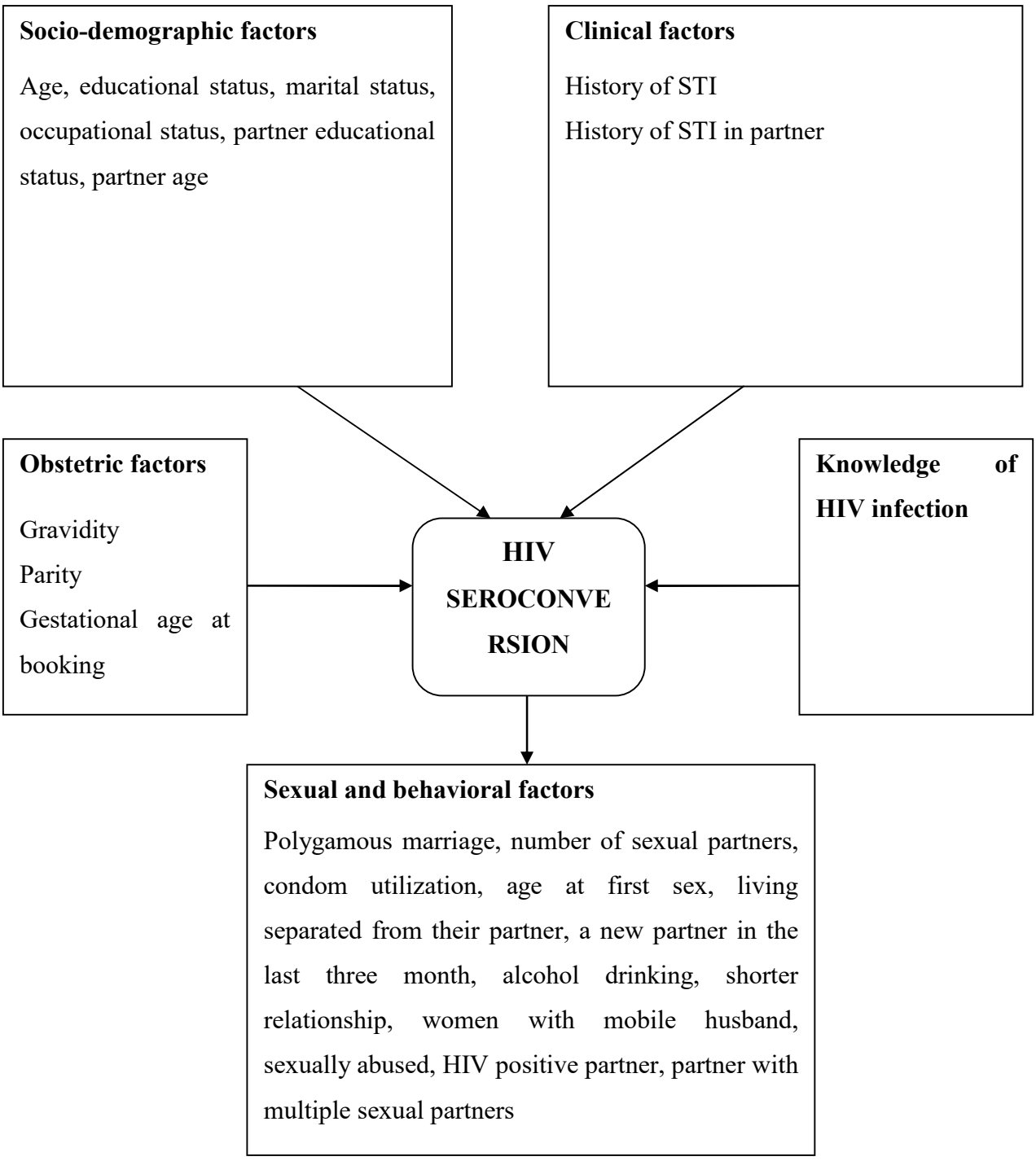


Figure 1: Conceptual framework on the assessment of factors associated with HIV seroconversion among booked seronegative pregnant women **(Source:** Constructed from the reviewed literature).

3. OBJECTIVE

3.1. General objective

- To measure the magnitude of HIV seroconversion and identify the associated factors among booked seronegative pregnant women in Kobo Town and Raya Kobo Woreda, North Wollo, Ethiopia from June 1, 2020 – July 30, 2020.

3.2. Specific objectives

- To measure the magnitude of HIV seroconversion among booked seronegative pregnant women in Kobo Town and Raya Kobo Woreda, North Wollo, Ethiopia from June 1, 2020 – July 30, 2020.
- To identify factors that may be associated with HIV seroconversion among booked seronegative pregnant women in Kobo Town and Raya Kobo Woreda, North Wollo, Ethiopia from June 1, 2020 – July 30, 2020.

4. METHOD

4.1. Study design and period

An institution-based cross-sectional study was conducted from June 01, 2020, to July 30, 2020, among booked seronegative pregnant women attendees in governmental health facilities. The research protocol (proposal), study planning, and execution phases covered from June 2019 to September 2020.

4.2. Study setting

The study was conducted in Kobo Town and Raya Kobo Woreda. The Town is located at 570 km from Addis Ababa and 410 km from Bahirdar, the capital city of the Amhara region. The Town has 1 governmental hospital, 1 private hospital, 1 health center, 5 health posts, 12 private health institutions and the total population of the town is 52256, of these the total number of a female of reproductive age groups is estimated to be approximately 10571. Raya Kobo Woreda has 9 Health centers, 45 health posts and 10 private health institutions and the total population is 242,159 of these males and females comprise 120186 and 121973 respectively, and women of reproductive age groups is estimated to be approximately 48989. In 2012 E.C, a total of 4,447 pregnant women underwent their first pregnancy follow-up, of which 4245 were tested for HIV, and 65 were tested positive and enrolled with the option B^+. The number of first ANC attendants at Kobo Health Center was 1365, of which 1311 were tested for HIV. Twenty-two of those tested for HIV were infected and enrolled with the option B^+. In the same year, 470 women underwent their first antenatal care visit at Kobo Hospital, all of whom were tested for HIV. Nine of those tested were infected and enrolled with the option B^+. From Raya Kobo Woreda, 963, 667, 579, and 403 pregnant women underwent initial pregnancy follow-up at Robit, Gobye, Tekulesh, and Workie Health Centers, of which 904, 646, 526, and 388 were tested for HIV respectively, thirty-four of those tested were infected and enrolled with the option B^+.

4.3. Population

4.3.1. Source population

All booked HIV seronegative pregnant women found in Kobo Town and Raya Kobo Woreda governmental health facilities.

4.3.2. Study population

All booked HIV seronegative pregnant women in the selected governmental health care facilities during the data collection time.

4.4. Eligibility Criteria

4.4.1. Inclusion criteria

Booked HIV seronegative pregnant women attendees in governmental health care facilities irrespective of their gestational age at booking and have had at least three months between their initial HIV negative test results.

4.4.2. Exclusion criteria

Pregnant women who have had serious medical or obstetric complications and mental health problems were excluded from the study.

4.5. Sample Size Determination and Sampling Technique

4.5.1. Sample size determination for the first specific objective

The sample size was calculated by using single population proportion formula based on the following assumption: a proportion of HIV seroconversion from the previous study which, was done in Nigeria was 3.9%(51); also, a margin of error of 2% was taken and corresponding 95% of a confidence interval, the calculated sample size become 360 and by considering a non-response rate of 10%, the final sample size was 400.

$n = \frac{(Z\ \alpha/2)\ p\ (1-p)}{d^2}$ Where:

n= the required sample size

Z= the standard score corresponding 95% confidence interval

P= proportion of HIV seroconversion among booked seronegative pregnant women from a study done in Nigeria

d^2= the permissible margin of error (the required precision) = 2%

4.5.2. Sample size determination for the second specific objective

Polygamy, post-primary education, and young age (42, 59, 61) were identified as the most important factors associated with HIV seroconversion among booked seronegative pregnant women. Then the sample size was calculated under the assumptions of 95% CI, power 80%, a ratio of unexposed to exposed (P_2) in the sample and using Open Epi version 2.3.1, and by adding a 10% non-response rate **(Table 1).**

Table 1: Sample size determination for factors associated with HIV seroconversion among booked seronegative pregnant women in Kobo Town and Raya Kobo Woreda, North Wollo, Ethiopia 2020.

Variables	AOR	P_2 (%)	Ratio of unexposed to exposed	Confidence interval (%)	Power (%)	Non-response rate (%)	Final sample size
Polygamy	2.6	7.6	1	95	80	10	425
Post primary education	2.4	7.7	1	95	80	10	509
Young age	2.17	11.2	1	95	80	10	491

The sample size calculation for the first specific objective by using a single population proportion formula was 400, which is the lowest sample size calculation value than the sample size calculated for the second specific objective. Therefore, the sample size of this study was 509.

4.5.3. Sampling technique

The study was carried out in six selected public health facilities that provide routine ANC services with comprehensive HIV counseling and testing in the study area. One primary hospital and one health center from Kobo Town were selected by default since these two facilities are the only governmental facilities found in Kobo Town and there were nine health centers in Raya Kobo Woreda, one of which was new and had not started providing services, therefore, we listed the remaining eight health centers and mixed them well, then we were randomly select the four health centers using the lottery method. Then, the total sample size was proportionately allocated for the six selected public health facilities based on the total number of HIV negative pregnant women who attend the first ANC visit in the selected health facilities from June to July 2019. All women who are present in the selected health facilities during the study period and who met the inclusion criteria was recruited sequentially as they arrive without skipping until the required sample size was reached **(Figure 2).**

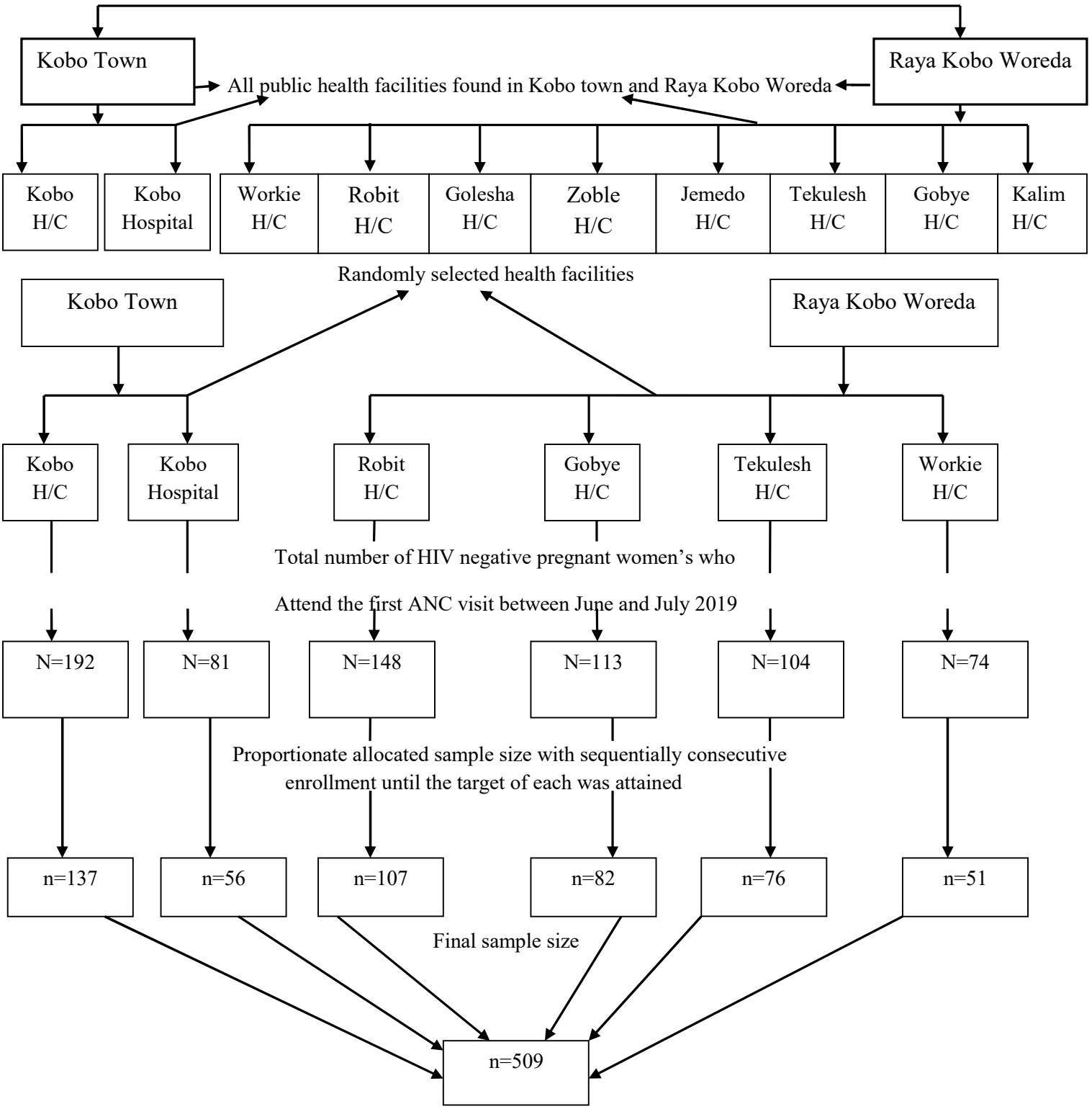


Figure 2: Schematic representation of sampling procedure on assessments of the HIV seroconversion and factors associated with HIV seroconversion among booked seronegative pregnant women in Kobo Town and Raya Kobo Woreda, North Wollo, Ethiopia 2020.

