ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCE

SCHOOL OF ALLIED HEALTH SCIENCES

DEPARTMENT OF NURSING AND MIDWIFERY

MOTHER- TO-CHILD TRANSMISSION OF HIV INFECTION AND ITS ASSOCIATED FACTOR AMONG EXPOSED INFANTS ON CARE AND FOLLOW-UP IN SELECTED HEALTH CENTERS, ADDIS ABABA ETHIOPIA, 2017

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A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF ADDISABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES, DEPARTMENT OF NURSING AND MIDWIFERY IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF SCIENCES IN ADULT HEALTH NURSING

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Approval by the Board of Examiners

This thesis by Hamelmal Bekele is accepted by the Board of Examiners as satisfying thesis requirements for the Degree of Master of Science in Adult Health Nursing.

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Abstract

Back ground: Mother to child transmission of HIV is responsible for about 20% of all HIV transmissions of which 95% are found in the Sub-Saharan Africa. Without any intervention, MTCT of HIV among non-breastfeeding infants' ranges from 14-32% in developed nations to 25- 48% in resource limited populations. Prevention of mother-to-child HIV transmission (PMTCT) is still the most effective intervention in fighting new HIV infections.

Objective: To assess the transmission rate and the associated factors of Mother-to-Child Transmission of HIV Infection among Exposed Infants on Care and Follow-Up in selected health centers of Addis Ababa, Ethiopia, 2017

Methods and Materials: A facility based retrospective study was conducted on HIV exposed infants who were on care and follow up from September 2012 to August 2016 enrolled in 10 selected health centers from Lideta, Arada and NifasSilkeLafto Sub Cities. The study was conducted from January to June 2017 by revising records of HIV positive mothers' and their HIV exposed infants' at PMTCT clinics of the 10 selected health centers. For this study the sample size was 228; the study subjects were selected using simple random sampling method.

Results: Of the 228 infants 5 (2.2%) were found HIV positive during follow up. Two hundred twenty (96.5%) had exclusive breastfeeding, whereas 8 (3.5 %) of the study subjects had exclusive replaced formula feeding. ART prophylaxis was given to 225 (98.7 %) of the exposed infants, only 2 (0.9%) haven't received ART prophylaxis. Initiation time of ART for the mother was significantly associated with the HIV status of exposed infants {**AOR=0.32, 95%CI (0.015-0.74)}.**

Conclusion and Recommendation: The study revealed that very low prevalence of mother to child transmission of HIV. There is a need to maintain current implementation of prevention of mother to child transmission program to help ensure that continually maintain low MTCT of HIV prevalence.

Key terms HIV; Breast feeding; MTCT; PMTCT; Infant HIV exposure

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Acronyms and Abbreviations

ABC:	Abstinence, Be faithful and Condom use
AIDS:	Acquired Immunodeficiency Syndrome
AOR:	Adjusted Odds Ratio
ART:	Anti-Retroviral Therapy
BCC:	Behavioral change in communication
BSc:	Bachelor of Science
CD:	Compact Disc
CHW:	Community health worker
EDHS:	Ethiopian Demographic Health Survey
FGAE:	Family Guidance Association of Ethiopia
FP:	Family Planning
HAART:	Highly Active Anti-Retroviral Therapy
HAPCO:	HIV/AIDS Prevention and Control Organization
HIV:	Human Immunodeficiency Virus
HO:	Health Officer
IEC:	Information Education and communication
KAP:	Knowledge, Attitude and Practice
NGO:	Non-Governmental Organization
OCPs:	Oral Contraceptive Pills
PICHT:	Provider Initiative counseling and HIV Testing

PLWHA: People Living With HIV/AIDS

PMTCT: Prevention of mother-to-child HIV transmission

RH: Reproductive Health

SNNPR: South Nations Nationalities and People Region

SPSS: Statistical Package for Social Sciences

UNAIDS: United Nations HIV/AIDS Program

UNFPA: United Nation Fund Population agency

USA: United States of America

USAID: Unite states AIDS Program

VCT: Voluntary Counseling and Testing

WHO: World Health Organization

1: **INTRODUCTION**

1.1 Background

Since 1981, when acquired immunodeficiency syndrome (AIDS) first emerged, more than 25,000,000 people have died of AIDS-related diseases globally. Currently, 33.2 million people of all age groups are living with human immunodeficiency virus (HIV). Sub-Saharan Africa remains the worst affected region in the global AIDS epidemic. Devastatingly, the epidemic has also impacted children, and has created an estimated 11.4 million orphans. According to a Joint United Nations Program on HIV and AIDS report, the HIV epidemic in Africa is following divergent trends (1). The Ethiopian Federal Ministry of Health has documented that "HIV was first detected in Ethiopia in 1984 and the first two AIDS cases were reported in 1986 (2).

In 2013 there were an estimated 793,700 (716,300-893,200) people living with HIV including 200,300 (172,400 – 232,400) children according to the latest EPP/Spectrum modeling. As per the same modeling, the pediatric HIV population in Ethiopia are mostly older children who were vertically infected in earlier years when the coverage and effectiveness of PMTCT in the country was low/MTCT rates high (in 2013 163,800 HIV positive children were aged 5-14 years). DHS 2011 data shows HIV prevalence in large towns including Addis Ababa the regional capital increased from 2005 to 2011. Higher prevalence in Addis Ababa and large towns may be associated with labor migration to large urban areas and large scale construction projects as well as a growing service industry (2).

Ethiopia is one among countries' most seriously affected by HIV/AIDS with adult HIV prevalence of 1.1% in 2016 which has shown drastic decrease when it is compared with 1.5% of the year 2011. The adult HIV prevalence for Addis Ababa is reported to be 1.5 %, close to the national estimate (3).

Based on data from sentinel antenatal care sites, the HIV/AIDS prevalence estimate for adult Ethiopians aged 15–49 years is 1.0% (3). Almost 90% of the HIV positive women in the world are found in Sub-Saharan Africa (4). The increasing number of women living with HIV worldwide makes prevention critical, not only for the sake of women's health but also to reduce future HIV infection among infants in sub-Saharan Africa, where half the female population is of childbearing age (5).

Prevention of mother-to-child HIV transmission (PMTCT) is still the most effective intervention in fighting new HIV infections. Globally, Human Immune deficiency Virus (HIV) is the leading cause of death and disease for women of reproductive age worldwide and a major contributor to infant mortality among women between the ages of 15 and 44 years (4).

Mother to child transmission of HIV is responsible for about 20% of all HIV transmissions (6), and for over 90% of new HIV infections among children, of which 95% are in the Sub-Saharan Africa (SSA). Without any treatment, MTCT of HIV ranges from 25-40% in both non-breastfeeding and breastfeeding populations (7). With effective PMTCT program in high-income countries, MTCT rate has been decreased to around 1% through specific interventions (8).

In other studies it has been showed that, with appropriate retention and adherence, the WHO recommendations make it possible to cut the risk of mother-to child transmission to 5% or less among breastfeeding populations, and to 2% or less among non-breastfeeding populations (8).This low MTCT level has not been attained at national levels in sub Saharan countries due to inaccessibility to highly active antiretroviral therapy (HAART), pre-labour interventions and other logistics constrains (7).

