COLLEGE OF HEALTH SCIENCES

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DEPARTMENT OF NURSING

HIV Sero_status outcomes and associated factors among HIV-exposed children at selected public hospitals in Addis Ababa, Ethiopia, 2024. Retrospective Cross-Sectional Study

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A research thesis to be submitted to Addis Ababa University, College of Health Sciences, School of Nursing and Midwifery, Department of Nursing in partial fulfillment of requirements for Master of Science in Pediatrics and Child Health Nursing

June 2024

Addis Ababa, Ethiopia

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POST GRADUATE PROGRAM

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APPROVAL SHEET

ADDS ABABA UNIVERSITY

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I, the undersigned MSc pediatric and child health nursing student hereby declares that, for the purpose of this examination, I have presented my original work on the topic HIV Sero_status outcomes and associated factors among HIV-exposed children at selected public hospitals in Addis Ababa**,** for the examination.

Submitted by: Habtamu Walle

Signature: _____ Date: _____

This thesis work has been submitted for examination with my approval as an advisor.

Examiner_____

Signature_____ Date_____

Approved by:

1. Principal advisor

   Dr. Habtamu Abera , Signature: _____Date: _____

2. Co-Advisor

   Mr. Mekonen Adimasu, Signature: _____Date: _____

STATEMENT OF DECLARATION

I certify that the work in this thesis is entirely original by signing my name below. I have prepared, collected, analyzed, and finished this thesis in accordance with the ethical guidelines for scholarship. Every academic source that the thesis contains has been acknowledged with a citation. I certify that every source I utilized for this paper was credited and referenced. This thesis has been prepared with great care to prevent plagiarism. This thesis is submitted in partial fulfillment of the degree of master in pediatric and child health nursing to AAU. I would like to declare that this thesis has not been submitted to any other institution anywhere for the award of any academic degree, diploma or certificate.

Principal investigator: Habtamu Walle, Signature: _____ Date: _____

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2. Mr. Mekonen Adimasu, Signature _____Date_____

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ACRONYM AND ABBREVIATIONS

AAU	Addis Ababa University
AOR	Adjusted odds ratio
ART	Anti-Retroviral Therapy
CI	confidence interval
COR	crude odd ratio
EDHS	Ethiopian Demographic Health Survey
GMH	Gandhi Memorial Hospital
HIV	Human Immunodeficiency Virus
PMTCT	Prevention of mother–child HIV transmission
SPHMMC	St. Paul's Hospital Millennium Medical College
SPSS	Statistical Package for Social Sciences
TASH	Tikur Anbessa Specialized Hospital
USAID	United States AIDS Program
ZMH	Zewditu Memorial Hospital

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ABSTRACT

Background-: HIV/AIDS can impact any age group and it is the major cause of pediatric morbidity and mortality worldwide. A substantial number of children are exposed to the virus through vertical transmission from their HIV-positive mothers. Government programs are aimed at eliminating new HIV infections in children. However, challenges persist in identifying and linking all HIV-exposed infants to early infant diagnosis and care.

Objective: To assess HIV Sero_status outcomes and associated factors among HIV-exposed children in Addis Ababa selected public hospitals 2024.

Methods: A cross-sectional study was done using 244 HIV-exposed children from HIV infected mother who were on follow up from January 2018 to December 2023 and enrolled in four public hospitals. The data extraction sheet was taken from the national standard for HIV-exposed newborn follow-up chart. The abstracted data was imported into Epi data and exported to SPSS version 26.0 for analysis. A binary logistic regression model was used to fit each variable. Variables having p values <0.25 in the bivariable analysis were included in the final multivariable analysis. A p-value of less than 0.05 and a 95% confidence range was used to indicate significant associations.

Results: Among 244 HIV-exposed infants, 10(4.1%) were diagnosed as HIV positive. Children who were received cotrimoxazole preventive therapy {AOR 0.89=, 95%CI (0.02-0.79)} and Children born at health facility 91.2% {AOR 0.088=, 95%CI (0.01-0.58)} were the major factors associated with positive HIV sero -status among HIV-exposed infants.

Conclusion and Recommendation: The level of HIV infection among infants born to HIV-positive mothers is high as compared to the national and WHO goals. Health care practitioners should give mothers with high-quality integrated information on the timely starting of cotrimoxazole, institutional delivery, for all HIV-exposed infants.

Key Words: HIV exposed infant, prevention of mother_to_child transmission

1. INTRODUCTION

1.1 Background

Human immunodeficiency virus (HIV) is an infection that attacks the body's immune system and Acquired immunodeficiency syndrome (AIDS) is the most advanced stage of the disease(1). Every year, about 1.3 million women living with HIV become pregnant worldwide(2). In any absence of intervention, an HIV-positive mother has a 15% to 45% probability of transmitting the virus to her unborn child during pregnancy, labor, delivery, or breastfeeding .In 2022, antiretroviral therapy was accessible to 85% of women and girls globally(3).

Compared to women in other locations, in sub-Saharan Africa have a disproportionately burden of HIV in women (4). Approximately 70% of infection with HIV globally are located in this region, with women responsible for sixty percent of infections, and gaps in clinical treatment of women and newborns suffering from HIV-related problems in urban as well as rural areas(5). Exposed-exposed children mean that your baby has been in contact with the HIV virus, but we do not know whether he/she is HIV-infected.

Transmission from mother to child of HIV in children remains a serious worldwide health concern, particularly in Sub-Saharan Africa, since it accounted for 90% of all new pediatric HIV infections globally in 2020(6). in sub-Saharan Africa, with over 700,000 people currently living with HIV including 57,000 children(5) .HIV-exposed newborns are more likely than their HIV-unexposed peers to experience poor growth, developmental delays, and mortality, according to recent research in sub-Saharan African nations such as South Africa, even in cases where PMTCT intervention uptake is high(7).

Ethiopia has an HIV/AIDS burden, estimated number of women affected by HIV of more than 245,000 in 2018 (11). As a result, a significant percentage of HIV-exposed newborns in the country are at risk of acquiring the infection themselves (8). A substantial number of children are exposed to the virus through vertical transmission from their HIV-positive mothers. The widespread implementation of PMTCT programs has reduced MTCT rates, yet challenges remain. In Ethiopia, MTCT rates were estimated at 9.93% in 2018, demonstrating the ongoing need to identify and address barriers to successful PMTCs(9).

Considerable progress has been made in preventing PMTCT nationwide, reducing transmission rates from 27% in 2011 to 8% in 2020 (10). However, an estimated 57% of pregnant women still do not access antiretroviral therapy (11). There has been progress in preventing MTCT in Ethiopia through expanded ART programs. However, Identifying and linking HIV-exposed to early infant diagnosis and care services without intervention remains challenging(3).

The prevention of mother-to-child transmission services for Ethiopia has increased through expanded antiretroviral therapy programs. However, challenges persist in identifying and linking all HIV-exposed infants to early infant diagnosis and care. National programs seek to eliminate new pediatrics infections with HIV by 2030. data on outcomes among HIV-exposed children urban areas, where transmission risk is highest, remain limited(12) .

