The Prevalence of HIV-Positive Infants Born to HIV-Positive Mothers Attended at the University of Gondar Specialized Hospital Anti-Retroviral Therapy Services, Northwest Ethiopia, 2018

Destaye Guadie Kassie¹ Worknesh Akanaw Bogale¹ Ayenew Addisu²
¹Department of Pediatrics and Child Health Nursing, School of Nursing, College of Medicine and Health Science, University of Gondar, Gondar, Ethiopia; ²Department of Medical Parasitology, School of Biomedical and Laboratory Science, College of Medicine and Health Science, University of Gondar, Gondar, Ethiopia

Introduction: The human immunodeficiency virus (HIV) attacks the human immune cells and affects their function. It is the highest burden that occurs in a developing country. Ethiopia is one of the top ten countries in the world, which has a high burden of HIV-infected children. Even if the country works hard on the PMCT program, still there is a challenging on MTCT reduction.

Objective: The purpose of this study was to assess the prevalence of HIV-positive infants born to HIV-positive mothers attending anti-retroviral treatment (ART) services at the University of Gondar specialized hospital, Gondar, northwest Ethiopia, 2018.

Methods: A retrospective chart review study was conducted from February to April 2018, among HIV-exposed infants who born to HIV-positive mothers in ART service at the University of Gondar specialized hospital. A systematic sampling method was applied to select study participants. Data were entered into EPI info version 7 statistical software and transferred to SPSS version 20 for analysis.

Results: In this study, 239 participants were enrolled, with a 98.8% response rate. The prevalence of HIV-positive infants born to HIV-positive mothers was 5.5% with a 95% CI (3.0–8.5%). Of the mothers, 77.1% were within 25–35 years of age range. Of the total infants, 56.8% were males. From these HIV-positive infants, 13 (5.5%) were born from age ranges of 25–35 years old mothers, 9 (3.8%) were females, 8 (3.4%) were 6–11 months old, 13 (5.5%) were post-term gestation, and 13 (5.5%) were maternal CD4+ less than 350/mm³.

Conclusion and Recommendations: The prevalence of HIV-positive infants born to HIV-positive mothers in this study was lower than the previous 10.2%. To reduce such infant HIV infection to zero, it needs proactive action from stakeholders, health professionals, and the community at large.

Keywords: HIV-exposed infant, HIV-positive mother

Introduction

The human immunodeficiency virus (HIV) is a virus that lives in human immune cells and affects their functions.¹,² HIV is the major public health problem worldwide that affects around 367,000 people in 2016. Of this 180,000 were newly HIV infected, and 100,000 were deaths of AIDS-related.³,⁴ From this data, around 2.1 million were under 15 years old children. Globally 1.4 million pregnant women were lived with HIV, and 80% received ART.⁵,⁶ About 1.2 million AIDS-related mortalities and 1.6 million newly
infected children, were reported in Sub-Saharan Africa in 2015. Ethiopia is one of the countries in Sub-Saharan African with similar HIV cases. According to the 2016 WHO report showed that Ethiopia has, 720,000 people lived with HIV, and 27,104 of them were newly diagnosed. Of the total living with HIV, 59% were received Highly Active Anti-Retroviral Therapy (HAART). Child illness and deaths among HIV/AIDS exposed infants were the major health problems in Ethiopia. The transmission of HIV from positive mother to child has occurred during pregnancy, labor, delivery, or breastfeeding. In the absence of interventions, the rate of mother to child HIV transmission is 15% to 45%. The rate of MTCT increment is related to maternal illness, mode of delivery, mixed feeding practice, breastfeeding in the first 6 months, and CD4 (cluster of differentiation cell 4) count. The transmission prevention of new HIV–infection from mother to infant is with regular follow-up, early infant DNA/PCR detection, and appropriate care. In 2013, Ethiopia modified the WHO guideline of mother–to–child transmission (PMTCT) by changing option B to B+ strategy, that endorsed lifelong ART without WHO staging and CD4 count. In Ethiopia, 50–60% of HIV-positive pregnant women received ART to prevent the mother to child transmission. Child morbidity and mortality among HIV-exposed infants are still the main health challenges in Ethiopia. The average number of MTCT of HIV in Ethiopia was 18%, which puts among the 10 HIV high burden countries. Although the country worked strongly on PMTCT services to reached 97%, still there are challenges on MTCT reduction to zero. Therefore, this study aimed to assess the prevalence of HIV-positive infants born to HIV-positive mothers at the University of Gondar, a specialized hospital that gives information to researchers, policymakers, and health providers on the PMTCT program.