In Ethiopia, since the introduction of PMTCT service in 2001, then the second and the third (currently used) guidelines were formulated in 2007 and 2011 respectively (9),The number of PMTCT sites has increased drastically from 719 in 2007/8 to 1044 in 2010/2011 to 2,044 in 2012/13 (9) and to 2,150 in 2013/14 (10). But mother to child transmission of HIV was decreased from 32% to 25% only for the pregnant women with ARV prophylaxis (10). Moreover by 2014 of the total of HIV positive women in the country 73% of them were receiving ARVs.

In considering the newly adopted WHO 2013 guidelines (which has remarkably increased eligibility criteria for treatment: CD4 count cut off at 500mm3 for all adults; pregnant women and all children below 15 years of age), It has been found that it is necessary to scale up health facility capacity through securing and distribution of ARV. Additionally, since March 2013, all pregnant women have been considered eligible to start long-term antiretroviral therapy (ART), through a package known as option B+regimen. As a result, treatment coverage for pregnant women, which has been historically lower than for other adults, has not only matched the average among adults but it has exceeded it (5).

Addis Ababa is one of the country's town with highest HIV prevalence for the year 2016 with 1.5%, with 3% prevalence for urban whereas 0.5% prevalence for rural areas of the country. Any

commitment to reducing the HIV infections among HIV exposed children and keeping them HIV free throughout their entire life should focus on enhancing HIV related health services (11).

1.2 Statement of the problem

Between 2009 and 2014, there were a total of 3.8 million newly infected women of reproductive age. The risk of mother-to-child transmission of HIV is much higher among newly infected women who are not yet diagnosed and not on treatment (5).

The Global Plan towards the elimination of new HIV infections among children by 2015and keeping their mothers alive (Global Plan) (12) was launched in July 2011 at the United Nation General Assembly High-Level Meeting on AIDS in NewYork. It prioritizes 22 countries with the highest number of pregnant women living with HIV who are in need of services which includes Ethiopia. Together, these countries accounted for 90% of the total number of pregnant women living with HIV that needed services to prevent mother-to-child transmission of HIV in 2009 (5).

In 2011, United Nations General Assembly Special Session (UNGASS) placed a clear emphasis on the effect of HIV/AIDS on maternal and child health. The final declaration of commitment from the assembly stated is to reduce the number of children newly infected with HIV by 90 % by 2015 (13).

HIV infection is an important cause of morbidity and mortality in children in Africa (5). Over 90%of HIV infections in children are acquired through the Mother‑to‑Child transmission (MTCT) route. About 25–40% of HIV‑ Positive women will transmit the virus to their children during the period of pregnancy, labor/delivery, and breastfeeding if there is no intervention (14). With appropriate interventions which include use of antiretroviral (ARV) drugs, obstetric interventions and modification of infant feeding, MTCT rates have been reduced to <2% in some countries (15, 16).

In 2012, according to the Ethiopian Health and Nutrition Research Institute, MTCT rates were 15 and 30 % without and with breast feeding respectively (17). Timely initiation of PMTCT interventions dramatically improved the natural history of prenatal infections (4, 7, 13 and 18).

1.3 Significance of the study

This study aims at pointing out the determinant factors of HIV sero-status among exposed infants in Addis Ababa health centers who were in care and follow up at the clinics in the period of September2012 to August2016.

In the first place this study would help to fill the gap in identifying determinant factors of HIV transmission among exposed infants. This report could also be helpful to professionals working on PMTCT to improve their roles in providing quality care.

More over the findings of this study could point outthe positive outcomes of the PMTCT intervention being commenced in Addis Ababa, as well as in general in the country. And also the findings of this study can be used as baseline for researchers planning to conduct large scale studies.

Despite the fact that many studies have been conducted in relation to PMTCT in Ethiopia only few are conducted to assess the determinant factors of HIV sero status among exposed infants; this study will be a paramount importance to the government, Non-Governmental Organizations (NGOs) and other responsible bodies in checking the progress and achievement made regarding PMTCT implementation since Ethiopia's acceptance of WHO's ARV treatment approach on 2013.

2: Literature Review

2.1 Introduction

HIV AIDS has been a major cause of illness and death among children, especially in Africa (5). Mother-to-child transmission of HIV is the most prevalent source of pediatric HIV infection.Which have be reduced to < 2% in developed countries with the appropriate PMTCT interventions; such as ARV use, obstetric interventions and modifications of infant feedings (14, 15, 16).

2.1Pediatric HIV/AIDS situations worldwide

Mother to Child transmission of HIV is expected to be higher at the time and around birth; at which there will be placental separation leading to maternal and fetal blood contact. Additionally at the time of delivery while passing through the vaginal canal.

The global plan towards the elimination of new HIV infections among children by the year 2015 and keeping their mothers alive was launched in June 2011 (19, 20). The plan targets for reducing new pediatric HIV infections by 90% (19), reducing HIV-associated deaths to women during pregnancy, childbirth and per partum by 50% (10), and reducing MTCT of HIV to less than 5% at the population level (19, 21). Interventions to reduce pediatric HIV infection have become readily available worldwide, through PMTCT services by providing effective medications and appropriate HIV treatment, care and support for mother and children have been underscored (22).

In 2009, 53% of HIV-infected pregnant women worldwide received antiretroviral (ARV) drugs in PMTCT program. While coverage is increasing in sub Saharan Africa, ranging from 8% in some settings to 54% in others (21) throughout Africa, the diagnostic challenge of HIV exposure in infants is being addressed by scaling up virological testing using dried blood spot polymerase chain reaction (DBS/ PCR) at 6 weeks of infant age(22). And antibody test at the age of 18 month for confirming status.

2.2 Mother-to-child transmission of HIV

HIV can be transmitted to infants either during pregnancy, labour or breast feeding. Risk of transmission may increase in advanced maternal disease, acute maternal infections during pregnancy and lactation and co-morbidity with sexual transmitted diseases (7).The transmission during pregnancy through placental tears, chorioamninitis, cigarette smoking and use of illicit

drugs; which disrupt the placenta and cause micro-transfusions of maternal blood to the fetus(23).During pregnancy transmission ranges 5-10%, during labour and delivery 10-20% of all children can get infected. This is through direct contact with infectious maternal blood, genital secretions and absorption through fetal or neonatal digestive tract (9, 24). The high mortality rate of pediatric HIV in resource limited countries could also be related to lack of early diagnosis and low coverage of pediatric highly active antiretroviral therapy (HAART) treatment (25).

2.3 Prevention of mother to child transmission of HIV interventions

In ideal situations, the provision of ARV prophylaxis and replacement feeding can reduce transmission of HIV from an estimated 15- 45% with no intervention to around 1-2%. In high income countries mother-to-child transmission has been nearly eliminated as a result of effective voluntary testing and counseling, access to antiretroviral therapy, safe delivery practices, and the widespread availability and safe use of breast milk replacement feedings (26).