Addis Ababa faces an even greater burden, contributing nearly one-third of the national HIV incidence estimated at 2.4% among reproductive age women (13). Challenges in urban settings include higher costs of living, overstretched services in informal settlements, and stigma preventing optimal care-seeking (14). Although government programs are aimed at eliminating new HIV infections in children, but there is a lack of information on the consequences of HIV exposure in newborns in cities such as Addis Ababa are limited. Early identification and intervention are crucial in reducing the impact of HIV on children's health. While there have been significant advancements in avoiding HIV transmission from mother to child. limited attention has been given to the outcomes and factors associated with HIV-exposed children (14).

1.2 Statements of the Problem

HIV/AIDS affects all age groups and is the leading cause of pediatrics morbidity and mortality globally.(15). The majority of HIV infections in children under the age of 15 are transmitted from mother to child. (16). In 2009, before the implementation of the global strategy, the total transmission of HIV from mother to child rate was 28% in 21 target nations, including Ethiopia, and it was decreased to 14% by 2014(2).

MTCT of HIV is a critical public health concern in Sub-Saharan African countries(17). The spread of HIV remains a serious public health problem, especially in Sub-Saharan Africa. HIV-exposed infants; those delivered from HIV-positive mothers face particular challenges that can impair their health outcomes during the critical early months of life (40). Early identification of

health issues and Interventions are critical considering that over 50% of under-five deaths occur in their first year among untreated HIV-exposed children in Sub-Saharan Africa. (5).

MTCT is responsible for 95% of pediatrics HIV infections, and the risk of transmission increases significantly if the mother is not treated(18).Mother-to-child transmission of HIV remains one of the greatest challenges in the country's response to HIV(9). Despite attempts to eliminate pediatrics HIV in Ethiopia, transmission from mother to child of HIV remains a challenge, and HIV-exposed newborns suffer an increased risk of poor health outcomes in their early years of life(3).

Previous studies in Ethiopia have shown that suboptimal antiretroviral therapy adherence and Delay in caring of pregnant or breastfeeding mother might increase the risk of MTCT. Additionally, socioeconomic barriers such as low maternal education and rural residence are associated with worse infant outcomes(19).Studies have shown that HIV disease progression is highest among untreated infants in the first 2 years, leading to high morbidity and mortality (20). However, Ethiopia has accomplished a tremendous scale-up of prevention of mother-to-child transmission programs, with more than 80% coverage nationwide(1).

A recent review revealed that in addition to PMTCT exposure, other socioeconomic and clinical factors influence infant HIV-free survival, yet associated factors are understudied in the Ethiopian context (21). Early identification of health issues among HIV-exposed infants is critical given their elevated risk of poor outcomes in the first years of life(22). However, data on the clinical profile and associated factors among this vulnerable group in Ethiopia remain limited (23). With birth cohorts comprising more than 30% of the population, better characterizing HIV disease progression, nutritional status, and their predictors among HIV-exposed children is essential for evidence-based optimization of pediatric HIV management guidelines(24).

A recent study revealed that only 64.84% of exposed infants in Ethiopia were able to receive early infant diagnosis and follow-up treatment within the first two months of life (25). Despite this, there are limited data regarding the current clinical profile, developmental milestones, nutritional status and factors associated with HIV-exposed infants especially in Addis Ababa(26)
.

Assessing the HIV sero _status outcomes and associated factors among HIV-exposed children is crucial for understanding the impact of HIV infection and intervention on vulnerable populations. This study provides light for the efficacy of mother-to-child transmission prevention programs, as well as the overall health of those children.

In Ethiopia, few researches have attempted to show the risk of HIV transmission from mother to child .However, they were either confined to a single dataset or used relatively remote data. This research can contribute to the existing knowledge base and provide evidence-based recommendations for interventions and policies that can improve the health and well-being of HIV-exposed children in Addis Ababa.

1.3 Significance of the study

Understanding the outcomes of HIV-exposed children helps to identify the specific needs of the population and enables the development of comprehensive support services tailored to address their medical, psychosocial, and educational requirements. In this study, HIV-exposed infants and infants' mother benefited in one way or another.

Information on HIV PMTCT is important for those who work in the prevention of HIV, and PMTCT programs use the results of this study to prioritize interventions, particularly in resource-limited settings such as Ethiopia. This study will help health policy makers and responsible bodies such as Woreda, zonal and regional health bureaus and the country at large plan necessary public health measures and interventions for the prevention of mother-to-child HIV transmission so that it will help them eliminate MTCT.

This study contributes to improved education and health professionals' skills and knowledge on PMTCT; identifies factors independently associated with HIV MTCT; provides input for interventional planning; and allows researchers to assess the impact of various interventions, such as early initiation of ART, prophylaxis against opportunistic infection, and nutritional support. This information will help refine and improve interventions to optimize the health outcomes of HIV-exposed children.

In conclusion, this study provides critical insights into the effectiveness of interventions, informs policy and guidelines, and helps improve the overall well-being of vulnerable populations.

2. LITERATURE REVIEW

2.1 Outcomes of HIV-exposed children

According to a study done in a Brazilian hospital, the prevalence of HIV transmission from mother to the child were 2.0% (27). A prospective cohort research conducted in Vietnam revealed that newborns exposed to HIV had a transmission rate of 8.9%(28). According to an Indian systematic review that the prevalence of HIV through MTCT in India were 8.76 %(29).

In 2016, Nigeria's mother-to-child transmission rate was 3.2%.(30). In Sub-Saharan Africa, infants who were exposed to HIV had an HIV prevalence of 7.8% (31). A retrospective review in South Africa revealed a 2.1% MTCT rate(32). In 2020,A meta-analysis study revealed that the prevalence of vertical HIV infection among HIV-exposed newborns in East Africa was 7.68 (33). A study conducted in Kenya showed a 15% mother-to-child transmission rate among women aged 15 to 54 years.(33).

In 2018, Ethiopia's MTCT-related HIV incidence among follow-up women was 9.93%, with a greater incidence in the Dire Dawa City Administration (15.7%) and lowest rates in the Southern Nations, Nationality, and Peoples Region (9). A 2020 study in Ethiopia found an overall positivity rate of 2.6% among infants born to HIV-positive mothers, with the greatest positivity rate (3.9%) in Oromia and the lowest (0.0%) in Afar and Benishangul Gumuz areas(34).

According study conducted in 2017 done at Amhara regional state referral hospitals, the prevalence of HIV transmission among exposed infants was 2.3% at enrollment and 3.7% at program completion(35). According to Gonder's study, the proportion of HIV-positive infants born to HIV-positive mothers was 5.5%, a decrease from the previous 10.2%(36). The incidence of HIV transmission from mother to child was 3.8% in Dessie town healthcare institutions(37).

A cross-sectional study conducted in public health facilities in Mekelle City, 2020, showed that overall MTCT rate of transmission of HIV among exposed children was 3.6%.