4.6. Study variables

4.6.1. Dependent variables:

The primary outcome of the study was HIV seroconversion during pregnancy.

4.6.2. Independent variables:

Socio-demographic factors: Age, residence, educational status, marital status, religion, occupational status, partner educational status, partner age, partner occupational status, household income.

Obstetric factors: Gravidity, parity, gestational age at booking, the status of pregnancy.

Knowledge: of HIV infection.

Clinical factors: A history of STI, partner with a history of STI.

Sexual and behavioral factors: Polygamous marriage, multiple sexual partners, condom utilization, age at first sex, history of alcohol drinking, living separated from their partner, duration of a relationship, a new partner in the last three month, women with mobile husband, knowledge of partners HIV status, HIV positive partner, partner with alcohol drinking, and Suspect their partner with other sexual partners, emotional, physical, and sexually abused pregnant women.

4.7. Operational definition of terms

Retest: HIV testing at least three months after an initial documented negative test result (14).

HIV seroconversion during pregnancy: having an HIV negative result at the initial HIV test and an HIV-positive result on a retest at least 12 weeks later(43).

Booking: the first documented antenatal care visit.

Knowledge of HIV infection: was assessed by using 12 items with "yes" or "no" questions. Participants who scored above the mean score were considered knowledgeable, and those who scored less than the mean score were considered not knowledgeable.

4.8. Data collection tool and data collection procedure

A structured questionnaire based on the face-to-face interview technique along with a client card review was used to collect the data. The questionnaires were adapted from related literature with slight modification in line with the objectives of this particular study. The questionnaire was

initially prepared in English and then translated to Amharic and was translated back to English to check for any inconsistencies. The data were collected by well-trained health professional data collectors in the selected health facilities under close supervision. The data collectors were twelve diploma midwives and the supervisors were three degree-level graduate midwives. For the data collectors and supervisors, relevant training was given by the principal investigator to make them familiar with the data collection tool and procedures and ethical code of conduct. The questionnaire was consisting of socio-demographic, HIV infection knowledge, and sexual and behavioral, obstetric, and clinical factor-related questions, and this information was collected during retesting. The data was collected after explaining the purpose of the study for all eligible pregnant women and after obtaining verbal informed consent from each study participant.

Moreover, provider-initiated voluntary testing and counseling (VCT) were conducted as per the national protocol for all study participants to determine the magnitude of HIV seroconversion after having a negative test result 12 weeks after the first test. Pretest counseling was given for all participants, followed by the collection of blood. The Chembio HIV 1/2 STAT-PAK Test, which has a sensitivity of 99.5% and a specificity of 100 %, was used to diagnose HIV infection. The HIV 1/2/0 Tri-line Human Immunodeficiency Virus Rapid Test Device, which has a sensitivity of 100%, and a specificity of 99.7%, was employed as a secondary test for those pregnant women who have found HIV positive in The Chembio HIV 1/2 STAT-PAK test. The SD BIOLINE HIV-1/2/3.0 Rapid test, which has a sensitivity of 100%, and a specificity of 99.8%, was used as a confirmatory test(62). Following retesting, post-test counseling was also employed.

4.9. Data quality assurance

To assure the data quality, the data collection tool was prepared after a review of relevant literature related to this particular study. Two days of training were given for both the data collectors and supervisors about the general objective of the study and the contents of the questionnaire by the principal investigator. The questionnaire was pretested on the 5% of sample size in one of the health facilities which were not included in the study before the actual data collection and correction was made for questions that may create confusion or misunderstanding. Strict daily supervision of the data collection process was maintained throughout the data collection period. The completed questionnaires were collected daily by the supervisors to check

for consistency and completeness, and then submitted to the principal investigator for the final check.

4.10. Data Management and Analysis

The collected data were entered into Epi data version 4.4.1 and were exported and analyzed by SPSS version 25. Inconsistencies and missing values were cleaned by checking the original questionnaire. Descriptive statistics were calculated based on the distribution of the data. Beyond descriptive statistics, associations between the dependent and independent variables were analyzed by calculating the Odds Ratios and 95 % confidence interval. First, a bivariate analysis was used for each variable and crude odds ratio (COR) was calculated. Second, confounders were controlled by logistic regression analysis. Independent variables with marginal associations ($P < 0.25$) in the bivariate analysis were entered in the multivariable logistic regression analysis to detect independent factors of HIV seroconversion. The significant association of independent variables with the dependent variable was assessed by using a 95% confidence interval and a respective adjusted odds ratio (AOR). A p-value of < 0.05 was taken as statistically significant.

4.11. Ethical consideration

Ethical clearance was obtained from the Research and Ethical Review Committee/Institutional Review Board, School of Public Health, College of Health Science of the Addis Ababa University before the start of the data collection process. Following the approval, an official letter of co-operation to the concerned bodies was secured from the School of Public Health of Addis Ababa University. The necessary permission to undertake the study was also obtained from Kobo Town and Raya Kobo Woreda Health Bureau and the respective health facilities. Then informed verbal consent was obtained from each participant after explaining the purpose, procedure, risks, and benefits of the study and the importance of their participation. Consent was voluntary and free from any coercion. Privacy and confidentiality were maintained for all study participants by coding of results known only to the caregivers. All Pregnant women who were found to be HIV positive during the re-testing got linked to the PMTCT clinic, and proper treatment was given based on the Ethiopian National Guidelines for the PMTCT by trained health professionals in the respective health facility.

4.12. Plan for dissemination of results

The final finding of this study will be submitted and defended as a Master's Thesis at Addis Ababa University's College of Health Sciences, School of Public Health. The finding of the research will also be disseminated to Kobo Town and Raya Kobo Woreda health institution, Zonal and Regional Health Bureau, Ministry of Health, and other concerned bodies at different managerial levels to enable them to consider recommendations during their planning process. Finally, the finding will be reported on the scientific forum workshops, seminars, and other professional meetings and an effort will be made to publish in peer-reviewed journals.

5. RESULT

5.1. Characteristics of study participants

5.1.1. Socio-demographic and obstetrics characteristics

From a total of 509 pregnant women who have recruited the study, 494 were volunteers and participated in the study, the remaining 15(2.9%) women declined; this makes the response rate 97.1 %. The reason given by the women who did not participate in the study was that they did not want to be tested again because they believed they could not have been infected after testing negative in early pregnancy. The median (interquartile range) age of the study participant was 30(25-35) years and the majority of the 253(51.2%) were among the age range of 25-34 years. Most of them were living in urban areas 326(66.0%) and were currently married 454(91.9%). Most 359(72.7%) of respondents have ever attended school, of these 157(43.7%) and 89(24.8) respondents have completed at least primary school and higher education respectively. The median age of participant partners was 35(IQR 30-40) years. The majority 354(71.7%) of study participant partners were ever attended school, of these, 91(25.7%) have completed their higher education. Four hundred and two (81.4%) of the study participants had a perceived lower income. Most 300(60.7%) of the participants underwent the first antenatal follow-up in 11-20 weeks of gestation. About 417(84.4%) pregnant women reported that the pregnancy was planned **(Table 2).**

Table 2:Socio-demographic and obstetrics characteristics of the study participants in Kobo Town and Raya Kobo Woreda, North Wollo, Ethiopia, 2020 (n= 494)

Variables	Frequency	Percent (%)
Age (completed years)		
15-24	104	21.1
25-34	253	51.2
35-49	137	27.7
Residence		
Urban	326	66.0
Rural	168	34.0
Marital status		
Single	34	6.90
Separated/divorced	6	1.20
Married	454	91.9
Religion		
Orthodox	381	77.1
Muslim	109	22.1

Other	4[a]	0.80
Ever attend school		
Yes	359	72.7
No	135	27.3
Educational status (n=359)		
Higher education	89	24.8
Secondary education	113	31.5
Primary education	157	43.7
Occupational status		
Employed	89	18.0
Housewife	223	45.1
Farmer	110	22.3
Unemployeed	52	10.5
Other[b]	20	4.00
Partner age		
≤30	179	36.2
31-45	281	56.9
≥46	34	6.90
Partner ever attend school		
Yes	354	71.7
No	140	28.3
Partner educational status (n=354)		
Higher education	91	25.7
Secondary school	108	30.5
Primary school	155	43.8
Partner occupational status		
Employed	153	31.0
Farmer	155	31.4
Merchant	78	15.8
Unemployed	88	17.8
Other[c]	20	4.00
Householdmonthly income (average estimate)		
Lower income	402	81.4
Low middle income	92	18.6
Gravidity		
1	146	29.6
2-3	211	42.7
≥4	137	27.7
Parity		
0	156	31.6
1-2	212	42.9
≥3	126	25.5
Gestational age at booking		
≥21 week	103	20.9
11-20 week	300	60.7
≤10 week	91	18.4
Status of pregnancy		
Planned	417	84.4
Unplanned	77	15.6

[a] Protestant, catholic, [b] student, merchant, daily laborer, [c] daily laborer, driver, student

5.1.2. HIV infection knowledge characteristics

Regarding the participant knowledge of HIV, the majority of the participants, 361(73.1%), had relatively good HIV knowledge. Almost all participants have heard of HIV 492(99.6%). Of these, 377(76.6%) said they could reduce HIV infection by having only one uninfected sexual partner. More than half of women 312(63.4%) believed that a person with HIV will always show signs and symptoms, and about two hundred ninety-seven (60.4%) know that a healthy-looking but HIV-positive person can be transmitted the virus to others. The majority 336(68.3%), 341(69.3%), and 313(63.6%) women know that HIV can be transmitted during pregnancy, childbirth, and breastfeeding respectively **(Table 3).**

Table 3: HIV infection knowledge of study participants in Kobo Town and Raya Kobo Woreda, North Wollo, Ethiopia, 2020 (n= 494)

Variables	Frequency	Percent (%)
Ever heard of HIV		
Yes	492	99.6
No	2	0.40
Have only one sexual partner reduces HIV risk (n=492)		
Yes	377	76.6
No	115	23.4
HIV transmitted by mosquito bite (n=492)		
Yes	193	39.2
No	299	60.8
Condom utilization reduces HIV risk (n=492)		
Yes	355	72.2
No	137	27.8
HIV transmitted by sharing food (n=492)		
Yes	88	17.9
No	404	82.1
HIV transmitted by witchcraft (n=492)		
Yes	178	36.2
No	314	63.8
HIV infected people always show signs (n=492)		
Yes	312	63.4
No	180	36.6
Healthy looking HIV positive person can be infectious (n=492)		
Yes	297	60.4
No	195	39.6
HIV transmitted during pregnancy (n=492)		
Yes	336	68.3
No	156	31.7
HIV transmitted during delivery (n=492)		
Yes	341	69.3
No	151	30.7
HIV transmitted by breastfeeding (n=492)		

Yes	313	63.6
No	179	36.4
There is special drug to reduce vertical transmission of HIV (n=487)		
Yes	205	42.1
No	282	57.9

HIV: Human Immunodeficiency Virus

5.1.3. Clinical characteristics

From a total of 494 pregnant women, twenty-six (5.3%) of pregnant women have been diagnosed with sexually transmitted infections, of these, fifteen (3%) were women been diagnosed with bad-smelling vaginal discharge, and eleven (2.2%) had been diagnosed with a genital ulcer or sore. A total of twenty-nine (5.9%) participant partners were infected with sexually transmitted infections, of these eighteen (3.6%) partners had an abnormal urethral discharge, and eleven (2.2%) had a genital ulcer or sore **(Table 4).**

Table 4: Clinical characteristics of the study participants in Kobo Town and Raya Kobo Woreda, North Wollo, Ethiopia, 2020 (n= 494)

Variables	**Frequency**	**Percent (%)**
Ever diagnosed with STI		
Yes	23	4.70
No	471	95.3
Had a bad smelling vaginal discharge		
Yes	15	3.00
No	479	97.0
Had a genital ulcer or sore		
Yes	11	2.20
No	483	97.8
Has had an STI		
Yes	26	5.30
No	468	94.7
Partner ever been diagnosed with STI		
Yes	21	4.30
No	473	95.7
Partner had urethral discharge		
Yes	18	3.60
No	476	96.4
Partner had genital ulcer or sore		
Yes	11	2.20
No	483	97.8
Partner had STI		
Yes	29	5.90
No	465	94.1

STI: Sexually Transmitted Infections

5.1.4. Sexual and behavioral characteristics

The majority of 346(70.0%) of pregnant women in the study were reported to have been drinking alcohol. Most participants 147(42.5%) drink alcohol less than once a week and nearly one-fourth (24.8%) of participants drank alcohol almost every day. More than three-quarters of the participants 375(82.6%) were living with their partners, and sixty-seven (13.6%) participant partners were traveled frequently to work. Only 94(19%) participants have a close knowledge of their partners' HIV status, of those who know, only 1(1.1%) participant partner had HIV. The median age of age at first sex was 16(IQR 15-18) years. Of the study participants, only 42 (8.5%) used condoms during their last sexual intercourse. Also, 4(0.8%) of the participants had sex with someone other than their partners. Thirty (6.1%) participants suspect that their partner has another sexual partner, and 10(2.0%) participant partners have another wife. Forty-nine (9.9%), 44(8.9%), and 31(6.3%) study participants had physically, emotionally, and sexually abused by their partners respectively **(Table 5).**