A “four-pronged” approach to a comprehensive PMTCT strategy was recommended by the WHO known as: Core programmatic component which include: Primary prevention of HIV infection among women of childbearing age, Preventing unintended pregnancies, among women living with HIV, Preventing HIV transmission, from women living with HIV to their infants, Providing appropriate treatment, care, and support to mothers living with HIV and their children and families (23).

1. The primary prevention of HIV infection among women of reproductive age group

The most effective strategy to prevent MTCT of HIV infection is through creating public awareness and educating people on HIV; its routes of transmission ,methods of prevention and its consequences if acquired (20). Avoiding HIV infection among women of reproductive age bears great proportion of reducing the transmission of HIV to infants (20).

2. Prevention of unintended pregnancies among HIV-infected women.

For every HIV -infected woman, pregnancy should be planned. Those women who desire to get pregnant should first have their viral load reduce to a level below 1000 copies/ml before conception. Nevertheless of the effort to reduce MTCT the lack of adequate reproductive services poses a problem in MTCT of HIV (20).

One of the main challenges is that the majority of women in low and middle-income countries has never been tested for HIV and is therefore unaware of their status. Making sure counseling and testing services are accessible can give them a chance to have been screened, which could help them pass an informed decision about their reproductive health (10)**.**

In a study conducted by Abay B. etal it was found that; mothers who knew their HIV sero-positivity during pregnancy and after delivery were found significantly more likely to transmit HIV to their babies compared with those who knew before getting pregnant (AOR [95% CI] = 4.71 [1.39-15.93] and 4.46 [1.40-16.22]), respectively (27).

3. Provision of specific interventions to reduce vertical transmission of HIV.

For an HIV –infected pregnant woman, her infant has 25–45% risk of being infected with HIV either before birth or after birth, without any form of intervention. The PMTCT program offers services and interventions that reduce the risk of MTCT to 1-2 %. The service include HIV education, testing and counseling for pregnant and breastfeeding women and their partners, antiretroviral treatment and prophylaxis, safe delivery practices, and counseling on safe infant feeding practices and care of the HIV exposed infant (20).

4. Provision of treatment, care and support for HIV infected mothers, their infants and family.

This has to do with the administration of ARV drugs to infected woman who needs treatment, nutritional and infant feeding counseling, and family planning support given to her, and as well her baby given prophylaxis (20).

As per WHO clinical guideline; lifelong ART has been recommended for all HIV positive pregnant and breastfeeding women regardless of their CD4 count or WHO clinical stage or gestational age (28). However, all women diagnosed with HIV infection should have clinical and immunological evaluation to monitor their progress as they start ART (9, 28). HIV positive women, their children and family should be given due attention in receiving this care and any other support.More over their reproductive health needs should be met and other care of new born should be provided to their baby (29).

In relation to different factors such as capacity, accessibility and availability of health services, different regions of the world have a different result of PMTCT; the rate of MTCT could be reduced to 5-8% by appropriate integrated PMTCT interventions in low and middle income countries, and it could be reduced to less than 2% in some high income countries (6, 30).

PMTCT is a highly effective program and has huge potential to improve both maternal and child health through proper implementation of its components. Beginning ART before the twelfth week of gestation reduces HIV related mortality in children living with HIV by 75% (31).

As Ethiopia adopted the world health organization (WHO) four-prong strategy, the most important challenge is the implementation of a comprehensive approach to PMTCT to achieve universal coverage of PMTCT services (9). However addressing all four prongs has potential to interrupt the cycle that leads to MTCT at several points (10).

2.3.1 HIV Counseling and testing

It's difficult todiagnose HIV infection in infants until the age of 18 months because the mother passes antibodies to the child which will remain in the fetal circulation. HIV diagnosis in infants is usually done by a qualitative HIV deoxyribonucleic acid polymerase chain reaction assay using peripheral blood mononuclear cells or by HIV ribonucleic acid PCR assays which detect plasma viral ribonucleic acid (32).

Antenatal care is the key entry point for Integrated PMTCT services (for example, through HIV testing). Virologic tests are required to diagnose HIV infection in infants aged less than 18 months and should be performed within the first 6weeks of life and at age 4 to 6 months (33). Yet in 2013, only 42% of infants born to mothers living with HIV in low- and middle-income countries received this test within two months as recommended by WHO (31). Only 40% of all PCR tests were done in the same year at 6 weeks of age for the infants as per the recommendations (34).

HIV infected mothers who never enter or complete PMTCT are the most at risk for transition to their infants. These infants are not the ones who arrived at the clinics for their 6 week DBS test, rather they are the children of mothers' who never attended antenatal care, were never tested during pregnancy, seroconverted after testing, delivered at home, were non-adherent to therapy, or were lost to follow-up (26).

A study in Ethiopia the progress and addressed need in access and utilization of PMTCT services showed that; a significant progress had been made in the proportion of pregnant mothers who had HIV test after receiving counseling services (35). According to 2013/14 annual performance reports pregnant women attend ANC visit at least once which is 89.1%, in the same year and

reached 100% for testing (20). Percentage of infants born to HIV positive women's receiving a virological test for HIV within 2 months of birth was 21% (10).

2.3.2 Antiretroviral treatment and prophylaxis

According to 2010's WHO clinical guideline; infants born to mothers with HIV who are at high risk of acquiring HIV should receive dual prophylaxis with AZT and NVP for the first 6 weeks of life, whether they are breastfed or formula fed (strong recommendation, moderate-quality evidence). Breastfed infants who are at high risk of acquiring HIV, including those first identified as exposed to HIV during the postpartum period, should continue infant prophylaxis for an additional 6 weeks (total of 12 weeks of infant prophylaxis) using either AZT (twice daily) and NVP (once daily) or NVP alone. Infants of mothers who are receiving ART and are breastfeeding should receive 6 weeks of infant prophylaxis with daily NVP. But infantsreceiveonly replacement feeding should be given 4–6 weeks of infant prophylaxis with daily NVP (or twice-daily AZT) (36).

The expansion of PMTCT programs,in 2005 and the end of 2012, the use of more efficacious ART regimen include HAART and integrated services have helped to prevent over 800,000 children globally from becoming newly HIV infected (9).

By the end of 2013, Ethiopian federal ministry of health (FMOH) developed an operational plan called option B+ services. In all PMTCT facilities typically were in laboratory sating for antenatal CD4 testing limited this option has a great role (38). With the outcome including further simplification and operational simplicity, avoidance of stopping and starting ARV drugs, protection against vertical transmission in future pregnancies and protection against sexual transmission to sero-discordant partners (36).

2.3.3 Safe delivery practices

For an HIV –infected pregnant woman, her infant has 25–45% risk of being infected with HIV either before birth or after birth, without any form of intervention. Around 70% of MTCT in non-breast-feeding infants and about 50% in breast-feeding infants occur during the intra-partum period (35). Intra-partum bleeding, premature rupture of membrane, prolonged labor more than 4 hour after rupture of membrane, chorioamnititis and cervico-vaginal infection may increase the risk of intra-partum transmissions (37).