A cross-sectional study conducted in public health facilities in Mekelle City, 2020, showed that overall MTCT rate of transmission of HIV among exposed children was 3.6%.(38). A retrospective cohort study conducted in Dire Dawa City, Eastern Ethiopia, showed that maternal-to-child HIV transmission was 15.7% (39). A retrospective chart review

research done in the Oromia Regional State, indicated that the incidence of HIV among HIV-exposed children was 7.70 %(40). A 2020 research in the South Omo Zone indicated that the prevalence of transmission of HIV among exposed children was 3.8%.(3).

In a cross-sectional survey done in 2020 Addis Ababa, the prevalence of infected with HIV mother-to-child transmission was 5.1%(41). Another cross-sectional research study in Addis Ababa revealed that HIV-positive children comprised 8.9% of HIV-exposed infants.(42).`.

2.2 Factors associated with mother-to-child transmission of HIV

2.2.1 Socio demographic characteristics

A study done in Romania showed that unmarried HIV-positive mothers had a higher likelihood of transmitting the virus to their children and Rural pregnant mother are two times more likely to pass along HIV to infants(43).

In Nigeria, children born to married or living together parents are less likely to acquire the virus, but pregnant women living in rural areas are twice as likely to transmit the virus to their children. (30). According to a cross-sectional study conducted in Tanzania, in comparison with 5.8% of HIV-uninfected children, 40% of mothers of children with HIV were illiterate, and 25% of mothers were widows, infants are more likely to acquire HIV than older mothers, and mothers who are younger tend to have more HIV-positive children than older mothers(19).

Studies conducted in northwest Ethiopia revealed that infants exposed to HIV who lived in rural regions had an almost four-fold higher risk of acquiring the virus than infants exposed to HIV who resided in urban areas.(36). According to a study done in Gonder town, Amhara regional state, Ethiopia, newborns of uneducated mothers are 1.36 times more likely to acquire HIV than children of educated mothers.(44).

2.1.2 Maternal factors

According to a Tanzanian study, infants born to mothers with HIV with an unsuppressed viral load had a six times higher chance of transferring on the virus to their children than mothers with a lower (suppressed) viral load. Also, infants born to mothers with a CD4 count ≤ 350 had an almost 2.7-fold higher chance of acquiring HIV than infants born to mothers with a CD4 count >350 and also exposed children' mothers who did not undergo ANC follow-up was nearly five times more likely to acquire HIV from their children than infants born to HIV-positive mothers ,WHO clinical stages 3/4, who had a three times higher risk of acquiring the virus.(6). In East

Africa, a systematic analysis showed that children born at home had twice the risk of acquiring (33).

According to a case-control study conducted in Ethiopia, women who gave birth within the home had a by six times higher risk of transferring the infection to their children than mothers who did not, and mothers who did not adhere to ART effectively had a greater than eight times higher (3)
.

A study conducted in Gondar found that infants of mothers who weren't attending ANC had far more likely to be HIV positive(44). A case-control study conducted in 2020 in West Amhara, Ethiopia, showed that mothers with HIV who delivered children at home had been four times more likely than those who delivered at healthcare facilities(45). The number of mothers who delivered via episiotomy was five times greater than that of mothers who delivered via spontaneous vaginal delivery(46).

A case-control study conducted in the West Shewa Zone, Ethiopia, found that at-home delivery increased the likelihood of HIV transmission from mother to child by six times compared to institutional delivery and HIV-exposed mothers who had good adherence to ART and HIV-exposed women with poor adherence were more than four times as likely to get infected with HIV (45). In a retrospective, cross-sectional study conducted in southern Omo, Ethiopia, women who were confirmed as positive but not on antiretroviral therapy before to their current pregnancy were over five times more likely to have a positive for HIV child than women who were on antiretroviral therapy before to their current pregnancy. Women whose received antiretroviral therapy before to pregnancy may have a good understanding about how to take them and may have adhered well to the protocol (3).

A 2020 case-control study conducted in Addis Ababa, Ethiopia, revealed that home delivery increases the likelihood of transmission of HIV from mothers who are positive to their children(42). cross-sectional study that was confirmed in Addis Ababa showed a strong correlation between MTCT and a woman's CD4 count/mm3 lower than 350(41).

2.3.1 Children factors

According to a study performed in Nigeria, infants who were exposed to HIV and who received mixed feeding had a greater proportion and an increased possibility positive for HIV outcomes than infants who were breastfed exclusively; Additionally, underweight infants were more likely

to have HIV-positive outcomes, and infants who did not get ARV prophylaxis or whose status was unknown were more probable than underweight infants (30).

The risk of transmission of HIV was twice as high for exposed children who weren't given ARV prophylaxis as soon as possible after birth, according to a Tanzanian study. Infants who had DBS tests at 6 weeks of age had a 91.1% less likelihood of getting HIV transmitted from their mothers who were HIV-positive than those who did not(47). women who mixed-feed her exposed newborns were 6.22 times likely to contract HIV than mother's who exclusively breastfed, according to a meta-analysis and conducted in East Africa(33).

According to a meta-analysis and systematic review conducted in Ethiopia, infants who were not exclusively breastfed prior to their sixth month of six months of age had a more than seven-fold increased risk of HIV positivity(48). According to a cross-sectional study done in Ethiopia in 2022, mothers with HIV who did not take prophylactic nevirapine were twice as likely to contract HIV as those who did (34). In a research conducted in southern Ethiopia, another factor associated to mother-to-child transmission was found; children who did not get cotrimoxazole therapy had a seven-fold higher risk of contracting HIV than children who were given the treatment (44).

According study in Gondar, mixed-breastfeeding infants were over 5 times more likely to experience than exclusively breastfed children(35). A cross-sectional study conducted in Mekelle revealed that children whose weren't given NVP prophylactic had a higher than of HIV than children who received NVP treatment and the likelihood of acquiring HIV was 4.7 times higher in exposed children who didn't get ARV prophylaxis than in infants who did (38).

According to a cross-sectional study conducted in Addis Ababa, infants obtaining mixed feedings have a higher MTCT risk than those receiving exclusive breast milk (41). Additional study conducted in Addis Ababa showed that infants with low birth weight had significantly increased MTCT (21). According to a study, children born to women who gave birth in health care facilities had a three times higher risk of contracting HIV than children born at home(49).

2.4 Conceptual Frameworks

After reviewing different studies on HIV Sero _status outcomes and factors associated with HIV-exposed children, the following conceptual framework was adapted to show the interaction between socio demographic factors, maternal obstetrics and gynecological factors, infant medical conditions and the associations between dependent and independent variables (3,11,14,20,23,24,26,50,51).