Table 5: Sexual and behavioral characteristics of the study participants in Kobo Town and Raya Kobo Woreda, North Wollo, Ethiopia, 2020 (n= 494)

Variables	Frequency	Percent (%)
Ever drink alcohol		
Yes	346	70.0
No	148	30.0
How often you drink alcohol (n=346)		
Almost everyday	86	24.8
At least once a week	113	32.7
Less than once a week	147	42.5
Partner living with her or not (n=454)		
Living with her	375	82.6
Staying elsewhere	79	17.4
Partner traveled for work frequently		
Yes	67	13.6
No	427	86.4
New partner in the last three months		
Yes	5	1.00
No	489	99.0
Duration of relationship		
≤1 year	62	12.6
>1 year	432	87.4
Partner ever drink alcohol		
Yes	446	90.3
No	48	9.70
How often did your partner take alcohol (n=446)		
Almost everyday	230	51.6
At least once a week	157	35.2

Less than once a week	59	13.2
Close knowledge about partner HIV status		
Yes	94	19.0
No	400	81.0
Partner HIV status (n=94)		
HIV positive	1	1.10
HIV negative	93	98.9
Age at first sex		
≤15	149	30.2
16-17	208	42.1
≥18	137	27.7
Time of last sexual intercourse.		
Days ago	77	15.6
Weeks ago	128	25.9
Months ago	289	58.5
Participants used a condom during their last sexual intercourse		
Yes	42	8.50
No	452	91.5
Had sex with other than their partner		
Yes	4	0.80
No	490	99.2
Partner have other wives		
Yes	10	2.00
No	484	98.0
Suspect their partner with other sexual partner		
Yes	30	6.10
No	464	93.9
Emotionally abused		
Yes	49	9.90
No	445	90.1
Physically abused		
Yes	44	8.90
No	450	91.1
Sexually abused		
Yes	31	6.30
No	463	93.7

HIV: Human Immunodeficiency Virus

5.2. HIV status of the pregnant women after re-testing

From a total of 494 pregnant women who were screened and reported negative for HIV at first ANC, six (1.2%) were HIV seropositive during retesting.

5.3. Factors associated with HIV seroconversion

5.3.1. Result of bivariate analysis

On bivariate logistic regression being single, a participant had STI, participant partner had STI, participants' partners reported travel history for work frequently, suspect their partners had other

sexual partners, and participants who are sexually abused by their partners were significantly associated with HIV seroconversion. Among socio-demographic factors, single women were seven times more likely to seroconvert than married once [COR=7.03; 95% CI (1.241, 39.853)]. Related to clinical factors, participants with a reported history of STI were more than nine times more likely to seroconvert than those who had not STI [COR=9.67; 95% CI (1.686, 55.420)]. Similarly, participants' partners with a reported history of STI were more than eight times more likely to seroconvert than partners without STI [COR=8.54; 95% CI (1.497, 48.696)]. Regarding sexual and behavioral factors, participants' partners reported travel history for work frequently were more than six times more likely to seroconvert than participant partners do not travel for work frequently [COR=6.62; 95% CI (1.309, 33.535)]. Those pregnant women who suspected their partners have other sexual partners were eight times more likely to seroconvert than pregnant women who did not suspect their partners have other sexual partners [COR=8.21; 95% CI (1.442, 46.787)]. Participants sexually abused by their partner were more than seven times more likely to seroconvert than those with no reported claim of sexual abuse by their respective partner [COR=7.91; 95% CI (1.391, 45.014)].

5.3.2. Result of multivariable analysis

Analysis in the multi-variable logistics regression model included all variables in the bivariate logistic regression with a p-value < 0.25. Accordingly marital status, gestational age at booking, the status of pregnancy, participants with a reported history of STI, participants' partners with a reported history of STI, participants' partners reported travel history for work frequently, duration of the relationship, participants who suspected their partner have other sexual partners, and participants sexually abused by their partner were analyzed in the final multivariable logistic regression model. After controlling the effect of other predictor variables, the multivariable logistic regression analysis showed participants with a reported history of STI, participants' partners reported travel history for work frequently and participants sexually abused by their partner were significantly associated with HIV seroconversion (p-value < 0.05). Pregnant women with a reported history of STI 7.9 higher odds [AOR=7.98; 95% CI (1.206, 52.818)] of HIV seroconversion than pregnant women without a reported history of STI. The odds of participants' partners reported travel history for work frequently were significantly higher than those partners do not report travel history [AOR=6.00; 95% CI (1.093, 32.993)]. Sexually abused pregnant

women 7.8 higher odds [AOR=7.82; 95% CI (1.194, 51.243)] of HIV seroconversion than those with no reported claim of sexual abuse by their respective partner **(Table 6).**

Table 6: factors associated with HIV seroconversion in Kobo Town and Raya Kobo Woreda, North Wollo, Ethiopia, 2020 (n= 494)

	HIV seroconversion			
Variable	**No (%)**	**Yes (%)**	**COR(95%CI)**	**AOR(95%CI)**
Marital status				
Married	450(99.1)	4(0.9)	1	1
Separated/divorced	6(100.0)	0(0.0)	-	-
Single	32(94.1)	2(5.9)	7.03(1.24, 39.85) *	2.78(0.31, 25.21)
GA at booking				
≤10 week	89(97.8)	2(2.2)	1	1
11-20 week	298(99.3)	2(0.7)	0.30(0.04, 2.15)	0.25(0.03, 2.04)
≥21 week	101(98.1)	2(1.9)	0.88(0.12, 6.39)	0.48(0.04, 5.30)
Status of pregnancy				
Planned	413(99.0)	4(1.0)	1	1
Unplanned	75(97.4)	2(2.6)	2.75(0.49, 15.30)	4.26(0.61, 29.86)
Had STI				
No	464(99.1)	4(0.9)	1	1
Yes	24(92.3)	2(7.7)	9.67(1.69, 55.42) *	7.98(1.21, 52.82)*
Partner had STI				
No	461(99.1)	4(0.9)	1	1
Yes	27(93.1)	2(6.9)	8.54(1.50, 48.70)*	5.05(0.62, 40.84)
Partner travelled for work frequently				
No	424(99.3)	3(0.7)	1	1
Yes	64(95.5)	3(4.5)	6.62(1.31, 33.53)*	6.00(1.09, 32.99)*
Duration of relationship				
> 1 year	428(99.1)	4(0.9)	1	1
≤ 1 year	60(96.8)	2(3.2)	3.57(0.64, 19.89)	0.86(0.03, 22.19)
Suspect partner with other sexual partner				
No	460(99.1)	4(0.9)	1	1
Yes	28(93.3)	2(6.7)	8.21(1.44, 46.79)*	1.78(0.16, 20.45)
Sexually abused				
No	459(99.1)	4(0.9)	1	1
Yes	29(93.5)	2(6.5)	7.91(1.39, 45.01)*	7.82(1.19, 51.24)*

STI: Sexually Transmitted Infections; *P value < 0.05; COR: crude odds ratio; AOR: adjusted odds ratio; CI: Confidence Interval; 1: Reference category

6. DISCUSSION

HIV-infected infants may suffer ill health and mortality, especially in the absence of diagnosis and treatment. Therefore preventing vertical transmission through effective PMTCT intervention is an acceptable way of ensuring HIV-free infant survival. To do so, identifying HIV seroconvert pregnant women through re-testing at least three months after an initial documented HIV test result is an imperative strategy(39, 60). This study has provided one such opportunity through repeat HIV screening.

This study documented a repeat HIV seroprevalence of 1.2% among the booked antenatal attendees who were previously HIV seronegative earlier in pregnancy. In this study, pregnant women have had a reported history of sexually transmitted infections, pregnant women partners traveling for work frequently, and pregnant women who have been sexually abused by their partners were significantly associated with HIV seroconversion.

The seroconversion rate in this study was somewhat low compared to a study conducted in other countries like 2% in Tanzania(47), 2.5% in Nigeria(40), 2.6% in Kenya(34), 3% in South Africa(13), 4% in Swaziland(11), and 17.7% in Zimbabwe(57). Nonetheless, the findings show that HIV seroconversion is still a public health problem among pregnant women and that its magnitude varies from country to country. It could be since different countries use different interventional policies to combat HIV. Plus, these studies used different sample sizes, thus resulting in the magnitude that made it different. The low seroconversion rate in this study might be differences in socio-demographic characteristics. Also, the place where the other studies conducted is in areas where HIV prevalence is high.

A low HIV seroconversion rate of 0.68% and 0.25% also reported in South Africa and Nigeria, respectively(30, 39). It could be due to the very fact that the pregnant women in these studies have received antenatal care early in pregnancy, which helps out them get health education regarding risky sexual behaviors, which in turn protect them against sexually transmitted infections, including HIV.

Single pregnant women (5.9%) in this study were more likely to seroconvert than married once (0.9%). It is consistent with a study conducted in South Africa(13) that showed single pregnant women were more likely to seroconverting during pregnancy. It explains the very fact that single women may be predisposed to have other sexual relations, which increases their chances of contracting HIV infection.

Pregnant women who have had a reported history of sexually transmitted infections in this study were significantly associated with HIV seroconversion (p=0.031). A study in Tanzania(27) also revealed pregnant women with sexually transmitted infections were significantly associated with HIV seroconversion (p<0.001). The study also showed that pregnant women partners who had sexually transmitted infections were seven-fold more likely to seroconvert than partners who had no sexually transmitted infections. This could partly be explained by the very fact that sexually transmitted infections will increase HIV susceptibility by disrupting the epithelial surface of the genital tract, thus providing an easy port of entry by activating HIV susceptibility inflammatory cells, the inflammation increases HIV shedding in the genital tract, thus the HIV infectiousness(63).

This study showed pregnant women's partner traveled for work frequently was significantly associated with HIV seroconversion (p=0.039). It also is supported by a study conducted in Tanzania(64); showed pregnant women with a mobile partner had significantly associated with HIV infection (p=0.003). This study was also supported by another author Mbena H et al**,** who showed pregnant women with a mobile partner were more likely seroconverting, though it is not statistically significant(27). This could partly be due to those men who may have to travel to work frequently are presumed to often have more sexual risk behaviors including drinking too much alcohol, having another sexual partner, and having sex with commercial sex workers putting themselves and their partners at risk for HIV infection. On the other hand, also, women with mobile partners may be presumed to have to get exposed to extramarital sex since they may be free, lonely, or facing economic hardship(57, 64).

Surprisingly, only 19 % know their partner's HIV status among seronegative pregnant women while none of the seroconvert pregnant women knows their partner's HIV status. This result is low compared to the study conducted in South Africa revealed 52% seronegative and 66% seroconvert pregnant women know their partner's HIV status(60). This can be explained by the fact that in Ethiopia the policy on partner HIV screening is not being implemented well(65). It also means that pregnant women partners do not commit to attending antenatal care. This is supported by Caroline De Schacht et al; showed fear of discrimination and/or stigma was the main barrier of male HIV testing(58).

In this study, there was only one serodiscordant couple (women HIV negative and partner HIV positive). And she was negative at retesting. It could be since the index woman might perhaps

have had used ARVs drugs and other precautionary measures, which prevented her from being infected with the virus.

In the study, only 8.5% of the participants have reportedly used condoms, while none of the seroconvert pregnant women had reportedly used condoms during pregnancy. Moodley et al(45) also had reported that only 2.8% of seroconverting pregnant women use condoms during pregnancy. Both findings suggest pregnant women who do not use condoms were more likely to seroconvert. It could be since couples usually did not use condoms: and if their partner has another sexual partner, it increases their risk of getting sexually transmitted infections, which can make them more susceptible to HIV.

This study revealed that pregnant women who suspected that their partner had another sexual partner were seven-fold more likely to seroconvert than their counterparts. Correspondingly, a study conducted in Nigeria also showed pregnant women who suspected that their partner had another sexual partner were three-fold more likely to seroconvert than their counterparts(61). The most likely scenario is that there is sexual abstinence during pregnancy by a large proportion of married women, during which their male partners are exposed to the risk of sexually transmitted infections including HIV through other sexual relationships(57).

This study showed a significant association between sexual abuse during pregnancy and HIV seroconversion ($p=0.032$). Likewise, a study conducted in Zimbabwe also revealed pregnant women who reported having been sexually abused were significantly associated with HIV seroconversion(59). It could partly be due to the very fact that sexually abused women may have forced sexual intercourse without condoms or not being able to negotiate using a condom with their partner that increases their chance of contracting HIV infection. Another study found that men who use violence against their partner were more likely to engage in high-risk sexual behavior like multiple sexual partners, condomless sex, excessive alcohol drinkers as well as intravenous drug abusers relative to non-violent men(66, 67). Biological mechanisms also are thought to play a role by indirectly increases the risk of HIV acquisition and other sexually transmitted infections through trauma to the genital tract(68).

Overall, this study highlights the benefit of repeat HIV screening strategy in late pregnancy, especially when the risk of seroconversion or new infection can not be convincingly excluded. And it will be an additional resource for our country's efforts to reduce vertical transmission of HIV.