Studies have found that there was an increased rate of HIV transmission after a mother's membranes have been ruptured for more than 4 hours before delivery (28). However, the key point was that the longer the membranes are ruptured, the higher the risk of HIV transmission. Certain obstetric procedures such as episiotomy and artificial rupture of amniotic membrane are also associated with increased risk of MTCT (35).

In Ethiopia, skilled birth attendances were 20.4% (9) and only 64% of MNCH facilities provided PMTCT services in 2011 (38). In Ethiopia the rate of low birth weight was recorded more than 30% in women under highly active antiretroviral therapy (HAART) during pregnancy, reaching almost 50% in those on ART prior to pregnancy added to a rate of preterm birth above 20% (39).

Pregnancy itself does not affect the outcome of HIV infection, but HIV may affect pregnancy outcome in several ways: HIV-infected pregnant women are at increased risk of premature deliveries and still birth (9). Various studies have been conducted in assessing the impact of those protocols on birth outcomes such as preterm delivery and low birth weight with conflicting results based on the ART protocol, timing of the treatment and other associated factors (39).

All women coming for ANC, labor, delivery and postpartum follow-up including child health care shall be routinely informed about the benefits of HIV testing for mother and baby in a group or on individual basis and shall be told that their routine laboratory checkup includes HIV testing unless they say "NO" but the right to say "no" shall be clearly communicated (19, 25).

2.3.4 Safe infant-feeding practices

The risk of mother to child transmission of HIV infection through breast milk can occur at any point during lactation (34). Exclusive breastfed (EBF) has been recognized as the best chance of the infant to receive the nutrients and antibodies needed to survive.Many of the factors known to influence overall risk of transmission are also likely to influence transmission through breastfeeding include infant gastro-intestinal pathology such as candidiasis and necrotizing enterocolitis may disrupt mucosal integrity (34, 40).

Globally, about 300,000 babies become infected with HIV through breast milk each year; while at the same time 1.5 million children die each year if the women prefer not to breastfeed (41). Twenty-two countries account for more than 90% of the global burden, and Ethiopia is one of these priority countries where one of every 3 children born to women living with HIV still gets infected with HIV (42).

In 2001 the World Health Assembly approved the recommendation that infants should be exclusively breastfed for the first six months of life to achieve optimal growth, development and health. In low infant mortality settings, HIV makes a larger contribution to the balance of risk so breastfeeding (in the absence of ARVs) is quite risky (33). With effective ARVs, abstinence from breastfeeding results in worse infant outcomes. In postnatal transmission, the key element is the importance of infant and child mortality (43).

Mixed feeding with both breast milk and other feeds has been associated with a higher risk of HIV infection for the infant than exclusive breastfeeding so that complete avoidance of breast milk eliminates the postnatal transmissions. Exclusive formula feeding is a preferred infant feeding method where infant formula is affordable, feasible, acceptable, sustainable and safe to do (37). In general, in resource poor settings the risks of infant death due to diarrheal diseases and malnutrition outweighs the risks of HIV transmission (41).

The risk of HIV transmission whilebreastfeeding during a period of 18–24 months is 15–20%, but studies in low-resource environments have concluded that not breastfeeding or stopping breastfeeding early increased mortality and reduced HIV-free survival (44). For the first 12 months of life, the high levels of nutrients in breast milk can protect against mortality from diarrhea, pneumonia and malnutrition (42).

However, around the age of 6 months, breast milk alone can no longer meet all nutritional requirements of the infant and several additional options of replacement feeding may be used. Although complementary foods provide energy and nutrients to help meet the growing child's needs, breastfeeding continues to provide at least half of a child's nutritional requirements between the ages of 6 to 12 months (43). The potential implications of exclusive breastfeeding recommendations are that more HIV-infected mothersfor whom replacement feeding is not acceptable, feasible, affordable, sustainable or safe, will start breastfeeding and more will feed until at least 12 months and more total mothers was partake in exclusive breastfeeding. This was result in protection for the infant against common childhood infections, improved nutritional intake and HIV free survival among HIV-exposed infants and overall improved infant survival (44).

A study conducted in Ethiopia, Gondar town health institutions, on infant feeding practice and associated factors of HIV positive mothers attending PMTCT and ART, 89.5% of the study participants had followed EBF practice, while significant percentage 10.5% of the study

participants had practiced mixed feeding (45). For the best possible infant health and development outcomes, all mothers, must adopt optimal infant feeding practices that allow protection against early childhood illnesses and lower the risk of HIV infection (44).

Effectiveness of PMTCT Programme defined as the prophylactic benefit of a PMTCT intervention when implemented in real practice to reduce the risk of mother-to-child transmission. It can be measured by use of several outcome indicators which include: PMTCT intervention coverage which is intended to act as a surrogate for the number of prevented infant infections, infant deaths and HIV free survival (34).

Study in Zambia suggested that the shift from 2010 option A to option B+ as the 2013 guidelines would result in a 33% drop of the risk of HIV transmission among exposed infants. The probability of HIV infected pregnant women to initiate ART would increase by 80%. To get good result in the elimination of new child infections, PMTCT programs must achieve high coverage of effective ARV interventions and safer infant feeding practices recommended (30, 42).

The Conceptual Frame work of HIV status of exposed infants

The following is a conceptual model, showing how exposed infant HIV status, was adapted from literature review. The most important factors of HIV status of exposed infants, is the effective provision of ANC, early initiation of ART for the mother, place of delivery, ARV for the infant and infant's feeding practices which is summarized in to Socio- demographic factors, maternal factors and infant factors.