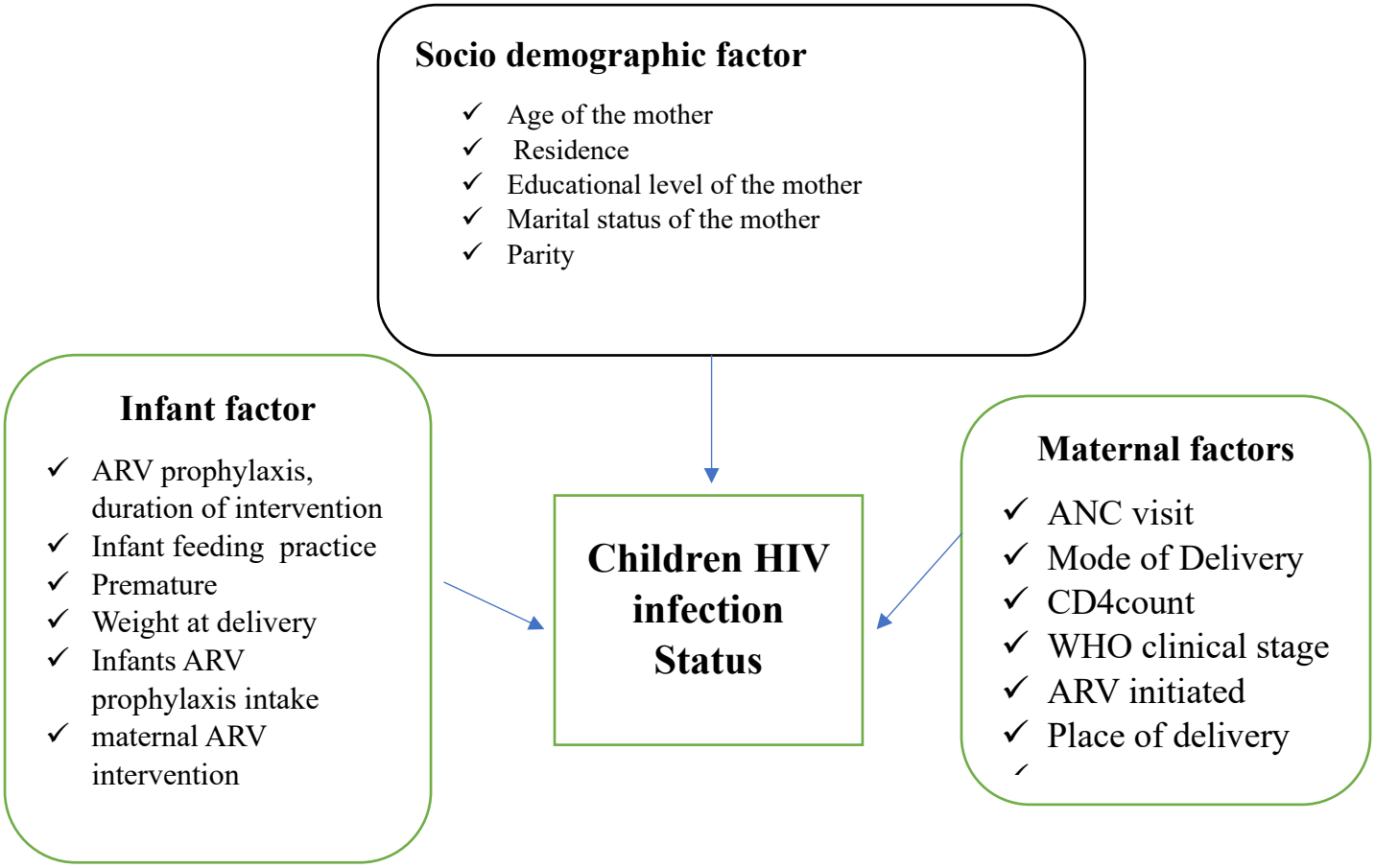

Figure 1: Conceptual framework of HIV Sero _status outcomes and factors associated with HIV-exposed children in Addis Ababa public hospitals 2024

3. OBJECTIVES OF THE STUDY

3.1 General objective

The main objective of the study was to assess the HIV Sero_status outcomes and associated factors among HIV-exposed children at selected public hospitals in Addis Ababa, Ethiopia, 2024

3.2 Specific objectives were

- ✓ To determine HIV Sero_status outcomes among HIV-exposed children at selected public hospitals in Addis Ababa, Ethiopia, 2024.
- ✓ To identify associated factors with the HIV Sero_status outcomes of HIV-exposed children at selected public hospitals in Addis Ababa, Ethiopia, 2024.

4. METHODOLOGY AND MATERIALS

4.1 Study Area and Period

The study was conducted in Addis Ababa, the city and founding headquarters of Ethiopia's African Union. The central statistics office estimates that the city will have eleven sub cities and 3.6 million residents by 2020(52). Totally there are fourteen hospitals in the city out of these six of them controlled under federal government, six of them governed by Addis Ababa city health bureau, one owned by police force and one owned by defense army. This investigation was conducted in four randomly selected public hospitals in Addis and this study was conducted in the city of Addis Ababa at four public hospitals that were selected at random. These are, St. Paul's Hospital Millennium Medical College, Gandhi Memorial Hospital, Zewidtu Memorial Hospital and Tikur Anbessa Specialized Hospital.

Tikur Anbessa Specialised Hospital (TASH) established in 1964 and is located in Lideta Sub City. It houses many outpatient specialization's and subspecialty units. PMTCT is one of these units, and on average, 120 RVI mothers link each year.(53).

St. Paul's Hospital Millennium Medical College (SPHMMC) is one of the government hospitals in central Addis Ababa, located in Gulele Kifle Ketema. It provides inpatient and outpatient services under several disciplines. According to statistics from the health management data base (HMIS), about 165 RVI mothers link annually according to the PMTCT (54).

Gandhi Memorial Hospital (GMH) is run by the Addis Abeba City Administration Health Bureau and specialises in maternity care. The hospital was established in 1951 E.C. According to HMIS data, approximately 180 RVI mothers link each year.

Zewditu Memorial Hospital (ZMH) is a government hospital in Addis Ababa. It provides many service specialties and outpatient sections. There is one yearly PMTCT in these units, and around 117 RVI mothers link each year.

The study period was from March 10–March 30–2024.

4.2 Study Design

An institutional- retrospective cross-sectional study was done.

4.3 Source Population and Study Population

4.3.1 Source population

All HIV-exposed children who were followed up at public hospitals in Addis Ababa

4.3.2 Study population

The study population comprised all HIV-exposed children who had follow-up in randomly selected public hospitals in Addis Ababa.

4.3.3. Study unit

The study unit was each randomly selected HIV-exposed child who had follow-up in selected public hospitals in Addis Ababa.

4.4 Inclusion and Exclusion Criteria

4.4.1 Inclusion criteria

All HIV-exposed children who have undergone a deoxyribonucleic acid-polymerase chain reaction test (DNA-PCR) prior to 18 months of age were included.

Additionally children who had undergone rapid antibody tests had done during follow-up six weeks after cessation of breastfeeding and who had been registered were be included in this study.

4.4.2 Exclusion criteria

HIV-exposed children transferred in or transferred out from health facility.

HIV- exposed children with incomplete data.

HIV-exposed children mother not enrolled in PMTCT.

4.5. Sample Size Determination and procedure

4.5.1 Sample Size Determination

For the first objective, HIV Sero -Status of HIV exposed children, a single population proportion formula used by considering the following statistical assumptions CI = confidence interval among exposed children.

($Z\ \alpha/2$ = Z score of 95% CI,

d = margin of error, 5%).