Methods
Cross-Sectional study design by using retrospective chart review data was conducted from February to April 2018, among HIV-exposed infants born to HIV-positive mothers who were attending ART services at the University of Gondar, specialized hospital. Gondar is one of the most ancient and densely populated towns in Ethiopia. The total population of Gondar, according to the 2007 census conducted by the Central Statistics Agency of Ethiopia (CSA), were 333,432. Of these 173,206 were females, 160,226 were males and 45, 146 were under-five children. The University of Gondar established since 1954 as a public health college. Currently, the University of Gondar specialized hospital provides medical services for over five million people in the catchment area.

Source and Study Population
The Source and study populations were all HIV-exposed infants paired with their mothers enrolled at the PMTCT clinic of the University of Gondar specialized hospital, northwest Ethiopia.

Inclusion Criteria
The infants who participated in this study were born to HIV-positive mothers, age less than or equal to 18 months, at least two times test by DNA/PCR, taking of ARV prophylaxis, their mothers on ART, and had a full recorded data were included.

Sample Size Determination
The sample size calculated by using the single population proportion formula of 17% prevalence of HIV transmission among HIV-exposed infants taken from the previous study in southwest Ethiopia, then calculated as \( n = \frac{Z^2 \times P \times (1-P)}{D^2} \). In Ethiopia, 50–60% of HIV-positive pregnant women received ART to prevent the mother to child transmission. Child morbidity and mortality among HIV-exposed infants are still the main health challenges in Ethiopia. The average number of MTCT of HIV in Ethiopia was 18%, which puts among the 10 HIV high burden countries. Although the country worked strongly on PMTCT services to reached 97%, still there are challenges on MTCT reduction to zero. Therefore, this study aimed to assess the prevalence of HIV-positive infants born to HIV-positive mothers at the University of Gondar, a specialized hospital that gives information to researchers, policymakers, and health providers on the PMTCT program.

A semi-structured data collection tool was developed by adapting the national HIV-exposed infant follow up form to compile the required information. Informed consents were obtained from the record personal at PMTCT and an exposed infant care follow-up clinic. Data were collected by reviewing the records using a checklist of antenatal and exposed infant follow-up tools. Data were collected by two professional nurses who have experience in comprehensive HIV care, PMTCT, and exposed infant care. The data collectors and supervisors were trained on data collection procedures by the principal investigator. Five percent of the pre-test was done at poly PMTCT clinic Gondar town. The investigators followed the overall process of data quality during the data collection.

Variables
Dependent Variable: HIV-positive infant
Independent Variables: Socio-demographic characteristics like age of the mother, marital status, occupation, residence and sex of the infant

Prenatal Characteristics: ANC follow up, and the number of ANC visit

Intra-Partum Characteristics: The place of delivery, mode of delivery, and weight of the infant during delivery

Postnatal Characteristics: Breastfeeding condition, type of enrollment, and infants feeding practice

ARV Intervention and Clinical Characteristics: Maternal ARV intervention, abnormal findings suggesting to HIV, infants ARV prophylaxis, duration of intervention, and WHO clinical stage

Exclusive Breastfeeding: Giving the infant only the mother’s milk for the first 6-months other than prescribed medicine, vitamin supplement and vaccines

Operational Definition
HIV-Exposed Infants: Infants born to HIV-positive mothers.
HIV-Infected Infants: Infant born to HIV-positive mothers and after two DBS tests declared as HIV-positive.

Option B+: An approach to all pregnant and lactating women living with HIV who received triple-drug ARV regimen regardless of CD4 count or WHO stage.

Option A+: An approach to all pregnant and lactating women living with HIV who received drug ARV regimen based on CD4 count or WHO clinical staging

Exclusive Breastfeeding: Giving the infant only the mother’s milk for the first 6-months other than prescribed medicine, vitamin supplement and vaccines.

Data Processing and Analysis
The data were clean, coded, and entered into EPI info version7, then exported to SPSS version 20 software for analysis. Descriptive statistics of percentages, tables, and bar graphs, were used to summarize the results.

Results
Socio-Demographic Characteristics of HIV-Exposed Infants and Their Mothers
In this study, 239 participants were enrolled, with a 98.8% response rate. Most infant mothers, 77.1%, were found in age range with 25–35 years old; 100 (42.4%), were not attended formal education; 192 (81.4%), were urban dwellers; 210 (89.0%), were married, and 80 (33.9%), were housewives. Above half of infants 134 (56.8%), were male (Table 1).