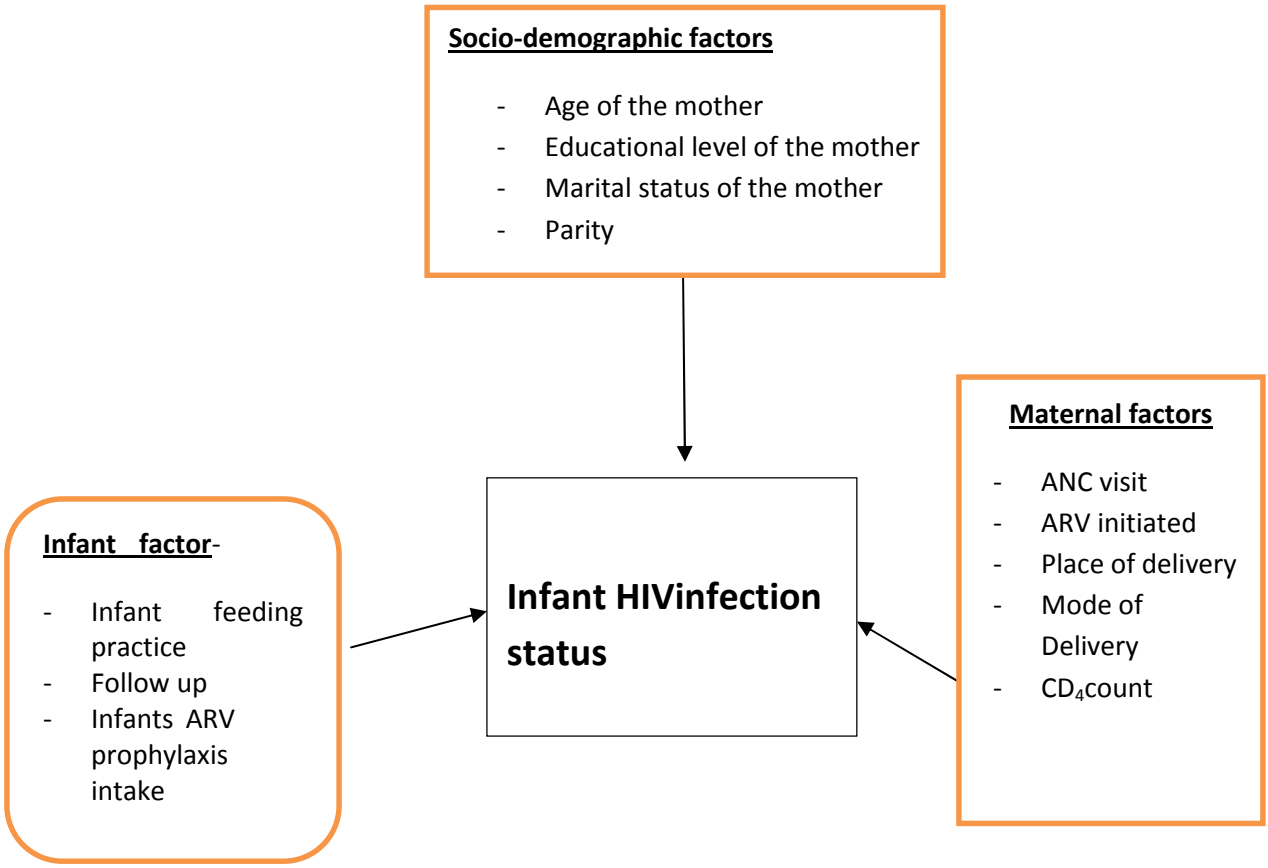

Figure 1: Conceptual Frame Work of HIV status of exposed infants

3: Objective of the study

3.1 General objective:

- To assess the transmission rate and the associated factors of Mother- to - Child Transmission of HIV Infection among Exposed infants on Care and Follow–up in selected health centers of Addis Ababa Ethiopia, 2017.

3.2. Specific objectives:

- To determine the magnitude of the HIV transmission from mother to infant in Addis Ababa, Ethiopia.
- To determine predictors of mother to child HIV transmission among HIV exposed infants in Addis Ababa, Ethiopia.

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4: Methods and Materials

4.1. Study Setting

A retrospective study was conducted from January to June 2017 for which; PMTCT records from September 2012 to August 2016 were reviewed at the ten selected health centers from Lideta, NifasSilke Lafto and Arada Sub cities. The population of Addis Ababa was around 3.8 million on the year 2015, and the city is administratively divided into 10 sub-cities and 116 woredas with a total of 98 health centers providing health care services. Of the 98 health centers which are offering maternity care services, 79 (81%) are providing PMTCT services (2).

4.2 Study design

A retrospective facility based study design was used.

4.3 Source Population

The source population was all record of infant-mother pairs who were on care and follow-up in PMTCT clinic at the selected ten health centers registered from September 2012 to August 2016.

4.4 Study population

The study population was records of exposed infants-mother pair who was on follow-up care between September2012 to August2016 at PMTCT clinics and for which a confirmatory HIV test was done.

4.5 Inclusion and exclusion Criteria

4.5.1 Inclusion Criteria

Infants whose mothers were enrolled in the PMTCT program were included. HIV exposed infants who had confirmatory HIV at 18 months of age and with complete data were included.

4.5.2 Exclusion Criteria

HIV exposed infant without confirmatory test during the study period (September 2012 to August 2016) and who had no complete data also excluded.

4.6 Sample size determination

The sample size was calculated using proportion of 15.7 % rate of maternal to child transmission which was obtained from a study conducted in Dire Dawa (18).The proportion used was 15.7 % to get the maximum sample size at 5% marginal error with 95% confidence.

Then using these assumptions the sample size was calculated by applying the formula of single population proportion.

i.e. $$n = \frac{(Z\alpha/2)^2 P(1-P)}{d2}$$

$$= \frac{(1.96)2 \times 0.16 \times 0.84}{(0.05)2}$$

$$= 207$$

Including non-response rate of 10 % of the sample =21

207+21= 228

n = the required sample size

P = assumed proportion of maternal to child transmission

Z= standard score corresponding to 95% confidence interval

d = allowable marginal error

4.7 Sampling technique

In Addis Ababa city administration there are 10 sub cities found the three sub cities; Lideta, NifasSilkeLafto and Arada were selected using simple random sampling. In the three selected Sub cities there are 24 health centers from which 10 were selected using simple random sampling technique.

From the Health centers' registry, the total number of HIV positive mothers who had children aged at least 18 months during September 2012- August 2016 was 1050 from which the study sample was drawn. HIV exposed mothers-infants pair on care and follow up at the PMTCT clinics at the Health centers'.The determined sample is proportionally allocated to each health centers. Each study subjects were selected by systematic random sampling in every k interval.