P = Population proportion of HIV transmission among exposed children, 17.5% in Dire Derwa(9) City, Ethiopia.

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

$(1.96)^2 * 0.175 * 0.825 / (0.05)^2$; thus, 3.84*0.175*0.825/0.0025 = 222

After adding a nonresponse rate of 10%, the total sample size was 244.

A double population proportion formula was used to determine the sample size for the second objective, which was to determine the predictors of HIV positivity. The major predictor variables for this objective were home delivery, mixed infant feeding, mothers in the late AIDS stage, and the absence of maternal PMTCT interventions(8,10,20,23,51). The sample sizes of the second objective were calculated using the open-epi version 7 statistical package as follows.

Table 1: Sample size calculation to assess the outcomes of HIV-exposed children and associated factors for positivity among selected public hospitals Addis, Ethiopia, 2024

Variable	Proportion		Total sample size
	P1	P2	79
Mothers advanced AIDS stage	26.2	10.6	
Absence of maternal PMTCT interventions	45.2	9.6	44
Home delivery	54.5	10.5	100
Mixed feeding	37.5	9.2	99

` Keys; P1- the proportion of exposed children with the outcome

P2- is the proportion of no exposed children with the outcome

Z α/2 is the 95%

CI, Zβ is the 80% power, and r is the ratio of exposed to no exposed children, 1:1.

When the sample sizes of the objectives were compared, the single population sample size was considered for data collection since it provided the maximum sample size. Consequently, the records of 244 mother–child pairs were reviewed.

4.5.2 Sampling technique

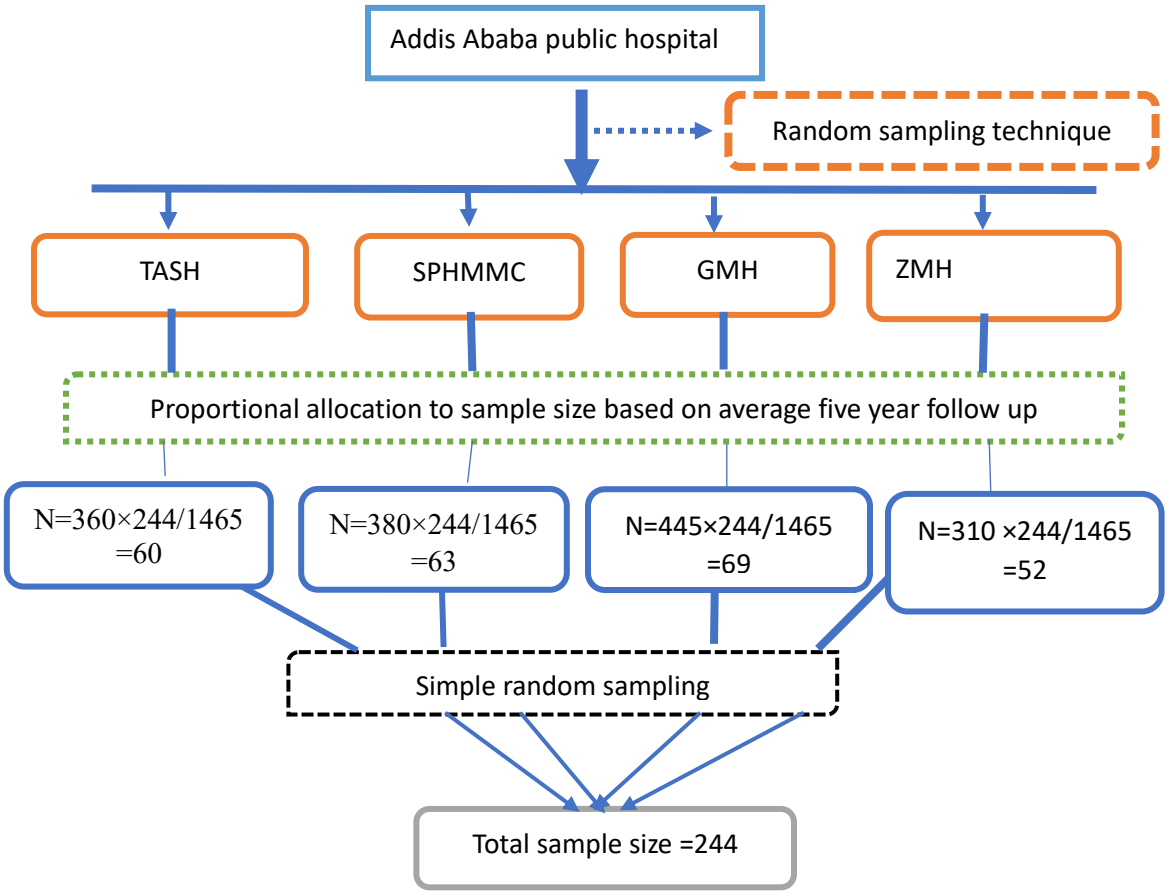

Figure 1: Schematic diagram for sampling procedure for HIV-exposed children who were followed up at public hospitals in Addis Ababa, 2024.

4.6 Operational Definitions

Mother-to-child transmission- the passage of HIV from mother to her child during pregnancy, labor, delivery or breast-feeding (55).

Pre-exposure prophylaxis: medication used by people who do not have HIV but are at high risk of being exposed (56).

ART adherence

ART adherence was calculated based on missed doses. There were three grades Out of 60 doses,

Good: if fewer than 3 of the 60 doses were missed.

Fair: 3–9 doses out of 60 doses were missed.

Bad: more than 9 of the 60 doses were missed (18).

Vertical transmission: The HIV virus passes from an HIV-positive mother to her baby during pregnancy(57).

HIV-exposed infants: Infants born to HIV-infected mothers or HIV antibody-positive infants (18).

ARV prophylaxis: short-term use of ARV drugs in mothers and/or infants to reduce MTCT (56).

Outcome of HIV -exposed infants. The final HIV status of exposed infants after antibody testing or DNA-PCR results.

1. **For non-breastfed infants**: HIV DNA/PCR result for children aged <18 months or HIV antibody test results for children aged ≥ 18 months (18).

2**. For breast-fed** infants: HIV DNA/PCR results for children aged <18 months after cessation of breast feeding or HIV antibody test results for children aged ≥ 18 months' six weeks after cessation of breast feeding (57).

4.7 Study Variables

4.7.1 Dependent Variable

HIV sero-status outcomes of HIV exposed children

4.7.2 Independent Variable

Socio-demographic factors (age , educational level of the mother, marital status, parity, residence, religion, and economic status)

Maternal factors (ANC visit, ARV initiation, place of delivery, mode of delivery, CD4 count)

Children factor (Birth weight, feeding practice, follow-up, and ARV prophylaxis intake, premature)

4.8 Data collection instrument and procedure

Data extraction sheets were used to obtain the data. Data extract sheets was generated from the national standard HIV-exposed children follow-up chart and the PMTCT registration book. included socio-demographic characteristics (mother age, marital status, level of education, infant age, sex of children, birth weight), PMTCT interventions provided to the mother and her children, antibody body ,DNA/PCR tests, test results, and the first six months of feeding . The data were gathered by hospital nurses working in the PMTCT department using structured data extraction forms. Following two days of training, the data collectors began collecting data. The data were gathered at the PMTCT clinic by the treatment and follow-up records of exposed children as well as their mothers' PMTCT.