7. STRENGTH AND LIMITATIONS OF THE STUDY

7.1. Strength of the study

- The study included both urban and rural health facilities, and also, the demographic, obstetric, clinical, and sexual behaviors of pregnant women had assessed; gives us a clear clinical picture of risk factors for HIV seroconversion.
- Besides, the data had collected by professional health care providers of pregnant women, which might have helped the pregnant women to feel at ease while collecting data on sensitive and private nature.

7.2. Limitation of the study

- The test which we used to diagnose HIV was a rapid serological test that is unable to detect the infection in the window period. It reduces the actual seroconversion rate.
- Also, the study does not tell us whether the seroconversion is due to new infection or following the window period.

With a due balance of the strengths and limitations, it is reasonable to believe that the study provides valid baseline information about HIV seroconversion among pregnant women.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1. Conclusions

The magnitude of HIV seroconversion in this study is 1.2%. This study suggests that pregnant women who were HIV negative during the first trimester of pregnancy will likely be seroconverting in the course of pregnancy. Re-screening of HIV-negative pregnant women during late pregnancy provides an opportunity to detect seroconverting pregnant women to allow the timely provision of ART prophylaxis for them and their exposed infants to prevent MTCT of HIV. In this study, pregnant women have had a reported history of STI, pregnant women partners traveling for work frequently, and sexually abused pregnant women were risk factors for HIV seroconversion. It emphasizes the need for couples counseling on safe sexual practices as well as active screening and management of STI in pregnancy to prevent HIV infection.

8.2. Recommendations

From the findings of the study, the following recommendations are given below for the concerning bodies.

- **For health care providers**
  - All health care providers working in maternal and child health clinics should empower to making re-screening pregnant women who were HIV negative during the first trimester of pregnancy three months later to detect HIV seroconverting pregnant women.
  - All health care providers should screen and manage sexually transmitted infections during pregnancy through the integration of STI management in the reproductive health clinic.
  - All health care providers should advise the HIV-negative pregnant women at booking that they are at risk of contracting HIV during pregnancy. Also should counsel them to use a condom during pregnancy to prevent horizontal transmission of HIV as post-test counseling guidance as an effective preventive measure until the HIV status of their partner is confirmed.
- **For pregnant women**

- Pregnant women should counsel, educate, and convince their partners to perform safe sexual practices like condom utilization or abstinence where feasible to reduce their risk of contracting HIV during pregnancy.
- Pregnant women should know their partners' HIV status by convincing their partners to attend an antenatal care clinic.

❖ **For stakeholders and other researchers**

- Further expanded and large scale study should undertake to understand the magnitude and factors of HIV seroconversion. Also, further study using antigen based test should employ in order to know whether the seroconversion is due to a new infection or a genuine seroconversion following the window period.

REFERENCE

1. Sidibe M. Plan towards the Elimination of New HIV Infections among Children by 2015 and Keeping Their Mothers Alive. 2015; [Available from [https://www.unaids.org/sites/default/files/media_asset/JC2774_2015ProgressReport_GlobalPlan_en.pdf] Accessed 26 August 2019.
2. World Health Organization (WHO). Mother to child transmission of HIV: Geneva: WHO. 2013; [Available from [https://www.who.int/hiv/topics/mtct/about/en/] Accessed 28 August 2019.
3. Joint United Nations Programme on HIV/AIDS (UNAIDS). UNAIDS report on the global AIDS epidemic 2013 Geneva: Joint United Nations Programme on (UNAIDS) HIV/AIDS; 2013 [Available from: [https://www.unaids.org/sites/default/files/media_asset/UNAIDS_Global_Report_2013_en_1.pdf] Accessed 17 August 2019.
4. Joint United Nations Programme on HIV/AIDS (UNAIDS). Miles to go: global AIDS update 2018 Geneva: UNAIDS; 2018 [Available from: [https://www.unaids.org/en/20180718_GR2018] Accessed 27 August 2019.
5. United Nations Children's Fund (UNICEF). Children and AIDS Statistical Update: UNICEF; 2017 [Available from: [https://data.unicef.org/resources/children-aids-statistical-update/] Accessed 05 August 2019.
6. Joint United Nations Programme on (UNAIDS) HIV/AIDS. UNAIDS DATA: UNAIDS; 2017 [Available from: [http://www.unaids.org/en/resources/documents/2017/2017_data_book] Accessed 13 August 2019.
7. Johnson LF, Stinson K, Newell M-L, Bland RM, Moultrie H, Davies M-A, et al. The contribution of maternal HIV seroconversion during late pregnancy and breastfeeding to mother-to-child transmission of HIV. Journal of AIDS 2012;59(4):417-25.
8. World Health Organization (WHO). Consolidated guidelines on HIV testing services.m5Cs: consent, confidentiality, counselling, correct results and connection Geneva, Switzerland: WHO Press; 2015 [Available from: [https://apps.who.int/iris/handle/10665/179870] Accessed 09 August 2019.
9. World Health Organization (WHO). Programmatic update: Use of antiretroviral drugs for treating pregnant women and preventing HIVninfection in infants. Executive summary. Geneva: World Health Organization; 2017 [Available from: [http://www.who.int/hiv/PMTCT_update.pdf] Accessed 03 August 2019.
10. Federal Ministry of Health (FMOH) Nigeria. Nigerian National Guidelines on Prevention of MotherToChild Transmission (PMTCT) of HIV. Abuja, Nigeria: FMOH; 2010; [Available from [https://aidsfree.usaid.gov>files>tx_nigeria_pmtct_2010.pdf]; [Accessed 16 September 2019].
11. Kieffer MP, Nlabhatsi B, Hoffman H, Mahdi M, Kudiabor K, Wilfert C ea. Repeat HIV testing in labour and delivery as a standard of care increases ARV provision for women who

seroconvert during pregnancy. Program and abstracts of the 17th Conference on Retroviruses and Opportunistic Infections (CROI);. San Francisco, California. 2010;Abstract 156.
12. World Health Organization (WHO). WHO Global Programme on AIDS 1991: Operational characteristics on commercially available assays to detect antibodies to HIV1 and/or HIV2 in human sera. Report 4 Geneva1991 [Available from: http://apps.who.int/iris/handle/10665/65977 Accessed 26 July 2019.
13. Moodley D, Esterhuizen TM, Pather T, Chetty V, Ngaleka L. High HIV incidence during pregnancy: compelling reason for repeat HIV testing. AIDS (London, England). 2009;23(10):1255-9.
14. Federal Ministry of Health (FMOH) Ethiopia. National consolidated guidelines for comprehensive HIV prevention, care and treatment. Addis Ababa: FMOH; 2018; [Available from [https://www.afro.who.int>files> national comprehensive hiv care guideline 2018 pdf] [Accessed 23 August 2019].
15. Joint United Nations Programme on HIV/AIDS (UNAIDS). the global impact of HIV and AIDS: UNAIDS; 2019 [Available from: [https//www.hiv.gov/hiv-basics/overview/data-and-trends/global-statistics] Accessed 01 September 2019.
16. World Health Organization (WHO). HIV/AIDS Fact Sheet Geneva: WHO; 2016 [Available from: [http://www.who.int/mediacentre/factsheets/fs360/en/] Accessed 21 August 2019.
17. Central Statistical Agency (CSA), [Ethiopia], and, ICF. Ethiopia Demographic and Health Survey 2016; Addis Ababa, Ethiopia, and Rockville, Maryland, USA: CSA and ICF. 2016; [Available from [http://dhsprogram.com>pubs>pdf] [Accessed 05 September 2019].
18. Federal Ministry of Health (FMOH) Ethiopia. HIV Prevention in Ethiopia National Road Map. Addis Ababa: Federal Minstry of Health; 2018; [Available from [https://ethiopia.unfpa.org/sites/default/files/pub-pdf/HIV%20Prevention%20in%20Ethiopia%20National%20Road%20Map%202018%20-%202020%20FINAL_FINAL.pdf]. Accessed 03 September 2019.
19. Federal Ministry of Health (FMOH) Ethiopia. Guidelines For Prevention of Mother-to-Child Transmission of HIV In Ethiopia Addis Ababa: Ethiopian Federal Ministry of Health; 2010 [Available from: [https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---ilo_aids/documents/legaldocument/wcms_125389.pdf] Accessed 15 August 2019.
20. Federal Ministry of Health (FMOH) Ethiopia. Ethiopia population-based HIV impact assessment Addis Ababa: FMOH; 2017-2018 [Available from: [https://phia.icap.columbia.edu/wp-content/uploads/2018/12/3511%E2%80%A2EPHIA-Summary-Sheet_v30.pdf] Accessed 30 July 2019.
21. Geremew D, Tajebe F, Ambachew S, Endalamaw A, Eshetie S. Seroprevalence of HIV among pregnant women in Ethiopia: a systematic review and meta-analysis. BMC Res Notes. 2018;11(1):908-.
22. Kassa GM. Mother-to-child transmission of HIV infection and its associated factors in Ethiopia: a systematic review and meta-analysis. BMC Infectious Diseases. 2018;18(1):216.

23. Drake AL, Wagner A, Richardson B, John-Stewart G. Incident HIV during Pregnancy and Postpartum and Risk of Mother-to-Child HIV Transmission: A Systematic Review and Meta-Analysis. PLoS Med. 2014;11(2):e1001608.
24. World Health Organisation (WHO). New Data on the Prevention of Mother to Child Transmission of HIV and their Policy Implications. WHO Technical consultation on behalf of the UNFPA/UNICEF/ WHO/UNAIDS Inter-Agency Task Team on Mother to Child Transmission of HIV Geneva: World Health Organisation; 2001 [updated Oct 11-13th. Available from: [https://apps.who.int/iris/handle/10665/66851] Accessed 29 July 2019.
25. Sheffield JS, Wendel GD, McIntire DD, Norgard MV. The Effect of Progesterone Levels and Pregnancy on HIV-1 Coreceptor Expression. Reprod Sci Reproductive Sciences. 2009;16(1):20-31.
26. Onakewhor JU, Olagbuji BN, Ande AB, Ezeanochie MC, Olokor OE, Okonofua FE. HIV-AIDS related maternal mortality in Benin City, Nigeria. Ghana medical journal. 2011;45(2):54-9.
27. Mbena H, Seni J, Kajura A, Matovelo D, Kihunrwa A. Human Immunodeficiency Virus Seroconversion and Associated Risk Factors among Pregnant Women Delivering at Bugando Medical Center in Mwanza, Tanzania. Annals of medical and health sciences research. 2014;4(5):733-7.
28. Nyoyoko NP, Umoh AV. The prevalence and determinants of HIV seroconversion among booked ante natal clients in the University of Uyo teaching hospital, Uyo Akwa Ibom State, Nigeria. The Pan African medical journal. 2016;25:247-8.
29. Machekano R, Tiam A, Kassaye S, Tukei V, Gill M, Mohai F, et al. HIV incidence among pregnant and postpartum women in a high prevalence setting. PLoS One. 2018;13(12):e0209782.
30. Fatti G, Shaikh N, Jackson D, Goga A, Nachega JB, Eley B, et al. Low HIV incidence in pregnant and postpartum women receiving a community-based combination HIV prevention intervention in a high HIV incidence setting in South Africa. PLoS One. 2017;12(7):e0181691.
31. Ukaire BC, Agboghoroma CO, Durojaiye KW. The Prevalence of Human Immunodeficiency Virus Infection among Pregnant Women in Labour with Unknown Status and those with Negative Status Early in the Index Pregnancy in a Tertiary Hospital in Nigeria. African journal of reproductive health. 2015;19(3):137-43.
32. Kinuthia J, Drake AL, Matemo D, Richardson BA, Zeh C, Osborn L, et al. HIV acquisition during pregnancy and postpartum is associated with genital infections and partnership characteristics. AIDS (London, England). 2015;29(15):2025-33.
33. Egbe TO, Tazinya R-MA, Halle-Ekane GE, Egbe E-N, Achidi EA. Estimating HIV Incidence during Pregnancy and Knowledge of Prevention of Mother-to-Child Transmission with an Ad Hoc Analysis of Potential Cofactors. J Pregnancy. 2016:7397695-6.
34. Kinuthia J, Kiarie JN, Farquhar C, Richardson B, Nduati R, Mbori-Ngacha D, et al. Cofactors for HIV-1 incidence during pregnancy and postpartum period. Current HIV research. 2010;8(7):510-4.