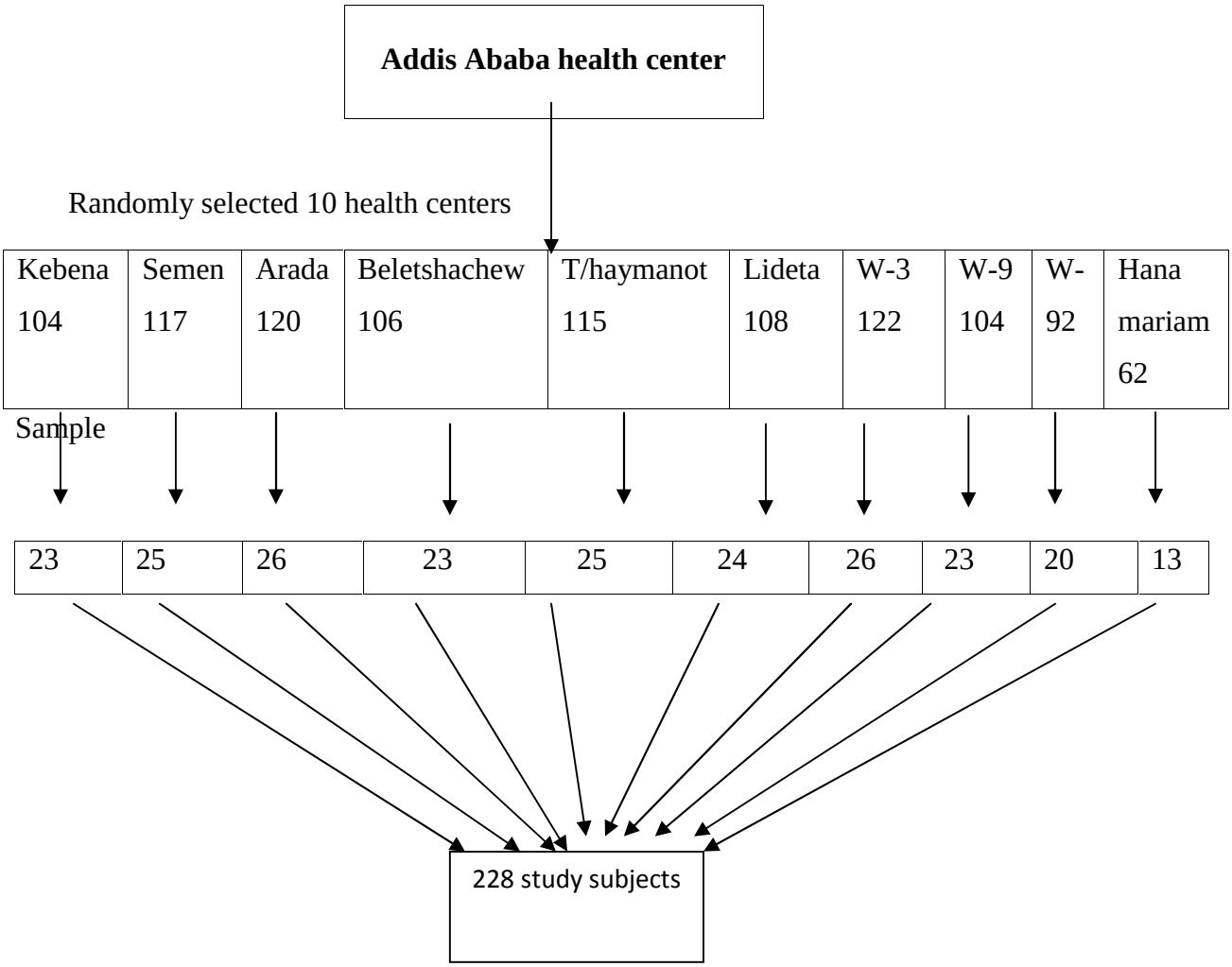

Figure 2. Proportional allocation of study subject

4.8Study Variables

4.8.1 Dependent Variable

- HIV transmission rate

4.8.2 Independent Variables

- Socio demographic characteristics,
- Mothers (ANC, illness during pregnancy, ARV prophylaxis, ART, CD4 count done)
- Place of delivery and Mode of delivery, infant feeding practice,
- Intake of ARV prophylaxis by infants.
- Infants age at which DBS was done

4.9 Data collection instrument and procedure

Data extraction sheet was used to collect data. The data extraction sheet was adapted from the national standard HIV exposed infant follow up chart and PMTCT registration log book which included, socio-demographic characteristics (mother age, marital status, level of education, infant age, sex of infant, birth weight), the PMTCT interventions offered to the mother and her infant, DNA/PCR test done, test results and the first 6 months feeding option of HIV positive mothers for her infant.

The data collection was conducted by the health centers staff nurses working in PMTCT department using the structured data extraction sheets. The data collectors started the data collection after they have been given training for two days. The data was collected by reviewing mothers' PMTCT and exposed infants' care and follow-up records at PMTCT clinic.

4.10 Data Quality Control procedures

The data collection was conducted under close supervision of the principal investigator. The data was collected by reviewing mothers' PMTCT and exposed infants' care integratedregister book at the PMTCT clinic.

Training was given for the data collectors for 2 days prior to the pretest and for 1 day after the pretest. The training included how to collect data, general objective, relevance of the study, and confidentiality of information. The training was conducted in the form of discussion going through the data extraction sheet. To assure the data quality the principal investigator has been with the data collectors' throughout the data collection making sure they are properly doing so. Moreover; the principal investigator has checked all the collected data for completeness, consistency, and clarity during data management, storage, and analysis.

The pre-taste was conducted on a total of 10% of the sample size at Bole 17 Health Centre. The data extraction format has passed through a pre – test, to make sure it measured what it is intended to measure. After the pre-testing the data extraction format was checked for its clarity, simplicity, understandability and coherency. Correction was made based on the feedback from the data clerks.

To make sure the quality of the study the participants of the pre-test were not included in the actual study.

4.11 Operational definition of terms

- **Mother to child transmission**: transmission of HIV from HIV positive mother to her infant during pregnancy, delivery and during breastfeeding.
- **Safe infant feeding**: Feeding practices that would lead to a healthy, well-grown, able, live, HIV-free child who has no underlying morbidity resulting from incorrect feeding practices.
- **Prevention of mother to child HIV transmission**: Are prevention activities that prevent women from being infected by virus, preventing unwanted pregnancy in sero-positive mothers, preventing the virus transmission to the baby during pregnancy, labor and delivery or breastfeeding and provision of care and support.
- **Vertical transmission**: Is when the HIV virus passes from an HIV positive mother to her baby. This can happen during pregnancy, during labor and delivery or during breastfeeding.
- **HIV-exposed infant**: Infant born to an HIV-positive woman.
- **Infant**: A person from birth to 12 months of age.
- **Antiretroviral therapy (ART**): Is use of 3 or more ARVs simultaneously to treat HIV infection.
- **ARV prophylaxis:** short term use of ARV drugs in the mother and/or infant to reduce MTCT.
- **Positive infant:** infant with positive Antibody HIV test result.

4.12Data processing and analysis

The collected data was checked for its completeness then coded and the data entry and analysis was done using SPSS version 20. Descriptive statistics was used to describe each individual variable using mean, standard deviation and other methods. To test whether there is relationship between dependent variables and independent first checked by binary regression and then if the p value is ≤ 0.2 then proved by multiple regression to rule out confounding variables.AOR with their 95% CI were calculated. Variables with a p value less than 0.05 were considered as determinant factors for exposed infant HIV sero-status. Finally data wasinterpreted and summarized using simple frequency tables.

4.13Ethical consideration

Letter of ethical clearance was obtained from the ethical review committee of school of Nursing and Midwifery, Addis Ababa University. As well Letter of ethical clearance was obtained from

Addis Ababa Public Health Research and Emergency Management Core Process. Since the study utilized routinely collected, aggregated data at the health centers' database, obtaining informed consent from individual patients was not possible. But, institutional permission letter was requested and attained to review records of HIV positive mothers and their infants.

Confidentiality of patient information was ensured as the names or identification number of study participants wasn't included in the data extraction format and the extracted data from charts won't be subjected to third party.

5. RESULTS

5.1. Socio demographic characteristics of the study population

A total of 228 study participants were included with a response rate 100%. Majority 78.1%of the mothers in the study were aged < 30 years with mean age of the study participants for this study28.21 years and SD±4.081. Regarding to educational level near to three fourth of the mothers' 160 (70.2%) have attained primary school. The majority of participants (81.1%) were married and 62 % of the women were multiparity (Table 1).