Cross-Tabulation Results of Mothers and Exposed Infant
In this study, the prevalence of HIV-positive infants born to HIV-positive mothers was 13 (5.5%) with 95% CI (3.0–8.5%). Those HIV-positive infants were born from mothers’ age ranges within 25–35 years old, gestational age post-term, spontaneous vaginal delivery (SVD), maternal CD4+ cells less than 350/mm³, and the infant took mixed feeding at the first 6 months. Among the HIV-positive infant mothers, 10 (4.3%) took formal education, 11 (4.7%) were urban dwellers, 7(2.9%) were a non-governmental employee. Among HIV-positive infants, 9(3.8%) were females, and 8(3.4%) were within the age ranges of 6–11 months, 10 (4.2%) were born from their mothers who took PMCT intervention on TDF +3TC+EFV (Table 2).

Table 1 Socio-Demographic Characteristics of HIV-Exposed Infants and Their Mothers at the University of Gondar Specialized Hospital, Northwest Ethiopia, 2018 (n=236)

| Variables          | Categories       | Frequency | Percentage |
|--------------------|------------------|-----------|------------|
| Maternal Age       | <25              | 20        | 8.4        |
|                    | 25–35            | 182       | 77.1       |
|                    | >35              | 34        | 14.5       |
| Educational Status | Not attend formal education | 100 | 42.4 |
|                    | Attend formal education | 136 | 57.6 |
| Residence          | Rural            | 44        | 18.6       |
|                    | Urban            | 192       | 81.4       |
| Occupation         | Governmental Employee | 42 | 17.8 |
|                    | House wife       | 80        | 33.9       |
|                    | Farmer           | 14        | 5.9        |
|                    | Merchant         | 71        | 30.1       |
|                    | Daily laborer    | 29        | 12.3       |
| Sex of the Infant  | Female           | 102       | 43.2       |
|                    | Male             | 134       | 56.8       |
| Age of the Infants | <6month          | 100       | 42.4       |
|                    | 6–11 month       | 111       | 47.0       |
|                    | 12–18 month      | 25        | 10.6       |
| Marital Status     | Married          | 210       | 89.0       |
|                    | Single           | 14        | 5.9        |
|                    | Divorced         | 8         | 3.4        |
|                    | Widowed          | 4         | 1.7        |
Table 2 Cross Tabulation Results of Maternal and Infant Characters Related to HIV-Positive Infants Born from HIV-Positive Mothers at University of Gondar Specialized Hospital ART Clinic 2018

| Variables                        | Categories | Dependent | HIV-Negative | HIV-Positive |
|----------------------------------|------------|-----------|--------------|--------------|
| Maternal Age                     | <25yrs     | 20(8.4%)  | 0(0%)        | 13(5.5%)     |
|                                  | 25–35yrs   | 203(86.1%)| 11(4.7%)     |              |
| Educational Status               | Non-formal education | 97(41.1%) | 3(1.3%)      | 10(4.3%)     |
|                                  | Formal education   | 126(53.3%)|              |              |
| Resident                         | Rural       | 42(17.8%) | 2(0.8%)      | 11(4.7%)     |
|                                  | Urban       | 181(76.7%)|              |              |
| Occupation                       | Government employee | 35(14.8%) | 7(2.9%)      |              |
|                                  | Not employee | 188(76.7%)| 6(2.5%)      |              |
| Sex of Infant                    | Female     | 93(39.4%) | 9(3.8%)      |              |
|                                  | Male       | 130(55.1%)|              | 4(1.7%)      |
| Infant Age                       | <6month     | 97(41.1%) | 3(1.3%)      | 10(4.3%)     |
|                                  | 6–11month   | 103(43.6%)| 8(3.4%)      |              |
|                                  | 12–18month  | 23(9.8%)  | 2(0.8%)      | 11(4.7%)     |
| Marital Status                   | Married     | 199(84.3%)| 11(4.7%)     |              |
|                                  | Single      | 24(10.2%) |              | 2(0.9%)      |
| ANC Follow-Up                    | 1–3        | 78(33.1%) | 3(1.3%)      |              |
|                                  | >3         | 145(61.4%)| 10(4.2%)     |              |
| Gestational Age                  | Pre-term    | 20(8.5%)  | 0(0%)        | 13(5.5%)     |
|                                  | Term       | 181(76.7%)|              |              |
|                                  | Post-term   | 22(9.3%)  |              |              |
| Mode of Delivery                 | SVD        | 197(83.5%)| 11(4.7%)     |              |
|                                  | C/S        | 26(11.0%) |              | 2(0.9%)      |
| Maternal CD4+                    | <350       | 122(51.7%)| 13(5.5%)     |              |
|                                  | ≥350       | 101(42.8%)|              | 0(0%)        |
| Infant Weight                    | <250       | 48(20.3%) | 2(0.9%)      | 11(4.7%)     |
|                                  | ≥250       | 175(74.2%)|              |              |
| Infant Feeding for the First Six Months | Exclusive | 80(33.9%) | 0(0%)        | 13(5.5%)     |
|                                  | Mixed feeding | 143(60.6%)|              |              |
| Maternal PMTCT Intervention Type | AZT+3CT+EFV| 163(69.1%)| 0(0%)        |              |
|                                  | AZT+3CT+NVP | 52(22.0%) | 9(3.8%)      |              |
|                                  | TDF+3CT+EFV | 8(3.4%)   | 10(4.2%)     |              |
|                                  | Others     | 0(0%)     | 3(1.3%)      |              |