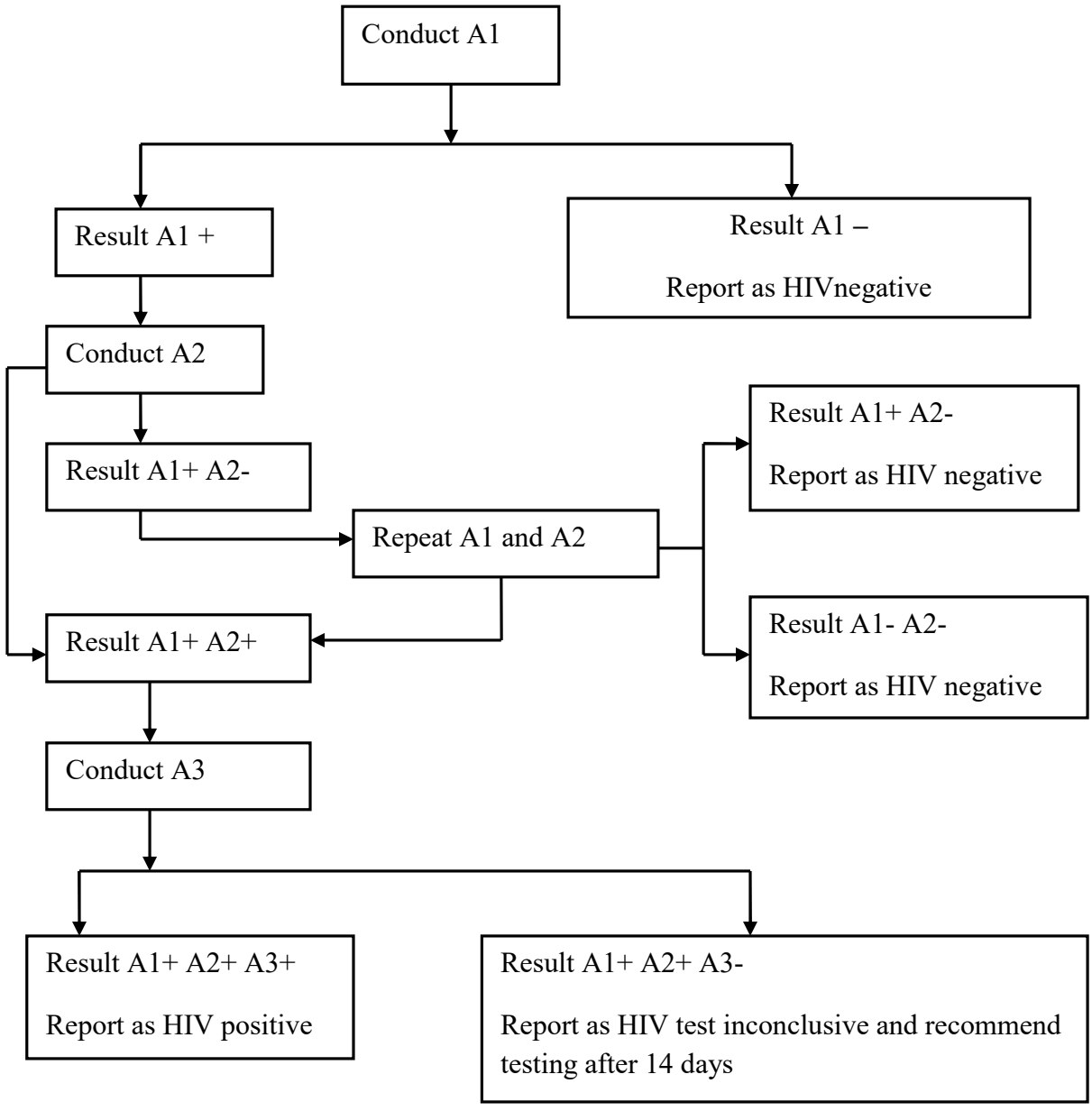
35. Gray RH, Li X, Kigozi G, Serwadda D, Brahmbhatt H, Wabwire-Mangen F, et al. Increased risk of incident HIV during pregnancy in Rakai, Uganda: a prospective study. The Lancet. 2005;366(9492):1182-8.
36. UNAIDS AIDSinfo. Geneva: Joint United Nations Programme on HIV/AIDS (UNAIDS). 2017. [Available from[http://aidsinfo.unaids.org/]. Accessed 21, September 2019.
37. UNITED NATION. Transforming our world: The 2030 agenda for sustianable development. 2015: Available from [https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf]. Accessed 28 July 2019.
38. Mofenson LM. Risk of HIV Acquisition During Pregnancy and Postpartum: A Call for Action. The Journal of Infectious Diseases. 2018;218(1):1-4.
39. Onakewhor JE, Osemwenkha A, Ovbagbedia O, Sadoh W, Abimiku A, Charurat M, et al. Appraisal of repeat intrapartum human immunodeficiency virus screening in a prevention of mother-to-child transmission program in Nigeria. J HIV Hum Reprod Journal of HIV and Human Reproduction. 2013;1(2):70.
40. Eka P, Ojabo A, Hembah-Hilekaan S, Utoo B, Audu O, Ben-Ameh J. HIV infection: Prevalence and seroconversion in a cohort of antenatal attendees at the Benue State University Teaching Hospital, Makurdi, Nigeria. Archives of International Surgery. 2016;6(4):206-9.
41. Kissin DM, Akatova N, Rakhmanova AG, Vinogradova EN, Voronin EE, Jamieson DJ, et al. Rapid HIV testing and prevention of perinatal HIV transmission in high-risk maternity hospitals in St. Petersburg, Russia. American journal of obstetrics and gynecology. 2008;198(2):1-7.
42. Bernasconi D, Tavoschi L, Regine V, Raimondo M, Gama D, Sulgencio L, et al. Identification of recent HIV infections and of factors associated with virus acquisition among pregnant women in 2004 and 2006 in Swaziland. Journal of Clinical Virology. 2010;48(3):180-3.
43. Rogers AJ, Akama E, Weke E, Blackburn J, Owino G, Bukusi EA, et al. Implementation of repeat HIV testing during pregnancy in southwestern Kenya: progress and missed opportunities. J Intern AIDS Soc Journal of the International AIDS Society. 2017;20(4):e25036.
44. Brubaker S, Bukusi E, Odoyo J, Achando J, Okumu A, Cohen C. Pregnancy and HIV transmission among HIV-discordant couples in a clinical trial in Kisumu, Kenya. HIV Medicine. 2011;12(5):316-21.
45. Moodley D, Esterhuizen T, Reddy L, Moodley P, Singh B, Ngaleka L, et al. Incident HIV Infection in Pregnant and Lactating Women and Its Effect on Mother-to-Child Transmission in South Africa. The Journal of Infectious Diseases. 2011;203(9):1231-4.
46. Qolohle DC, Hoosen AA, Moodley J, Smith AN, Mlisana KP. Serological screening for sexually transmitted infections in pregnancy: is there any value in re-screening for HIV and syphilis at the time of delivery? Genitourinary Medicine. 1995;71(2):65-7.
47. Lawi JDT, Mirambo MM, Magoma M, Mushi MF, Jaka HM, Gumodoka B, et al. Sero-conversion rate of Syphilis and HIV among pregnant women attending antenatal clinic in Tanzania: a need for re-screening at delivery. BMC Pregnancy and Childbirth. 2015;15(1):3.

48. Keating MA, Hamela G, Miller WC, Moses A, Hoffman IF, Hosseinipour MC. High HIV Incidence and Sexual Behavior Change among Pregnant Women in Lilongwe, Malawi: Implications for the Risk of HIV Acquisition. PLoS One. 2012;7(6):e39109.
49. justin Mandala TB, Kwasi Torpey. HIV Retesting of HIV-Negative Pregnant Women in the Context of Prevention of Mother-to-Child Transmission of HIV in Primary Health Centers in Rural Zambia: What Did We Learn? Journal of the International Association of Providers of AIDS Care. 2019;18(1):1-6.
50. Sagay AS, Musa J, Adewole AS, Imade GE, Ekwempu CC, Kapiga S, et al. Rapid HIV Testing and Counselling in Labour in a Northern Nigeria Setting. AFRICAN JOURNAL OF REPRODUCTIVE HEALTH. 2006;10(1):76-80.
51. Umeononihu O, Ikechebelu J, Mbachu I, Okonkwo JN, Udigwe G. The prevalence of HIV sero-positivity in late pregnancy among antenatal attendees with seronegative status in first half of pregnancy in Nnewi, South East Nigeria. J HIV Hum Reprod Journal of HIV and Human Reproduction. 2013;1(1):25.
52. De Schacht C, Mabunda N, Ferreira OC, Ismael N, Calú N, Santos I, et al. High HIV incidence in the postpartum period sustains vertical transmission in settings with generalized epidemics: a cohort study in Southern Mozambique BMC Infectious Diseases. 2014;17(1):18808-9.
53. Morrison CS, Wang J, Van Der Pol B, Padian N, Salata RA, Richardson BA. Pregnancy and the risk of HIV-1 acquisition among women in Uganda and Zimbabwe. AIDS AIDS. 2007;21(8):1027-34.
54. Reid SE, Dai JY, Wang J, Sichalwe BN, Akpomiemie G, Cowan FM, et al. Pregnancy, contraceptive use, and HIV acquisition in HPTN 039: relevance for HIV prevention trials among African women. Journal of acquired immune deficiency syndromes (1999). 2010;53(5):606-13.
55. Wand H, Ramjee G. Combined Impact of Sexual Risk Behaviors for HIV Seroconversion Among Women in Durban, South Africa: Implications for Prevention Policy and Planning. AIDS and Behavior. 2011;15(2):479-86.
56. Chetty T, Vandormael A, Thorne C, Coutsoudis A. Incident HIV during pregnancy and early postpartum period: a population-based cohort study in a rural area in KwaZulu-Natal, South Africa. BMC Pregnancy and Childbirth. 2017;17(1):247-8.
57. Mbizvo MT, Kasule J, Mahomed K, Nathoo K. HIV-1 seroconversion incidence following pregnancy and delivery among women seronegative at recruitment in Harare, Zimbabwe. The Central African journal of medicine. 2001;47(5):115-8.
58. De Schacht C, Hoffman HJ, Mabunda N, Lucas C, Alons CL, Madonela A, et al. High Rates of HIV Seroconversion in Pregnant Women and Low Reported Levels of HIV Testing among Male Partners in Southern Mozambique: Results from a Mixed Methods Study. PLoS One. 2014;9(12):e115014.
59. Munjoma MW, Mhlanga FG, Mapingure MP, Kurewa EN, Mashavave GV, Chirenje MZ, et al. The incidence of HIV among women recruited during late pregnancy and followed up for six years after childbirth in Zimbabwe. BMC Public Health. 2010;10(1):667-8.

60. Dinh T-H, Delaney KP, Goga A, Jackson D, Lombard C, Woldesenbet S, et al. Impact of Maternal HIV Seroconversion during Pregnancy on Early Mother to Child Transmission of HIV (MTCT) Measured at 4-8 Weeks Postpartum in South Africa 2011-2012: A National Population-Based Evaluation. PLoS One. 2015;10(5):e0125525.
61. Etukumana E, Thacher T, Sagay A. HIV risk factors among pregnant women in a rural Nigerian hospital. West Indian Medical Journal. 2010;59(4):424-33.
62. United Nations Children's Fund(UNICF). UNICEF Supply Catalogue. UNICEF 2018 [Available from [https://supply.unicef.org/] Accessed 05 August 2019.
63. Fox J, Fidler S. Sexual transmission of HIV-1. Antiviral research. 2010;85(1):276-85.
64. Msuya SE, Mbizvo E, Hussain A, Uriyo J, Sam NE, Stray-Pedersen B. HIV among pregnant women in Moshi Tanzania: the role of sexual behavior, male partner characteristics and sexually transmitted infections. AIDS Res Ther. 2006;3:27-.
65. Balcha TT, Lecerof SS, Jeppsson AR. Strategic Challenges of PMTCT Program Implementation in Ethiopia. Journal of the International Association of Physicians in AIDS Care. 2011;10(3):187-92.
66. Mumtaz GR, Weiss HA, Thomas SL, Riome S, Setayesh H, Riedner G, et al. HIV among people who inject drugs in the Middle East and North Africa: systematic review and data synthesis. PLoS Med. 2014;11(6):e1001663.
67. Campbell JC, Baty ML, Ghandour RM, Stockman JK, Francisco L, Wagman J. The intersection of intimate partner violence against women and HIV/AIDS: a review. Int J Inj Contr Saf Promot. 2008;15(4):221-31.
68. Mitchell J, Wight M, Van Heerden A, Rochat TJ. Intimate partner violence, HIV, and mental health: a triple epidemic of global proportions. International review of psychiatry (Abingdon, England). 2016;28(5):452-63.

ANNEX

Annex 1: Recommended HIV testing strategy for Ethiopia



Annex 2: Information Sheet English version

The title of the research proposal: HIV seroconversion and associated factors among booked seronegative pregnant women in Kobo Town and Raya Kobo Woreda, North Wollo, Ethiopia: Institution based cross-sectional study.

Introduction: Vertical transmission of HIV is still a major health problem in the globe particularly in sub-Saharan Africa including Ethiopia. The infection is usually not well detected by rapid serological tests to those women in the window period and for those women who have newly acquired HIV infection, because of low levels of HIV antibodies if the test is offered only once at their first ANC. HIV seronegative women in the early stage of pregnancy are at continued risk of seroconverting throughout pregnancy. Repeat HIV tests during late pregnancy allow identifying women who have to seroconvert after having a negative test result and to initiate ART to prevent MTCT of HIV.

Purpose: This study aims to identify seroconvert pregnant women after having a negative test result 12 weeks after the first test. This research to undertake is in partial fulfillment of the requirements for the degree of master in public health.