Table 1: Socio-demographic characteristics of mother, at selected health centers Addis Ababa, Ethiopia (N=228)

Variable	Frequency (n)	Percentage
Age of Mother		
≤ 30	178	78.1
> 30	50	21.9
Level of education of mother		
Illiterate	16	7.0
Read and write	5	1.8
Primary school	161	70.2
Secondary school	42	18.4
Tertiary School	3	1.3
Non recorded	3	1.3
Marital status		
Single	14	6.1
Married	185	81.1
Separated/divorced/widowed	29	12.7
Parity		
Primi-parity	86	37.7
Multi parity	142	62.3

5.2. PMTCT interventions for the mother

Regarding to CD4 counts of the mother taken before the last pregnancy, 24.1% were less than 350mm^3, while 28.4%, 16.2% were 350- 500 mm^{3}and greater than 500 mm^{3}respectively.Of the total mothers participated in the study, only 134 (58.8 %) of them were on ARV prior to this pregnancy. Around 225(98.3%) have attended at least 1 antenatal care visit during this pregnancy. For 91(39.9%) of the mothers ART was initiated during this pregnancy. Of the mothers who delivered at health facility; 188 (82.5%) had normal deliver whereas 39 (17.1%) had caesarean section. (Table 2)

Table 2: PMTCT intervention for the mother, at selected health centers Addis Ababa, Ethiopia, (N=228)

Variable	Frequency(n)	Percentage (%)
Mother had CD4 counts taken before last pregnancy		
Yes	134	58.8
No	92	40.4
Non recorded	2	0.9
Mother's CD4 Count		
< 350 mm^3	55	24.1
350- 500 mm^3	42	28.4
> 500 mm^3	37	16.2
Antenatal care clinic attended		
Yes	225	98.3
No	0	0
Non recorded	3	1.3
Number of ANC visit		
1	1	0.4
2	26	11.4
3	63	27.6
4	135	59.2
Mother on ARVs prior to this pregnancy		
Yes	134	58.8
No	92	40.4
Non recorded	2	0.9

Drugs of ARVs taken by mother prior to this pregnancy		
HAART	134	58.8
ART drugs were initiated		
During pregnancy	91	39.9
After delivery for a short period of time	2	0.9
Missing (Diagnosed before current pregnancy)	135	59.2
Gestational age at diagnosis		
8-15 Weeks	22	9.6
16-23 weeks	27	11.8
24-31 Weeks	12	5.3
32 -39 Weeks	5	2.2
Missing (Diagnosed before current pregnancy included both on HAART and not)	162	71.1
Illness during pregnancy		
Yes	53	23.2
No	172	75.4
Non recorded	3	1.3
WHO stage of mother		
I	156	68.4
II	59	25.9
III	11	4.8
IV	2	0.9
TB status of the mother		
Positive	1	0.4
Negative	227	99.6
Syphilis test result		
Reactive	1	0.4
Non-reactive	226	99.1
Not done	1	0.4
Where did mother deliver?		
Health facility	219	96.1
Home	8	3.5
Non recorded	1	0.4
How did mother deliver child?		
Normal delivery	188	82.5
Elective caesarean section	39	17.1
Non recorded	1	0.4

5.3. PMTCT interventions for the infant

According to this study225 (98.7%) of the infants have received prophylaxis whereas 2(.9%) haven't received. Of the total of the study subjects 220(96.5%) had exclusive breast feeding for the first six months of their life, whereas 8 (3.5%) of the exposed infants has exclusive replaced formula.

In relation to HIV test, all of the children 228 (100%) have been tested for HIV. Five (2.2%) of the tested children are on ART and 112(49.1%) were Male and 104 (45.6 %) were female by sex (Table 3).

Table 3: PMTCT intervention for the exposed infant, at selected health centers Addis Ababa, Ethiopia (N= 228)

Variable	Frequency (n)	Percentage (%)
Infants weight at birth		
< 2.5 Kg	7	3.1
> 2.5 Kg	187	82.0
Non recorded	34	14.9
Sex of infant		
Male	112	49.1
Female	104	45.6
Non recorded	12	5.3
Infant feeding options		
Exclusive breast feeding	220	96.5
Exclusive replaced formula	8	3.5
Child received ART prophylaxis		
Yes	225	98.7
No	2	0.9
Non recorded	1	0.4
Drugs given((prophylaxis)		
NVP syrup	225	98.7
Non recorded	3	1.3
Child tested for HIV		
Yes	228	100
No	0	0

Result of the test		
Negative	223	97.8
Positive	5	2.2
CD4 done HIV Positive infant		
Yes	0	0
No	5	2.2
Child is on ART		
Yes	5	2.2
No	223	97.8
If on treatment, drugs given		
AZT, 3TC, NVP	5	2.2
Age of child DBS done		
≤ 6 Weeks	195	85.5
> 6 weeks	33	14.5

5.4 Outcome of the HIV exposed infants

Among participant exposed infants who had HIV test, 5 (2.2 %) were reported having positive results. Status of those children at the age of 18 months also remained the same 5 (2.2%) were found HIV positive (Table 4).

Table 4: Outcome of HIV exposed infants, at Selected health centers Addis Ababa, Ethiopia (N=228)

Variable	Frequency (n)	Percentage %
HIV test result		
Negative	223	97.8
Positive	5	2.2
DBS result		
Positive	3	1.3
Negative	225	98.7
Status of the child after 18 months		
Positive	5	2.2
Negative	223	97.8

5.5 Factors associated with HIV status among HIV exposed infants

Bivariate and multivariate analysis was performed between HIV status (dependent variable) and each independent variable. Binary Logistic regression was performed to assess the association of each independent variable with HIV status. The factors that showed a p-value of 0.2 and less were added to multivariate regression model. In multiple logistic regression analysis p-value of less than 0.05 were considered for association and initiation time of drugs for mother was significantly associated with HIV status.

Children those their mother with HIV and started ART drugs during pregnancy were 0.32 times {**AOR=0.32, 95%CI (0.015-0.74)}** less likely to be HIV positive compared to children those their mother with HIV and started ART drugs after a delivery for a short period of time

Table 5: Factors associated with HIV status of exposed infants in health centers, A.A, Ethiopia (n=228).

Variable	**HIV status**		**COR, 95%CI**	**AOR, 95%CI**
	Positive	**Negative**		
Age				
≤ 30	4 (80%)	174 (78%)	1.12 (0.12-10.31)	1.02 (0.54-9.48)
> 30	1 (20%)	49 (22%)	1	1
Parity				
Primi parity	1(20%)	85 (38.1%)	0.46 (0.045-3.69)	0.73 (0.23-2.61)
Multi parity	4 (80%)	138 (61.9%)	1	1
Drugs were initiated for mother				
During pregnancy	2 (66.7%)	89 (98.9%)	**0.02(0.001-0.502) ***	**0.32 (0.015-0.74)****
After a delivery for a short period of time	1 (33.3%)	1 (1.1%)	1	1
Feeding option				
Exclusive breast feeding	4 (80%)	216 (96.9%)	2.77 (0.87-8.84)	2.37 (0.89-9.36)
Exclusive replaced formula	1 (20%)	7 (3.1%)	1	1

NB * P<0.2 significance level **** P<0.05 significance level**

COR Crude odd ratio **AOR Adjusted odd ratio**

6 DISCUSSIONS

This facility based retrospective study has attempted to assess the prevalence of HIV infection among exposed infants on care and follow-up in selected health centers, Addis Ababa Ethiopia.