Discussion
The prevention of mother to child transmission is still challenging among infants born to HIV-positive mothers, although the PMTCT program implemented. This facility-based retrospective study attempted to assess the prevalence of HIV infection among exposed infants on ART care and follow-up at the University of Gondar specialized hospital. In this study, the prevalence of HIV-positive infants born to HIV-positive mothers attending at PMTCT clinic was 13 (5.5%) with a 95% CI (3.0–8.5%). This finding is similar to the studies conducted in West Gojjam (6.1%), Awasa (4.16%), Bahirdar (5.9%), and China 3.9%.11,21,22 The similarity might be due to the implementation of a similar program of PMTCT service. Our finding is markedly lower than those of studies conducted in Gondar (10.2%), Dire Dawa (15.7%), Jimma (17%),16,17,19 Nigeria (34.4%), Cameroon (7.1%), and Burkina Faso (11.2%).23–25 The possible reasons might be due to the current study used the modified WHO guideline (option B+) and the implementation of combined ART drugs regimen in the health facilities; While the other studies used the previous WHO guideline with PMCT option A+ and B implementation program. On the other hand, this finding is higher than studies conducted in Tigray (2.4%),26 Zambia (0.5%), and South Africa (2.4%).26,27 The possible reason might be cultural difference, distance from health facility, and client satisfaction with health provider, client tracing system and disclosure, and awareness creation in different media.

This study shows that HIV-positive infants were increased in post-term gestational age, SVD delivery, maternal CD4+ cells less than 350/mm3, and giving of mixed feeding in the first 6 months. The possible reasons might be due to exposed infants who born at a post-term gestational age that can increase viral transmission in the case of the too old placenta.28 During the SVD labor force increased, the fetus may repeat contact with the pelvic bone and results in a laceration that leads virus entrance to baby circulation.29 A mother with CD4+ cells less than 350/mm3 in her circulation had increased viral loads that may expose the fetus for HIV transmission.30 Mothers who gave mixed feeding for their infants in the first 6 months, the infants may develop diarrheal disease which causes a large volume of fluid loss and an intestinal mucosal laceration that results in the transmission of viruses.31

Conclusion and Recommendations
The prevalence of HIV-positive infants born to HIV-positive mothers in this study was lower than the previous 10.2%. To reduce such infant HIV infection to zero, it needs proactive action from stakeholders, health professionals, and the community at large.

Abbreviations
AIDS, Acquired Immune Deficiency Syndromes; ART, Anti-Retroviral Therapy; DBS, Dried Blood Sample; DNA, Deoxyribonucleic Acid; HIV, Human Immune deficiency

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Virus; MTCT, Mother to Child Transmission; PCR, Polymerase Chain Reaction; PMTCT, Prevention of Mother to Child Transmission; WHO, World Health Organization.

Ethical Approval and Consent to Participate
Ethical assurance was obtained from the school of nursing at the University of Gondar College of Medicine and Health Sciences ethical review committee in a letter with a reference number N/S 6012/06/2010E.C. A permission letter was obtained in the hospital medical director’s office to collect the data. Written informed consents were obtained from ART records. The confidentiality of patient-related data was maintained by avoiding possible identifiers, such as the name of the mother; only numerical identification was used as a reference, in accordance with the Declaration of Helsinki. After the whole data collection, the data extraction tool was locked and kept confident throughout the whole process of the research work.

Data Sharing Statement
Data will be obtained upon request by e-mail to the corresponding author using “dstgd32@gmail.com”.

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Author Contributions
All authors contributed to data analysis, drafting or revising the article, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

Disclosure
The authors declare that they have no competing interests in publication.

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