Procedure and participation: this study used to conduct a cross-sectional study that pregnant women will ask at once in the field. The data will be collected by well-trained health professional data collectors along with the client's corresponding card review. The questionnaire is based on the face-to-face interview and the HIV retesting procedure will be conducted. The pregnant women will be asked to participate in this study because the trustful information that will be provided is presumed to ensuring a significant understanding of the proposed subject matter. Participants will be asked about their socio-demographic, sexual, and behavioral related questions that are very important for the fulfillment of the research.

Confidentiality: The information package will be kept confidential in that any of their identifications including name or phone numbers will not be recorded on the study rather codes will get assigned to their data for processing. Moreover, the original data will be kept in cabinets until the full processing gets conducted. The use of this information is not exposed to any unethical reason without the knowledge of the participants.

Benefit: This research has a benefit to the participant and their unborn babies to facilitate initiation of ART and other interventions for HIV positive pregnant women after retesting to

avoid MTCT of HIV. Besides, it will have a significant benefit to different stakeholders for designing strategies that prevent and eliminate MTCT of HIV. Focused (targeted) literacy information related to HIV will be provided for the participants after gathering the data.

Risk: The targeted participants may lose their time during the interview and the blood provides for the HIV test. Beyond this background, this study does not have any inhumane treatment of the participants, any physical harm, social discrimination, psychological trauma, and economic loss.

Inducement, incentive, and Compensation: This study process has no any form of inducement, coercion, and does not bring any risks that incur compensation.

Results dissemination: The researcher is responsible for the dissemination of the findings that will be fully accountable to provide feedback to the concerned health departments and districts in the area. Moreover, the presentations at national, international scientific conferences and publications in reputable scientific journals of the findings will be pursued.

Freedom to withdraw: If the participants do not want to cooperate in the study, they will have the full right to withdraw from the study any time that they wish. This would not affect at all their health benefits or other administrative effects that they get from the health facilities.

Person to Contact: The participant has the right to cross-check the information which might not be clear about the study before and/or during the study and can contact the principal investigator via the addresses provided below.

Principal Investigator: Dawit Sisay

Phone Number: +251913325631

E-mail: dawitsisaydevdas@gmail.com

Primary advisor: Mulugeta Betre Gebremariam (Assoc Prof, -Dr)

Phone Number: +251920812800

E-mail: fbbms@yahoo.com

Annex 3: Consent Form English version

Hello

I am _____ I am working with Dawit Sisay who is doing research as partial fulfillment for the requirement of MPH at AAU. For his research, he will be conducting a study of HIV seroconversion and associated factors among booked seronegative pregnant women. He humbly requests your kind permission to use the data that he will collect from this specific study site. The purpose of the study is to identify seroconvert pregnant women to prevent the mother-to-child transmission of HIV. In this regard, the questions are mainly concerned with socio-demographics, sexual and behavioral, and other related questions that are crucial for the proposed research. HIV tests will be conducted to know the current HIV status. The interview will be taking at least 30 minutes. Participation in this research is made strictly confidential by using only code numbers and locking the data. You do not have to answer any question that does not want to answer and can ask any question that is not clear to you. Also, you can withdraw at any time after you get involved in the study.

A. Would you be willing to participate? 1. Yes, 2. No

Annex 4: English version questionnaire

Questionnaire ID_____

Name of the health facility_____

Date of interview_____

Part 1: General background information (socio demographic characteristics)

No	Questions	Coding categories	Remark
101	How old are you?	Age in completed years_____	
102	Your usual residence?	Urban……....….....…1 Rural……....2	
103	What is your marital status now?	Never married……..1 Married……2 Widowed…….....3 Divorced……..4 Separated…….....5	
104	What is your religion?	Orthodox…….……1 Muslim …….....2 Protestant…..……...3 Catholic …….....4 Traditional…..…..….....5 Other…….……..88	
105	Have you ever attended school?	Yes …….....1 No …….....2→	107
106	What is the highest level of school (education) you have attended?	Primary school ……..……1 Secondary school ……...2 Technical/Vocational....…..3 Higher education. ……4	
107	What is your main occupation?	Government employee……1 Private employee ……...2 Merchant…….....3 House wife…….…..…....4 Farmer…….……5 Daily laborer…….…….....6 Unemployed…..…….....7 Other…….……88	
108	How old is your husband/partner?	Age in completed Years ____	
109	Did your husband/partner ever attend school?	Yes ……..……...……1 No ……..…….….....2→	111

110	What was the highest level of school (education) he had attended?	Primary school ……..1 Secondary school…....…...2 Technical/Vocational.....….3 Higher education ……..4 Don't know……88	
111	What is your husband/partner's main occupation?	Government employee…….1 Private employee …….……2 Merchant……..3 Farmer…….……4 Daily laborer…….…....5 Unemployed…….....6 Other……...……88	
112	Household's average monthly income(Birr)	Birr _____	

Part 2: Obstetric related questions

201	During your life, how many times have you become pregnant including the current pregnancy (including a pregnancy that was miscarried/ aborted, or ended in a stillbirth)? (verify her answer from the card where appropriate)	Times_____	
202	During your life, how many times have you given live birth? (I mean, to a child who ever breathed or cried or showed other signs of life-even if he or she lived only a few minutes or hours) (verify her answer from the card where appropriate)	Times_____	
203	How many weeks of pregnant were you when you first received antenatal care for this pregnancy? (verification from ANC card)	Weeks_____	
204	Women can sometimes get pregnant without planning or needing to get pregnant; Did you plan this pregnancy?	Yes……1 No…….2 Uncertain…….88	

Part 3: MTCT of HIV knowledge related questions

301	Have you ever heard of HIV?	Yes……..…..……1 No……..…..….2 →	Part 4
302	Can people reduce their chance of getting HIV by having just one uninfected sex partner who has no other sex partners?	Yes……..1 No……2 Don't know……..88	
303	Can people get HIV from a mosquito bite?	Yes……..1 No……...2 Don't know…….88	
304	Can people reduce their chance of getting HIV by using a condom every time they have sex?	Yes……..1 No……...2 Don't know…….....88	
305	Can people get HIV by sharing food with a person who has HIV?	Yes…….1 No……..2 Don't know…….88	
306	Can people get HIV because of witchcraft or other supernatural means?	Yes…….....1 No……..2 Don't know……88	
307	Do HIV-infected people always show signs?	No (Can look healthy)…...1 Yes (Always show signs)...2 Don't know……..…88	
308	Are healthy-looking infected men infectious?	Yes…….1 No……..2 Don't know……88	
309	Can HIV be transmitted from a mother to her baby: a) During pregnancy? b) During delivery? c) By breastfeeding?	YES NO DK a)……1 2 88 b)…….....1 2 88 c)……1 2 88	
CHECK 309 AT LEAST ONE YES ↓		OTHER →	Part 4
310	Are there any special drugs that can give to a woman infected with HIV to reduce the risk of transmission to the baby?	Yes……..1 No……...2 Don't know…….88	

Part 4: Clinical related questions

401	Have you ever been diagnosed with a sexually transmitted disease?	Yes……..1 No……...2 Don't know……88	

402	Sometimes women experience a bad-smelling abnormal genital discharge. Have you had a bad-smelling abnormal genital discharge?	Yes…….1 No……..2 Don't know……88	
403	Sometimes women have a genital sore or ulcer. Have you had a genital sore or ulcer?	Yes…….1 No……..2 Don't know……88	
404	Check for 401, 402, and 403, Has had an infection?	Yes…….1 No……..2 Don't know……88	
405	Has your husband / partner been diagnosed with sexually transmitted disease?	Yes…….1 No……..2 Don't know……..88	
406	Sometimes men experience an abnormal discharge from their penis. Has your husband/partnerhad an abnormal discharge from his penis?	Yes…….1 No……..2 Don't know……....88	
407	Sometimes men have a sore or ulcer near their penis. Have your husband/partner had a sore or ulcer on or near his penis?	Yes…….1 No……...……...2 Don't know……88	
408	Check 405, 406, and 407, Has a husband/partner had an infection?	Yes…….1 No……...……...2 Don't know……88	

Part 5: Sexual and behavioral related questions

501	Have you ever taken a drink that contains alcohol(Tella/Tegii/Areke/Beer/Wine, etc...)?	Yes……1 No…….2 ⟶	504
502	How often did you take a drink that contains alcohol?	Almost every day…….....1 At least once a week……..2 Less than once a week…..3 At least once a month…....4	
503	Is your husband/partner living with you now or is he staying elsewhere? (married only)	Living with her……1 Staying elsewhere…….....2	
504	Does your husband/partner travel for work frequently?	Yes…….……..1 No……..……...…2	
505	Do you have a new husband/partner in	Yes……..……...1	

	the last three months?	No……..……2	
506	How long have you been together with your husband/partner?	_____	
507	Has your husband/partner ever taken a drink that contains alcohol (Tella/Tegii/Areke/Beer/Wine, etc...)?	Yes……1 No…….2 Don't know ……88 →	511
508	How often did your husband/partner take a drink that contains alcohol?	Almost every day……..1 At least once a week……..2 Less than once a week…....3 At least once a month……4	
509	Do you have close knowledge about the HIV status of your husband/partner?	Yes……...……...1 No…….……..2 →	513
510	What is your husband/partner's HIV status?	Has HIV …….1 No HIV…….……...2	
511	Now I would like to ask some questions about sexual activity in order to gain a better understanding of some important life issues. Let me assure you again that your answers are completely confidential and will not be told to anyone. If we should come to any question that you don't want to answer, just let me know and we will go to the next question. How old were you when you had sexual intercourse for the very first time?	Age in years _____	
512	When was the last time you had sexual intercourse?	Days ago_____ Weeks ago_____ Months ago_____	
513	The last time you had sexual intercourse, was a condom used?	Yes…….....1 No……2 Uncertain…….3	
514	Apart from your husband/partner, have you had sexual intercourse with any other person?	Yes……...……1 No…….……...……2 →	518
515	In total, with how manydifferent people have you had sexual intercourse?	People_____ Don't know……88	

516	Does your husband/partner have other wives or does he lives with other women as if married?	Yes……1 No…….2 Don't know…….88	
517	Do you suspect your husband/partner has another sexual partner?	Yes…….1 No…….....2 Don't know……..88	
518	Does your husband/partner abuse you emotionally (like insults, talkdown to, threaten to harm, scream, curse you, and make you feel bad about yourself)?	Never…….…..…..1 Sometimes……..…..2 Often…….....3 Almost always……..4	
519	Does your husband/partner abuse you physically (like a hit, slapped,kicked, push you)?	Never……..……1 Sometimes…….……2 Often……..……3 Almost always.……..4	
520	Does your husband/partner abuseyou sexually (like forced to have sexual intercourse when you did not want to)?	Never…….....1 Sometimes…….....2 Often…….....3 Almost always……...4	

Part 6: HIV status of the women

601	The HIV status of the women after retesting?	HIV negative…….……1 HIV positive……..…....2	

Thank you for your time

Name of interviewer_____Signature_____

Name of supervisor_____Signature_____

አባሪ

አባሪ 1፡ለጥናት ተሳታፊዎች የሚሰጥ መረጃ

የምርምር ፕሮፖዛል ርዕስ

በኤች አይቪ ሴሮ-መለወጥ እና ለዚህም አጋላጭ ምክኒያቶች በመጀመሪያው ምርመራ ኤች አይ ቪ በደማቸው ውስጥ የሌለባቸው ነፍሰ ጡር እናቶች መካከል፤ በሰሜን ወሎ ራያ ቆቦ ወረዳ እና በቆቦ ከተማ በመንግስት ጤና ተቋማት የሚካሄድ ጥናት ።

መግቢያ፤ የኤች አይቪ ቀጥተኛ ስርጭት አሁንም በዓለም ላይ በተለይም ኢትዮጵያን ጨምሮ ከሰሃራ በታች ባሉ የአፍሪካ አገሮች ውስጥ ትልቁ የጤና ችግር ነው ። ኢንፌክሽኑ በመጀመሪያ ሶስት ወራት ውሰጥ እና በቅርቡ በተያዙት ሴቶች ላይ በሚደረገው ምርመራ በቀላሉ አይገኝም። ምክንያቱም በቅድመወሊድ ክትትል ጊዜ ምርመራው አንድ ጊዜ ብቻ ስለሚሰጥ በአነስተኛ ኤች.አይ.ቪ አንቲቦዲ ምክንያት ኢንፌክሽኑ በምርመራ ወቅት ላይገኝ ይችላል። በመጀመሪያዎቹ የእርግዝና ጊዜያቶች ኤች አይቪ በደማቸው ውስጥ ያልተገኘባቸው ነፍሰ ጡር ሴቶች ቀጣይ ባለው የእርግዝና ጊዜ ለኤች አይቪ የመለወጥ የተጋለጡ ናቸው። ስለዚህም ድጋሚ ምርመራ ማድረጉ በመጀመሪያ ምርመራ ወቅት ቫይረሱ በደማቸው ውስጥ እያለ ያልተኘባቸውን ለማግኘትና የፀረ-ኤች.አይ.ቪ መድሃኒት በማስጀመር ከእናት ወደ ልጅ ኤች አይቪ ቫይረስ እንዳይተላለፍ ማድረግ ነው።