The study found that the prevalence of HIV infection among exposed infants on care and follow-up was 2.2%. This finding was the same with the finding reported in Nigeria where 2.1% of infants those exposed had HIV positive status (46). However, relatively high number of prevalence of mother- to-child transmission rate of HIV infection was reported in the study conducted in Cameroon which was 11.6 % (47). The difference of the result might be due to difference of the study location and time of the study conducted. The Cameron report shows that it was conducted before four years and the current study may be due accessibility of information that may have influence on increasing of skilled birth attendant that can have impact on the transmission of HIV to child from mother.

In the current study almost half of the involved infants were male and majority of the mothers of children were married. This was comparable with the study conducted in the Assela and Cameroon where half of the male infants and majority of the married mothers were involved in the study (48, 47).

Regarding to the type of breast feeding option, in the present study around 96% of infants were exclusively breast fed. This finding was inconsistent with finding reported in the study conducted in Cameroon where about 44% of infants were exclusively breastfed(47).This difference could be due to difference of geographical location and improvement on the accessibility of updated information on the benefits of exclusive breast feeding

In the regression model the factor that was not significantly associated withthe prevalence of mother- to-child transmission of HIV infection was maternal educational level. Association of maternal education documented in this study finding was inconsistent with the findings in the study conducted in Arbaminch where maternal educational level had a statistical association (P, 0.001) (4).

Anti natal care visit, number of visit and age were not significantly associated with mother to child transmission of HIV. This result was consistent with the study in Assela, Adama, Bishoftu Hospital and Malawi (48, 49).

7. Limitation and strength

7.1 Strength

- There is high response rate in this study
- Give information on prevalence of MTCT of HIV
- Resources for next researchers.

7.2 limitations

- Since the data was secondary there was difficult of controlling missing values.

8. Conclusion

The study revealed that very low prevalence of mother to child transmission of HIV. This shows the strength of current PMTCT program. The chance of HIV transmission of mother to child was high among those started ART drugs after delivery for a short period of time. There is a need to maintain current implementation of prevention of mother to child transmission program to help ensure that continually maintain low MTCT of HIV prevalence.

9. Recommendation

Based on the finding of the study the following important recommendation is forward respective body on decreasing MTCT of HIV and researchers who are engaged in this area. Therefore this study recommend for:-

Health care providers

Giving attention of health care providers on providing health education for mothers is necessary on timely initiation of ART to decrease the transmission of HIV from mother to child.

Other researchers

Other research should be done to identify the time of mother to child transmission occurred (pre-partum, intra partum or post-partum period) in order to focus on the specific intervention that will have a positive impact on the prevention of mother to child transmission of HIV.

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Appendix I: Data extraction Sheet

Introduction: This information extraction sheet is adapted from the national PMTCT registration log book by the principal investigator whose main aim is to assess retrospectively Mother-to-Child Transmission of HIV Infection and its associated factors among Exposed Infants on Care and Follow-Up**.** The investigator is adult health nursing student at AAU.

The study will be conducted by reviewing the health centers PMTCT and infant follow-up records of each selected health centers. The information that will be collected from this research study will be kept confidential and will be used for the research purpose only. The identity of the selected study subjects will not be mentioned in the study or any other publication in relation to this study.

The data collectors will take the information from the registry of the specific health facility after a random selection is done.

Directions: Based on the information from the registry complete the following questions.

Name of health institution:_____

Date:_____ Time:_____

Department/unit:_____ Code number of the tools_____

Part I: socio demographic characteristics of the mother

Mother / infant code number _____ / _____

1.	What was the age of the mother? _____years (in completed year)
2.	What was the level of education of the mother? A. Illiterate B. Read and write C. Primary D. Secondary E. Tertiary F. Not recorded
3.	What was the marital status of the mother? A. Single B. Married C. separated/ divorced/ Widowed D. Not recorded
4.	What was the parity of the mother? A. prim parity B. multiparty C. Not recorded

Part II: Information to be extracted from Maternal Records

5.	Did mother have CD4 counts taken before last pregnancy? A. Yes B. No C. Not recorded

6.	If yes for question number 5, what was the CD4 count in----------no_/mm3?
7.	Antenatal care clinic attend? A. Yes B. No C. Not recorded
8.	If yes for question number 7, how many visits? _____
9.	Were the mothers on ARVs prior to pregnancy with this infant? A. Yes B. No C. Not recorded
10.	If yes for question number 9, please specify which ones? A. AZT + 3TC during pregnancy B. Sd-NVP at the onset of labor C. HAART (1c,1e,1d,1f) D. None taken E. Not recorded
11.	When ART drugs initiated for the mother? A. During pregnancy B. During labor/ delivery C. After delivery for a short period of time D. During breastfeeding E. Not recorded
12.	What was the gestational age at the time of diagnosis? _____
13.	Is there any illness during pregnancy? A. Yes B. No C.Not recorded

14.	What was the WHO stage of the mother? A. I B. II C. III D. IV E. Not recorded
15.	What was TB status of the mother? A. positive B. negative C. Not recorded
16.	What was syphilis test result of the mother? A. reactive B. non-reactive C. not done D. Not recorded
17.	Where did mother deliver? A. health facility B. Home C. Not recorded
18.	How did mother deliver the child? A. Normal delivery B. elective Caesarean section C. Emergency Caesarean Section D. Not recorded
19.	Infant feeding practice within the first 6 months of life? A. Exclusive breast feeding B. Mixed feeding C. Exclusive infant formula milk D. Not recorded

Part III. Information to be extracted from infant health records

20.	What is sex of infant? A. Male B. Female C. Not recorded
21.	What was the infant birth weight? _____
22.	Did child receive ARV prophylaxis? A. Yes B. No C. Not recorded
23.	If yes for question number 23, What drugs were given for the child? A. NVP syrup B. AZT syrup C. AZT+ 3TC D. Not recorded
24.	Has the child been tested for HIV? A. Yes B. No C. Not recorded
25.	If yes for question number 25, what is the HIV test result? A. Negative B. Positive C. Not recorded
26.	If question number 26 is positive, has CD4 been done for the child? A. Yes B. No C. Not recorded
27.	If CD4 test done, please state the result -----?

28.	Is child is on ART for treatment? A. Yes B. No C. Not recorded
29.	If on treatment, please state drugs given for the child? A. AZT, 3TC, NVP B. AZT, 3TC, LPV/R C. ABC, 3TC, NVP D. Other specify……. E. Not recorded
30.	What was the DBS result? A. Positive **B.** Negative C. Not recorded
31.	At what age was DBS (DNA/ PCR) done? _____
32.	What was the status of the child after 18 months? A. Positive B. Negative C. LTFU D. Drop E. Dead (if died write date of death) F. Not recorded

Name of data collector _____ Signature: _____Date:_____

Supervisor's Name: _____Signature:_____ Date: _____