4.8 Data quality control

The data were gathered at the PMTCT clinic through reviewing mothers' PMTCT and exposed children's care integrated register books. The primary investigator was closely monitoring the process. The data collectors received training for two days before to and one day following the pretest. The training included how to gather data, the overall goal, the significance of the study, and the confidentiality of the information. The training was provided in the form of a discussion using the data extraction sheet. To make sure data quality, the primary investigator worked with the data collectors throughout the data collection process to ensure that they were correctly doing so.

Furthermore, during data management, storage, and analysis, the lead investigator ensured that all acquired data was complete, consistent, and clear. Five percent of the pretests were completed before the actual data collection began at the selected public hospital.

4.9 Data processing and analysis

The data were collected, coded and entered into Epi-Data 4.6. The data then exported to SPSS Version 26 statistical software for further analysis. For continuous variables, descriptive statistics are reported as mean, and standard deviation, as well as a measure of dispersion. In addition, descriptive summaries for categorical variables were presented using tables, figures, and charts. The variance inflation factor was used to determine whether there were outliers or multicollinearity among the independent variables. Both the bivariate and multivariate binary logistic regression models were fitted. Variables having p-values <0.25 from the bivariable analysis were included in the multivariable analysis.

The Hosmer-Lemeshow goodness of fit test was used to check model fitness. Variables with p values < 0.05 were found to be statistically significant predictors of positive outcomes in HIV-exposed infants, with an adjusted odds ratio of 95%.

4.9 Ethical consideration

The School of Nursing and Midwifery at Addis Ababa University's ethical review committee provided letters of clearance. In addition, the Addis Ababa Public Health Research and Emergency Management Core Process provided an ethical approval letter. Individual patients could not provide informed consent because the study used routinely acquired, aggregate data from the hospital database. However, institutional permission letters were requested and secured for reviewing information of HIV-positive mothers and their infants. To maintain patient confidentiality, no names or identifying numbers were included in the data extraction format, had been stored in password protected computer.

5. RESULTS

5.1 Socio demographic characteristics of the study population

A total of 244 study participants were included with a response rate 100%. From a total study participant 93(38.1%) of the mothers aged were between 25 and 30 years**.** Regarding to educational level, 78 (32.0%) had attained secondary school. Regarding to marital status 109(44.7.1%) participants was married and 147(60.2%) of the women were multiparty. Majority of 175(72%) were lived in urban (Table 1).

Table 2: Socio demographic characteristics of mothers of HIV-exposed children in Addis Ababa, Ethiopia, 2024 (n = 244).

Variable	Category	Frequency(n)	Percent (%)
Age of the mother	15-24	41	16.8
	25-30	93	38.1
	30-34	54	22.1
	35-39	48	19.6
	40-44	8	3.2
Level of education of the mother	Cannot Read and Write	20	8.2
	Read and write	45	18.4
	Primary	46	18.9
	Secondary	78	32.0
	Tertiary	55	22.5
Place of residence	Rural	69	28
	Urban	175	72
Marital status of the mother	Single	84	34.4
	Married	109	44.7
	Separated/divorced/ widowed	51	20.9
Parity of the mother	Multi parity	147	60.2
	Prim parity	97	39.8

5.2 PMTCT interventions for the mother

Regarding to CD4 counts of the mother taken before the last pregnancy, 35.3% were less than 350mm3, while 64.7 % Greater than 500 mm3 .The CD4 counts of the mothers prior to the before last pregnancy were 35.3% less than 350 mm3 and 64.7% larger than 500 mm3. The majority of mothers who participated in the study, 213 (87.3%) were on ARV prior to this pregnancy. The majority of mothers had ANC flow of 216 (88.5%), and approximately 204 (83.6%) had attended more than 4 antenatal care visits during pregnancy. For 206 (84.4%) of the mothers, ART was initiated during this pregnancy, and those whose ART drugs were initiated for the mother206 (84.4) had good adherence. mothers who delivered at the health facility were, 132 (54.1%) had a normal delivery, whereas 112 (46.9%) had a cesarean section. Because the viral load196 (80.6) was less than 1000 ml/copy, approximately 56 (23%) patients experienced illness during pregnancy. Regarding to AIDS stage of mothers about to give birth, 34 (13.9%) were classified as Stage 1, 93 (38.1%) were classified as Stage 2, 103 (42.2%) were classified as Stage 3, and 14 (5.7%) were classified as Stage 4. (Table 2)

Table 3: PMTCT intervention for mothers of HIV-exposed infants in Addis Ababa, Ethiopia, 2024 (n = 244).

variable	Category	Frequency(n)	Percent (%)
Mother have CD4 counts taken before last pregnancy	Yes	244	100
	NO	0	0
Mother CD4 count	0-350	86	35.3
	>351	158	64.7
Mother viral load	0-1000	196	80.3
	>1000	48	19.7
Antenatal care clinic attend	Yes	216	88.5
	No	28	11.5
If Yes Number of ANC visits	1-4	40	16.4
	>4	204	83.6
Mothers on ARVs prior to pregnancy	Yes	213	87.3
	No	31	12.7

ART drugs initiated for the mother	during pregnancy	206	84.4
	during labor/delivery	34	13.9
	after delivery	4	1.6
Mothers adherence status	Good	213	87.3
	Fair	16	6.6
	Poor	15	6.1
Illness during pregnancy	Yes	56	23
	No	188	77
WHO stage of the mother	I	34	13.9
	II	93	38.1
	III	103	42.2
	IV	14	5.7
Place mother deliver	Health facility	227	93
	Home	17	7
Mode of delivery	SVD	132	54.1
	Elective C/S	71	29.1
	Emergency C/S	41	16.8

5.3. PMTCT interventions for the infant

Among total children who were enrolled in the study, 138 (56.6%) were males. with reference to birth weight, 187 (76.6%) of the infants had a weight greater than 2500 grams. According to the findings, 224 (91.8%) of the infants received prophylaxis, whereas 20 (8.2%) did not. Accordingly, those infants received prophylaxis 223 (91.4) AZT+NVP, 12 (4.9%) received NVP syrup, and the others did not. Majority of exposed children 223(91.4%) received Cotrimoxazole preventive therapy. Out of the total number of study subjects, 104 (42.6%) experienced exclusive breast feeding for the first six months of life, although 110 (45.1%) of the exposed infants received exclusive formula replacement, and 30 (12.3%) had mixed feeding. The HIV test was done to all 228 children (100%).