ዓላማው፤ ይህ ጥናት በመጀመሪያው ምርመራ ኤች.አይ.ቪ ቫይረስ በደማቸው ውስጥ የሌለባቸውን ከ12 ሳምንታት በኋላ በሚደረገው ምርመራ በደማቸው ውስጥ የሚገኝባቸን ነፍሰ ጡር እናቶች ለመለየት የታለመ ነው። ይህ ጥናት የሚካሄደው የሁለተኛ ድግሪ የመመረቂያ ጽሁፍ ማሟያነት ያግዝ ዘንድ ነው።

የጥናቱ አፈጻጸምና ተሳትፎ፤ ይህ ጥናት ነፍሰ ጡር ሴቶችን አንድ ጊዜ ብቻ በመጠየቅ ይካሄዳል። መረጃው የሚሰበሰበው በሰለጠኑ የጤና ባለሞያዎች በመጠየቅ መልክ እና የታካሚውን የህክምና ካርድ መረጃን በመጠቀም ነው። መረጃው በአብዛኛው የሚሰበሰበው በቃለ-መጠይቅ መልክ ሲሆን የኤች.አይ.ቪ ምርመራ ማድረግ ሂደትም ተካቶበታል። እርጉዝ ሴቶች በዚህ ጥናት ውስጥ ለመሳተፍ ፈቃደኛነታቸውን ይጠየቃሉ ምክንያቱም የሚሰጡት የታመነ መረጃ ለጥናቱ የጎላ ሚና አለው ። ተሳታፊዎቹ ለምርምሩ መጠናቀቅ በጣም አስፈላጊ በሆኑት ማህበራዊ-ስነ-ህዝብ ፣ ወሲባዊ እና ተዛማጅ ባህርይ ጥያቄዎች ይጠየቃሉ ።

ምስጢራዊነት፣ የምስጥር አጠባበቅ፤ የሚሰጡን ማናቸዉም መረጃዎች ምስጢሩ የተጠበቀ ለማድረግ የግል መግለጫ የሆኑት ስምዎትንና ስልክ ቁጥሮትን ሳይመዘገብ በሚሰጦት መለያ መሰረት ተተንትኖ ማንነቶን በማይገልፅ መልኩ ብቻ ይሰራጫል። በተጨማሪም መረጃዉ ከአጥኝዎች ዉጭ ማንም በማይደርስበት ቦታ ተቆልፎ ይቀመጣል። የሚሰጡንን መረጃ ከጥናቱ አላማ ዉጪ ማዋል የጥናት ስነ-ምግባር ስላልሆነ ለሌላ ጉዳይ አይዉልም።

ጥቅም፤ የኤች አይቪ በሽታን ለመከላከል በድጋሚ ምርመራ ከተደረገላቸው ነፍሰ ጡር ሴቶች መካከል በደማቸው ውስጥ ቫይረሱ ያለባቸውን ነፍሰ ጡር እናቶች የፀረ-ኤች አይቪ መድሃኒት በማስጀመር ከእናት ወደ ልጅ ቫይረሱ እንዳይተላለፍ በማድረጉ ረገድ ትልቅ ሚና አለዉ። ከኤች አይቪ ጋር በተያያዘ ቫይረሱ ከእናት ወደ ልጅ እንዳይተላለፍ ለመከላከል እና ለማጥፋት ስልቶችን ለመንደፍ ለተለያዩ ባለድርሻ አካላትም ትልቅ ጠቀሜታ አለው ። በሌላ በኩል መረጃው ከተሰበሰበ በኋላ ከኤች አይ ቪ ጋር የተገናኘ መረጃ ለተሳታፊዎች ይሰጣል ።

ስጋት፤ የጥናቱ ተሳታፊዎች በቃለ መጠይቁ ወቅት መጠይቁን ለመሙላት ከ25 እስከ 30 ደቂቃ የሚወስድ ሲሆን ከዚህ በተጨማሪ ለኤች አይ ቪ ምርመራ ያገለግል ዘንድ የደም ናሙና ከጣት ላይ ይወሰዳል። ከዚህ ባሻገር ፣ ይህ ጥናት የተሳታፊዎችን ኢ-ሰብዓዊ አያያዝ ፣ ማንኛውም አካላዊ ጉዳት ፣ ማህበራዊ መድልዎ ፣ ሥነልቦናዊ ጉዳትን እና ኢኮኖሚያዊ ኪሳራ አያደርስም ።

ስጦታዎች፤ የጥናቱ ሂደት ምንም ዓይነት መደለያ ወይም ማስገደጃ ድርጊት ወይም ስጦታ የሌለዉ ከመሆኑም በላይ ጥናቱ ካሳ የሚያስከፍል ሂደትም የለዉም።

መረጃ ስለማሰራጨት፤ አጥኚዎቹ የጥናቱን ዉጤቶች የማሰራጨት ሙሉ ኃላፊነት የሚኖራቸዉ ሲሆን ለሚመለከታቸዉ ጤና መምሪያዎችና ወረዳዎች ተገቢዉን ግብረ መልስ ይሰጣሉ። በተጨማሪም የጥናቱን ዉጤቶች በተለያዩ አገርዊና አለም አቀፋዊ ሳይንሳዊ ጉባኤያት ለይ በማቅረብ እንዲሁም በተዓማኒ የጥናት መፅሄቶች ለይ በማሳተምም ይሰራጫል።

ከጥናቱ ስለማቋረጥ፤ በጥናቱ መሳተፍ ካልፈለጉ በማንኛዉም ጊዜ የማቋረጥ መብት አላቸዉ። ይህን በማድረጋቸዉም ምንም ዓይነት የጤና አገልግሎትና አሰተዳደራዊ ችግሮች አይደርስባቸዉም፤ የሚያቋርጡበትንም ምክንያት እንዲገልጹ ማንም አያስገድዳቸዉም።

መረጃ ስለመጠየቅ፤ የጥናቱ ተሳታፊዎች ማንኛዉንም ስለጥናቱ ያልገባቸዉንም ሆነ ጥናቱ የሚያካትታቸዉን ጉዳዮች የመጠየቅ መብት አላቸዉ። ስለሆነም መረጃ ከፈለጉ ከዚህ በታች በተገለጸው አድራሻ ዋና አጥኚውን ማግኘት ይችላሉ ።

ዋና ተመራማሪ፡ ዳዊት ሲሳይ

ስልክ ቁጥር፡+251-913 32 56 31

ኢሜል፡ dawitsisaydevdas@gmail.com

የመጀመሪያ አማካሪ፡ ሙሉጌታ በትረ-ገብረማርያም(ተባባሪ ፕሮፌሰር፣ዶክተር)

ስልክ ቁጥር፡ +251920812800

ኢሜይል፡ fbbms@yahoo.com

አባሪ 2፡ የጥናት ተሳታፊዎች ስምምነት መቀበያ

ጤና ይስጥልኝ።

ስሜ _____ይባላል። በአሁኑ ሰአት በአዲስ አበባ ዩኒቨርሲቲ በማህበረሰብ ጤና ሳይንስ ዘርፍ የሁለተኛ ድግሪ የመመረቂያ ጥናታዊ ፁህፋችዉን ከሚሰሩት አቶ ዳዊት ሲሳይ ጋር በመሆን መረጃ በማሰባሰብ ላይ እገኛለሁ። በዚህ የጥናት ቦታ ላይ የሚሰበሰበዉን መረጃ ለመጠቀም ፈቃድዎን በትህትና ይጠይቃል። የምርምሩ አላማም በኤች አይ ቪ ሴሮ መለወጥ እና ለዚህም አጋላጭ የሆኑ ምክኒያቶችን ማወቅ ነዉ፡፡ ይህም ማለት በመጀመሪያው የኤች.አይ.ቪ ምርመራ ኤች.አይ.ቪ ቫይረስ በደማቸው ውስጥ የሌለባቸውን ከ12 ሳምንታት በኋላ በሚደረገው ምርመራ ቫይረሱ የሚገኝባቸዉን ነፍሰ ጡር እናቶች ለይቶ ተገቢውን ህክምና ላይ በማኖር ከእናት ወደ ልጅ ኤች.አይ.ቪ ቫይረስ እንዳይተላለፍ ማድረግ ነው። በዚህ ረገድ ፣ ጥያቄው በዋናነት የሚመለከተው ማህበራዊ-ስነ-ህዝብ ፣ ወሲባዊ እና ስነ-ምግባራዊ ፣ እንዲሁም ለታቀደው ምርምር አስፈላጊ የሆኑ ሌሎች ጥያቄዎችን የሚመለከት ነው ። የኤች አይቪ ሁኔታዎን ለማወቅ ወቅታዊ ምርመራ ይደረጋል ። ጥናቱ ቢያንስ 30 ደቂቃዎችን ሊወስድ ይችላል። በማናቸዉም ጉዳዮች ዙሪያ የሚሰጡኝ መረጃ ምስጥራዊነቱ የተጠበቀ ነዉ፤ ለዚህም ማንነትዎን የሚገልጽ ማንኛዉንም መረጃ የማናያያዝ ከመሆኑም ባሻገር መረጃዉ ከጥናቱ ዓላማ ዉጭ ለሌላ ወገን ወይም ጉዳይ እንደማይዉል ልናረጋግጥላችሁ እንወዳለን፡፡ መመለስ የማይፈልጉትን ማንኛውንም ጥያቄ አለመመለስ ይችላሉ እንዲሁም ግልፅ ያልሆነላችሁን ማንኛውንም ጥያቄ መጠየቅ ትችላላችሁ ፡፡ ጥናቱ ዉስጥ ከገባችሁ በኋላም በማንኛውም ሰዓት ማቋረጥ ትችላላችሁ ፡፡

በጥናቱ ለመሳተፍ ፈቃደኛ ነዎት? ሀ. አዎ ለ. አይደለሁም

አባሪ 3፡- የአማርኛ መጠይቅ

የጤናተቋሙ ስም_____

የመጠይቁ መለያ_____

መጠይቁ የተሞላበት ቀን_____

ክፍል አንድ፡-አጠቃላይ የማህበራዊ እና ስነ ህዝብ ተዛማች ጥያቄዎች

ቁጥር	ጥያቄዎች	የምልክት ምድብ	አስተያየት
101	እድሜዎ ስንት ነው?	_____	
102	ቋሚ የመኖሪያ አድራሻዎ ?	ከተማ.....1 ገጠር.....2	
103	አሁን ያሉበት የጋብቻ ሁኔታዎ ምንድን ነው?	ፈፅሞ ያላገባች.....1 ያገባች.....2 ባልዋ የሞተባት .....3 የተፋታች.....4 የተለያየች 5	
104	ሃይማኖትዎ ምንድን ነዉ?	ኦርቶዶክስ ክርስቲያን.....1 ሙስሊም.....2 ፕሮቴስታንት.....3 ካቶሊክ.....4 ባህላዊ.....5 ሌላ.....88	
105	ትምህርት ተምረው ያዉቃሉ?	አዎ.....1 አላዉቅም.....2 →	107
106	እርስዎ የጨረሱት/ የደረሱበት ከፍተኛ የትምህርት ደረጃ?	የመጀመሪያ ደረጃ .....1 ሁለተኛ ደረጃ .....2 ቴክኒክ እና ሙያ.....3 ከፍተኛ ትምህርት 4	
107	ዋና/መደበኛ ስራዎ ምንድነዉ?	የመንግስት ተቀጣሪ.....1 የግል ተቀጣሪ.....2 ነጋዴ.....3 የቤት እመቤት.....4 አርሶ አደር.....5 የቀን ሰራተኛ.....6 ስራ የሌላት.....7 ሌላ.....88	

108	የባለቤትሽ/ የፍቅር ጓደኛሽ እድሜ ስንት ነው?	_____	
109	ባለቤትሽ/ የፍቅር ጓደኛሽ ትምህርት ተምሯል?	አዉ.....1 አልተማረም.....2 →	 111
110	ባለቤትሽ/ የፍቅር ጓደኛሽ የጨረሱት/ የደረሱበት ከፍተኛ የት/ት ደረጃ?	የመጀመሪያ ደረጃ.....1 ሁለተኛ ደረጃ.....2 ቴክኒክ እና ሙያ.....3 ከፍተኛ ትምህርት.....4 አላውቅም.....88	
111	የባለቤትሽ/ የፍቅር ጓደኛሽ ዋና/መደበኛ ስራው ምንድን ነው?	የመንግስት ተቀጣሪ.....1 የግል ተቀጣሪ.....2 ነጋዴ.....3 አርሶ አደር.....4 የቀን ሰራተኛ.....5 ስራ የሌለዉ.....6 ሌላ.....88	
112	የቤተሰብ አማካይ ወርሃዊ ገቢ (በብር)?	_____	

ክፍል ሁለት፤- ስነ ተዋልዶ ጋር ተዛማችነትያላቸዉ ጥያቄዎች

201	የአሁኑን ዕርግዝና ጨምሮ በሕይወትዎ ውስጥ ስንት ጊዜ ነፍሰጡር ሆነዋል? (ፅንሱ የተጨናገፈ/ የወረደ/ሞቶ የተወለደን ይጨምራል) (መልሱ ተገቢ ከሆነ ከካርዱ ላይ ያረጋግጡ)	_____	
202	በህይወትዎ ውስጥ ስንት ጊዜ በሕይወት ያለ ልጅ ወልደዋል? (ማለትም ሲወለድ እስትንፋስ የነበረው/ ያለቀሰ /ሌሎች የህይወት ምልክቶች የነበሩት ምንም እንኳን ከተወለደ/ች ጥቂት ደቂቃ /ሰዓት ብቻ በሕይወት ቢኖርም/ ብትኖርም) (መልሱ ተገቢ ከሆነ ከካርዱ ላይ ያረጋግጡ)	_____	
203	የመጀመሪያውን የቅድመ ወሊድ ክትትል ስታደርጊ የስንት ሳምንታት ነፍሰ ጡር ነበርሽ? (ማረጋገጫ ከ ANC ካርድ)	_____	
204	ሴቶች አንዳንድ ጊዜ እቅድ ሳያወጡ ወይንም ሳይፈልጉ እርጉዝ ሊሆኑ ይችላሉ ፣ እርስዎስ ይሄን እርግዝና አቅደው ነው ያረገዙት?	አዎ ..... 1 አይደለም .....2 እርግጠኛ አይደለሁም 88	

ክፍል ሦስት፡- ኤች አይ ቪ ዕውቀት ጋር ተዛማችነትያላቸዉ ጥያቄዎች

301	ስለ ኤች አይ ቪ ሰምተዉ ያዉቃሉ?	አወ.....1 አላዉቅም.....2 →	ክፍል አራት
302	ሰወች ሌላ የወሲብ ጉዋደኛ ከሌለዉ እና ከ ኤች አይ ቪ ነፃ ከሆነ ጓደኛ ጋር ብቻ በመሆን በ ኤች አይ ቪ የመያዝ እድላቸዉን ሊቀንሱ ይችላሉ?	አወ.....1 አይችሉም.....2 አላዉቅም.....88	
303	ሰወች በትንኝ ንክሻ ኤች አይ ቪ ሊያዙ ይችላሉ?	አወ.....1 አይያዙም.....2 አላዉቅም.....88	
304	ሰወች የግብረ-ስጋ ግኑኝነት በሚፈጮበት ወቅት ኮንዶም ቢጠቀሙ በኤች አይ ቪ የመያዝ እድላቸዉን ሊቀንሱ ይችላሉ?	አወ.....1 አይችሉም.....2 አላዉቅም.....88	
305	ሰወች ኤች አይ ቪ ካለበት ሰዉ ጋር ምግብ ቢመገቡ ኤች አይ ቪ ሊያዙ ይችላሉ?	አወ.....1 አይያዙም.....2 አላዉቅም.....88	
306	ሰዎች በ ጥንቆላ ወይንም መለኮታዊ በሆኑ ምክኒያቶች ኤች አይ ቪ ሊያዙ ይችላሉ	አወ.....1 አይያዙም.....2 አላዉቅም.....88	
307	በ ኤች አይ ቪ የተያዙ ሰወች ሁል ጊዜ የህመም ምልክት ያሳያሉ?	አያሳዩም.....1 ያሳያሉ.....2 አላዉቅም.....88	
308	ጤናማ የሚመስል ግን ኤች አይ ቪ ያለበት ሰው በሽታውን ሊያስተላልፍ ይችላል?	አወ.....1 አይችልም.....2 አላዉቅም.....88	
309	ኤች አይ ቪ ከ እናት ወደ ልጅዋ ሊተላለፍ ይችላል? ሀ) በዕርግዝና ወቅት ለ) በወሊድ ጊዜ ሐ) ጡት በማጥባት	አወ አይችልም አላዉቅም ሀ).....1 2 88 ለ).....1 2 88 ሐ).....1 2 88	
309 ኝን ያረጋግጡ ቢያንስ አንድ አወ ካለ ☐ ↓		ከሌለ →	ክፍል አራት
310	ኤች አይ ቪ ከእናት ወደ ልጅ እንዳይተላለፍ የሚያግዝ ኤች አይ ቪ ለተያዙ ሴቶች ሊሰጥ የሚችል ልዩ መድሃኒት አለ	አወ.....1 የለም.....2 አላዉቅም.....88	

ክፍል አራት፤- ከህክምና ጋር ተዛማችነት ያላቸዉ ጥያቄዎች

401	በጾታዊ ግንኙነት አማካኝነት በሚመጣ በሽታ ተይዘዉ ያዉቃሉ?	አዎ .....1 አልተያዝኩም.....2 አላውቅም.....88	
402	አንዳንድ ጊዜ ሴቶች ያልተለመደ ሽታ ያለው የብልት ፈሳሽ ያጋጥማቸዋል፡ አርስዎስ ያልተለመደ ሽታ ያለው የብልት ፈሳሽ አጋጥመዎት ያዉቃል?	አወ.....1 አላጋጠምኝም.....2 አላውቅም.....88	
403	አንዳንድ ጊዜ ሴቶች የብልት ቁስለት ያጋጥማቸዋል፡ አርስዎስ የብልት ቁስለት አጋጥመዎት ያዉቃል?	አወ.....1 አላጋጠምኝም.....2 አላውቅም.....88	
404	401ን፣402ን፣እና 403ን ያረጋግጡ እንፌክሽኑ ነበረባት?	አወ.....1 አልነበረባትም.....2 አታውቅም.....88	
405	ባለቤትዎ/የፍቅር ጓደኛዎ በጾታዊ ግንኙነት በሚመጣ በሽታ ተይዞ ያዉቃል?	አወ.....1 አልተያዘም.....2 አላውቅም.....88	
406	አንዳንድ ጊዜ ከወንዶች ብልት ዉስጥ ያልተለመደ ፈሳሽ ይወጣል፡ ከባለቤትሽ/ከፍቅር ጓደኛሽ ብልት ውስጥ ያልተለመደ ፈሳሽ ይወጣ ነበር?	አወ.....1 አይወጣም.....2 አላዉቅም.....88	
407	አንዳንድ ጊዜ ከወንዶች ብልት አካባቢ ቁስል ይኖራል ፡ ከባለቤትሽ/ከፍቅር ጓደኛሽ ብልት አካባቢ ቁስለት ነበር?	አወ.....1 አልነበረም.....2 አላዉቅም.....88	
408	405ን፡ 406ን፡ እና 407ን ያረጋግጡ እንፌክሽኑ ነበረበት?	አወ.....1 አልነበረበትም.....2 አታዉቅም.....88	

አምስት፣ ወሲባዊ እና ባህሪ ጋር ተዛማጅነት ያላቸው ጥያቄዎች

501	አልኮል የያዘ መጠጥ ጠጥተው ያውቃሉ? (ለምሳሌ ጠላ ፣ አረቂ፣ ጠጅ፣ ቢራ ፣ ወይን ወዘተ)	አወ.....1 አላዉቅም.....2 →	503
502	በ ምን ያህል ጊዜ ውስጥ ነው አልኮል የያዘ መጠጥ የሚጠጡት?	በየቀኑ ማለት ይቻላል.....1 ቢያንስ በሳምንት አንድ ጊዜ.....2 በሳምንት ከአንድ ጊዜ በታች.....3 ቢያንስ በወር አንድ ጊዜ.....4	
503	ባለቤትዎ/ የፍቅር ጓደኛዎ አሁን ከእርስዎ ጋር ነው ወይንስ ሌላ ቦታ ነው የሚኖረው?	ከእኔ ጋር ነው የሚኖረዉ.....1 ሌላ ቦታ ነው የሚኖረው.....2	

	(ላገባ ብቻ)		
504	ባለቤትዎ/ የፍቅር ጓደኛዎ ለስራ በተደጋጋሚ ወደ ሌላ ቦታ ይጓዛል?	አዎ.....1 አይጓዝም 2	
505	በአለፉት ሶስት ወራት ውስጥ አዲስ የትዳር አጋር / የፍቅር ጓደኛ አለዎት?	አዎ.....1 የለኝም.....2	
506	ከባለቤትዎ/ ከፍቅር ጓደኛዎ ጋር ምን ያህል ጊዜ አብረዉ ኖረዋል?	ጊዜ_____	
507	ባለቤትዎ/የፍቅር ጓደኛዎ አልኮል የያዘ መጠጥ ጠጥቶ ያዉቃል? (ለምሳሌ ጠላ ፣ አረቂ፣ ጠጅ፣ ቢራ ፣ ወይን ወዘተ)	አወ.....1 አያዉቅም.....2 አላዉቅም.....88 →	509
508	ባለቤትዎ/የፍቅር ጓደኛዎ በ ምን ያህል ጊዜ ውስጥ ነው አልኮል የያዘ መጠጥ የሚጠጣው?	በየቀኑ ማለት ይቻላል.....1 ቢያንስ በሳምንት አንድ ጊዜ.....2 በሳምንት ከአንድ ጊዜ በታች.....3 ቢያንስ በወር አንድ ጊዜ.....4	
509	የባለቤትዎን/ የፍቅር ጓደኛዎን የኤች አይ ቪ ሁኔታ የቅርብ ዕውቀት አለዎት?	አዎ.....1 የለኝም.....2 →	511
510	የባለቤትዎ/ የፍቅር ጓደኛዎ የኤች አይ ቪ ሁኔታ ምንድን ነው?	ኤች አይ ቪ አለበት .....1 ኤች አይ ቪ የለበትም 2	
511	አሁን አንዳንድ አስፈላጊ የሆኑ የሂዎት ጉዳዮችን በተሻለ ለመረዳት ወሲባዊ ሂወትዎን የሚዳስሱ የተወሰኑ ጥያቄዎችን መጠየቅ እፈልጋለሁ፡ መልሶችዎ ሙሉ በሙሉ ሚስጢራዊ እና ለማንም የማይነገሩ መሆናቸዉን በድጋሜ ላረጋግጥለዎት እወዳለሁ፡ መልስ መስጠት የማይፈልጉትን ማንኛዉንም ጥያቄ አሳዉቁን እና ወደ ሚቀጥለዉጥያቄ እንሄዳለን። የመጀመሪያውን ግብረ ስጋ ግንኙነት በፈፀሙበት ወቅት እድሜዎ ስንት ነበር?	አመት_____	
512	ለመጨረሻ ጊዜ የግብረ-ስጋ ግንኙነት የፈፀሙት መቸ ነበር?	ከ_____ቀናት በፊት ከ_____ሳምንታት በፊት ከ_____ወራት በፊት	
513	ለመጨረሻ ጊዜ የግብረ-ስጋ ግንኙነት በፈፀሙበት ወቅት ኮንዶም ተጠቅመዋል?	አወ.....1 አልተጠቀምኩም.....2 እርግጠኛ አይደለሁም.....3	
514	ከባለቤትዎ/ከፍቅር ጓደኛዎ በተጨማሪ ከሌላ ሰዉ ጋር የግብረ-ስጋ ግንኙነት ፈፅመዋል?	አወ.....1 አልፈፀምኩም.....2 →	516

515	በጠቅላላዉ ምን ያህል ሰዎች ጋር የግብረ-ስጋ ግንኙነት ፈፅመዋል?	ሰዎች ጋር_____ አላውቅም.....88	
516	ባለቤትዎ/ የፍቅር ጓደኛዎ ልላ የትዳር አጋር አለው? (ወይንም እንዳገባ ሆኖ ከሌላ ሴት ጋር ይኖራል)?	አዎ.....1 የለውም.....2 አላውቅም 88	
517	ባለቤትዎ / የፍቅር ጓደኛዎ ሌላ ወሲባዊ አጋር አለው ብለው ይጠረጥራሉ?	1.አዎ.....1 2.አልጠረጥርም.....2 3.አላውቅም.....88	
518	ባለቤትዎ ወይም የፍቅር ጓደኛዎ ስሜትዎን የሚጎዱ ነገሮችን ያደርጋል? (ለምሳሌ ስድብ፤ ማጣጣል፤ ለመጉዳት ማስፈራራት፤ መጮህ፤ መርገም፤ ለራስሽ መጥፎ ስሜት እንዲሰማሽ ማድረግ)	በፍጹም.....1 አንዳንድ ጊዜ.....2 ብዙዉን ጊዜ.....3 ሁልጊዜ ለማለት ይቻላል.....4	
519	ባለቤትዎ ወይም የፍቅር ጓደኛዎ አካላዊ ጥቃት አድርሶቦት ያውቃል?(ለምሳሌ ፤በጥፊ መምታት፣በካልቾ መምታት፣መገፍተር)	በፍጹም.....1 አንዳንድ ጊዜ.....2 ብዙዉን ጊዜ.....3 ሁልጊዜ ለማለት ይቻላል.....4	
520	ባለቤትዎ ወይም የፍቅር ጓደኛዎ ጾታዊ ጥቃት ፈጽሞቦት ያውቃል? (ለምሳሌ ባልፈለግሺበት ጊዜ የግብረ-ሥጋ ግንኙነት እንዲፈጽሙ ማስገደድ)?	በፍጹም.....1 አንዳንድ ጊዜ.....2 ብዙዉን ጊዜ.....3 ሁልጊዜ ለማለት ይቻላል.....4	

ክፍል ሰባት ፡- የሴቷ የኤች አይ ቪ ሁኔታ

701	ድጋሜ ምርመራ ከተደረገላት በኋላ ያለው የኤች አይ ቪ ውጤት	ኤች አይ ቪ ያልተገኘባት.....1 ኤች አይ ቪ የተገኘባት.....2	

ስለሰጡን ጊዜ እናመሰግናለን።

የመረጃሰብሳቢውስም_____ፊርማ_____

የተቆጣጣሪውስም_____ ፊርማ_____