Table 4: PMTCT intervention for exposed infants in Addis Ababa, Ethiopia, 2024 (n = 244).

variable	Category	Frequency	Percent
sex of children	Male	138	56.6
	Female	106	43.4
children birth weight	0-2500	57	23.4
	>2500	187	76.6
Infant feeding practice during the first six months of life.	Exclusive breast feeding	104	42.6
	Mixed feeding	30	12.3
	Exclusive infant formula milk	110	45.1
Did child receive ARV prophylaxis	Yes	224	91.8
	No	20	8.2
drugs given for the child	NVP syrup	12	4.9
	AZT syrup	4	1.6
	AZT+ NVP	223	91.4
	None	5	2
child Cotrimoxazole preventive therapy	Received	223	91.4
	not Received	21	8.6
child has been tested for HIV	Yes	244	100
	NO	0	0
Child Antibody HIV test result	Negative	234	95.9
	Positive	10	4.1
age was DBS (DNA/ PCR) done	0-6	197	80.7
	>6	47	19.3

5.4 Outcomes of HIV-exposed infants

Ten (4.1%) of the exposed infants tested positive for HIV.

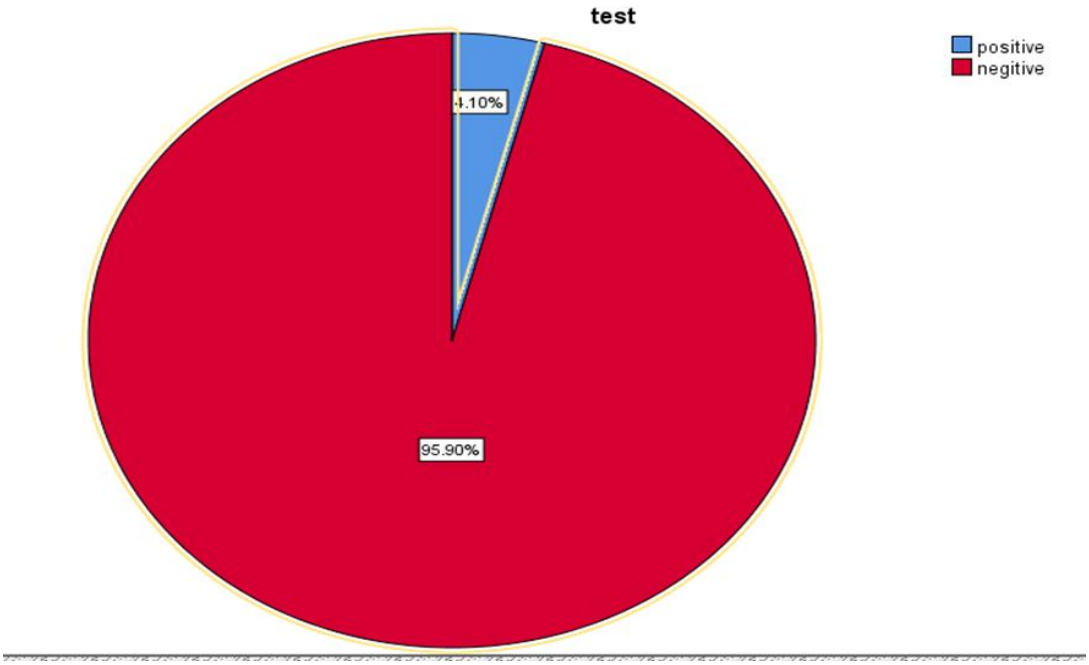

Figure 2: HIV sero –status outcomes of exposed children at selected public hospitals in Addis Ababa, Ethiopia, 2024 (n=244)

5.5 Factors associated with HIV status among HIV exposed infants

In bivariate variables and multivariate variables analysis was performed between HIV sero- status outcomes (dependent variable) and each independent variable. The factors that showed a p-value of 0.25 and less were added to multivariable regression model. In multivariable logistic regression analysis p-value of less than 0.05 were considered for association an initiation Cotrimoxazole preventive therapy and delivery place of mother was significantly associated with HIV status.

Children who were received cotrimoxazole preventive therapy were 89 % {AOR 0.89=, 95%CI (0.02-0.79)} less likely to be HIV positive compared to children who were not received cotrimoxazole preventive therapy and Children born at health facility 91.2% {AOR 0.088=, 95%CI (0.01-0.58)} less likely to be HIV positive compared to children born at home.

Table 5: Factors associated with HIV Sero-status outcomes of exposed children in Addis Ababa, Ethiopia, 2024(n=2024)

variable	category			AOR(95%CI)	COR(95%CI)	p value
		negative	positive			
Antenatal care clinic attend	Yes	209	7	0.27(0.27,1.14)	0.46(0.09,2.32)	0.46
	No	25	3	1	1	
mothers on ARVs prior to pregnancy with this infant	Yes	207	6	0.19(0.05,0.73)	0.39(0.08,1.19)	0.24
	No	27	4	1	1	
Mothers adherence status	Good	206	7	1	1	
	Fair	15	1	0.51(0.04,4.41)	0.74(0.41,13.72)	0.84
	Poor	13	2	0.22(0.04,1.17)	0.18(0.02,1.59)	0.12
place mother deliver	health facility	221	6	0.08(0.02,0.35)	0.088(0.01,0.58)	0.01*
	Home	13	4	1	1	
Cotrimoxazole preventive therapy	Received	217	6	0.11(0.03,0.45)	0.11(0.02,0.79)	0.025*
	not Received	17	4	1	1	

NB 1 reference * P<0.05 significance level

COR Crude odd ratio AOR Adjusted odd ratio

6. DISCUSSION

This institutional -based retrospective study attempted to assess the outcomes of HIV-exposed children who were followed up at a selected governmental hospital, Addis Ababa, Ethiopia. The study indicated that the prevalence of HIV infection among exposed children during the follow-up was 4.1%. This progress is far from what the country had intended to achieve.

The national objective of MTCT is to reduce HIV transmission to less than 2% by 2030(58). This finding was lower than that of a study performed in Vietnam that reported an 8.9% transmission rate among children exposed to MTCT; another study conducted in India indicated that the prevalence of HIV due to MTCT is 8.76% (29). In East Africa, the prevalence of vertical HIV infection among HIV-exposed infants was 7.68 (33). A study conducted in Eastern Ethiopia revealed that maternal-to-child HIV transmission was 15.7%(59), additionally, also lower than study conducted in Gondar reported that the prevalence of HIV-positive infants born to HIV-positive mothers was 5.5%(36). In another study conducted in Addis Ababa, the prevalence rate of HIV-positive mother-to-child transmission was 5.1%(36) and study conducted in Addis Ababa indicate the prevalence rate of HIV-positive mother-to-child transmission was 5.1 %(14) The difference in the results might be due to differences in the study design, study location and time of study.

This study was higher in HIV prevalence compared to study conducted in Brazil indicated that the rate of mother-to-child HIV transmission among HIV-exposed individuals was 2.0%(27) and a study conducted in South Africa showed a 2.1% MTCT rate (32), A study conducted in Ethiopia indicated that the overall MTCT rate in Gonder of HIV infection among exposed children was 3.6%(35), and a study conducted in Dessie reported that the transmission rate was 3.8 among HIV-exposed infants (37) . This difference may be due to differences in the study population, study design, study area and period.

The factors associated with positive HIV sero_ status outcomes among HIV-exposed infants were receiving cotrimoxazole preventive therapy and the place of delivery.

Children who were received cotrimoxazole preventive therapy were 89 % {AOR 0.89=, 95%CI (0.02-0.79)} less likely to be HIV positive compared to children who were not received cotrimoxazole preventive therapy. A study conducted in Oromia, Ethiopia, revealed that children who did not receive cotrimoxazole therapy were seven times more likely to acquire HIV than

were children who did receive cotrimoxazole(40). Cotrimoxazole is relatively inexpensive and cost-effective; with the use of logistically feasible interventions to reduce morbidity in HIV-exposed infants but lacking an adequate supply of cotrimoxazole in health facilities, the factors causing poor implementation of cotrimoxazole prophylaxis and treatment cannot be provided regularly without interruption. Another reason may be poor communication and inadequate counseling for the mothers; they may not be motivated to take their child for follow-up or to take the medication and care services, and interestingly, mothers/caretakers of HIV-exposed infants who had knowledge of the benefits of cotrimoxazole prophylaxis

Children born at health facility 91.2% {AOR 0.088=, 95%CI (0.01-0.58)} less likely to be HIV positive compared to children born at home. This result is consistent with studies in which Gondar infants born at home were three times more likely to be infected with HIV than infants born to women who delivered in health facilities(49). Because women getting professional delivery services are offered antiretroviral therapy or antiretroviral prophylaxis to avoid maternal-to-child HIV transmission during labor and delivery. Even HIV-exposed infants may have an opportunity to get ARV prophylaxis immediately, hence decreasing the risk of acquiring HIV infection during labour and delivery, as the majority of newborns are infected at this time. However, in this study, an appreciable number of pregnant .women did not obtain skilled birth care, leading to the catastrophic effects of HIV on their infants. Additionally, infants who delivered at home were more prone to many harmful traditional practices that increase the HIV infection rate, such as cord-cutting by blade, placental blood contamination, unplanned circumcision, pre lacteal feeding, and breastfeeding from unexamined nipples.

7. Strengths and Limitations of the Study

7.1. Strength

- ✓ This study had a high response rate and provides information on the outcomes of infants exposed to HIV mothers.
- ✓ Sources for future investigators

7.2 Limitations

First, this was a retrospective study in which some data were incomplete. Hence, some independent variables that could affect the outcome of HIV-exposed infants were not registered in the document and were excluded from the analysis. Second, this study could identify only associated risk factors for which causal inference may be difficult because of the nature of the study. Second, the limited sample size may potentially have an impact on the test's power. As a result, the findings may not be generalizable. Although this study might suffer from its lower precision despite its reduced precision, this study provides useful evidence for evaluating program efficacy and establishing the groundwork for future interventions. Finally, data collection errors may have had an impact on retrospective data collection.

8. Conclusion and Recommendations

8.1 Conclusion

The study revealed a higher risk of HIV infection among children born to HIV-positive mothers in the study area. Infants did not receive cotrimoxazole, and delivery at home increased the risk of HIV transmission from mother to child. Therefore, education and promotion for seeking obstetric care and HIV services during pregnancy, institution delivery counseling and promotion, and early initiation of cotrimoxazole prophylaxis for HIV-exposed infants are recommended to eliminate the devastating consequences of HIV in pregnant women and their newborns

8.2 Recommendations

According to the study's findings, following necessary suggestions is offered to reducing MTCT in HIV patients and researchers working in this field. Therefore, this study suggests for

Policy makers

To improve maternal and child health, government health institutions and non-governmental organizations should provide inexpensive availability of cotrimoxazole for families with low incomes in developing countries.

Health care providers

To reduce HIV transmission from mother to child, health care practitioners should give mothers with high-quality integrated information on the timely starting of cotrimoxazole, birth preparation, institutional delivery, and postnatal care.

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 will be adapted from the national PMTCT registration logbook by the principal investigator, whose main aim is to retrospectively assess outcomes and associated factors among HIV-exposed children younger than 18 months at selected public hospitals in Addis Ababa, Ethiopia.

Directions: Based on the information from the registry, the following questions were answered.

Part I: sociodemographic characteristics of the mothers

Mother/infant code number _____/____

No	Question		
101	What is the age of the mother?	_____years (in completed year)	

102	What is the level of education of the mother?	A. Illiterate B. Read and write C. Primary D. Secondary E. Tertiary F. Not recorded	
103	What is the marital status of the mother?	A. Single B. Married C. separated/ divorced/ Widowed D. Not recorded	
104	What is the parity of the mother?	A. prim parity B. multiparty C. Not recorded	
105	Place of residence	A. Urban B. Rural	

Part II: Information will be extracted from maternal records

201	Did mother have CD4 counts taken before last pregnancy?	A. Yes B. No C. Not recorded	
202	If yes for question number 201	What was the CD4 count in----------no_/mm3?	

203	Antenatal care clinic attend?	A. Yes B. No C. Not recorded	
204	If yes for question number 203,	How many visits? _____	
205	Were the mothers on ARVs prior to pregnancy with this infant?	A. Yes B. No C. Not recorded	
206	If yes for question number 205, please specify which ones?	A. AZT + 3TC during pregnancy B. NVP at the onset of labor C. HAART (1c, 1e, 1d, 1f) D. None taken E. Not recorded	
207	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	
208	Mothers adherence status	A. good B. fair C. Poor	
208	What was the gestational age at the time of	_____ In weeks?	

	diagnosis?		
209	Is there any illness during pregnancy?	A. Yes B. No C. Not recorded	
210	What was the WHO stage of the mother?	A. I B. II C. III D.IV E .Not recorded	
212	Where did mother deliver?	A. health facility B. Home C. Not recorded	
213	How did mother deliver the child?	A. Normal delivery B. elective Cesarean section C. Emergency Cesarean Section D. Not recorded	
214	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	
205	Cotrimoxazol preventive therapy (CPT)	A. Received B. Didn't receive	

Part III. Information will be extracted from children's health records.

301	What is sex of children?	A. Male B. Female C. Not recorded	
302	Place child of Delivery	A. home B. institution	
303	What is the children birth weight?	_____in grams?	
304	Did child receive ARV prophylaxis?	A. Yes B. No C. Not recorded	
304	If yes for question number 303, What drugs were given for the child?	A. NVP syrup B. AZT syrup C. AZT+ NVP D. Not recorded	
305	cotrimoxazole prophylaxis therapy	A. Yes B. No C. not recorded	
305	Has the child has been tested for HIV?	A. Yes B. No C. Not recorded	
306	If yes for question number 305, what is the HIV test result?	A. Negative	

		B. Positive C. Not recorded	
307	If question number 306 is positive, has CD4 been done for the child?	A. Yes B. No C. Not recorded	
308	If CD4 test done, result	----------?	
	Mother viral load	----------?	
309	Is child is on ART for treatment?	A. Yes B. No C. Not recorded	
310	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	
311	What was the HIV Anti body test result?	A. Positive B. Negative C. Not recorded	
312	At what age was DBS (DNA/ PCR) done?	_____	

Name of data collector _____ Signature: _____Date:_____

Supervisor's Name: _____Signature:_____ Date: _____