

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

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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 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 1,000,000 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

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infected children, were reported in Sub-Saharan Africa in 2015.⁴ 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).^{7,8} 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%.⁹ 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.^{10,11} 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.^{12,13} 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.^{11,14,15,16} Although the country worked strongly on PMTCT services to reached 97%, still there are challenges' on MTCT reduction to zero.¹⁷ 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),¹⁸ 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,¹⁹ then calculated as α . n = the required sample size, Z = the value of the standard normal curve with a confidence interval of 95% was 1.96, D = the margin of error 5%, P = prevalence of HIV-positive infants; was 17%, and 10% none response rate added, the final sample size was 239. A random sampling method was used to select the first participant chart. After the first participant record had got a random selection, a systematic random sampling technique was applied to get the final sample size of 239 infants. The k th interval (K) was calculated, as $K=N/n=780/239=3$.

A semi-structured data collection tool was developed by adapting the national HIV-exposed infant follow up form to compile the required information.²⁰ 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 follows 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, infant age at diagnosis, 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 25–35years 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
	12–18month	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%)
	25–35yrs	203(86.1%)	13(5.5%)
Educational Status	Non-formal education	97(41.1%)	3(1.3%)
	Formal education	126(53.3%)	10(4.3%)
Resident	Rural	42(17.8%)	2(0.8%)
	Urban	181(76.7%)	11(4.7%)
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%)
	6–11 month	103(43.6%)	8(3.4%)
	12–18month	23(9.8%)	2(0.9%)
Marital Status	Marrried	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%)
	Term	181(76.7%)	0(0%)
	Post-term	22(9.3%)	13(5.5%)
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%)
	≥250	175(74.2%)	11(4.7%)
Infant Feeding for the First Six Months	Exclusive	80(33.9%)	0(0%)
	Mixed feeding	143(60.6%)	13(5.5%)
Maternal PMCT Intervention Type	AZT+3CT+EFV	163(69.1%)	0(0%)
	AZT+#CT+NVP	52(22.0%)	0(%)
	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%), Jima (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 regimens 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

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.

References

1. Pantaleo G, Graziosi C, Fauci AS. The immunopathogenesis of human immunodeficiency virus infection. *N Engl J Med.* 1993;328(5):327–335.

2. Tersmette M, Gruters R, De Wolf F, et al. Evidence for a role of virulent human immunodeficiency virus (HIV) variants in the pathogenesis of acquired immunodeficiency syndrome: studies on sequential HIV isolates. *Journal of Virology.* 1989;63(5):2118–2125.
3. UNAIDS D. *Joint United Nations Programme on HIV/AIDS (UNAIDS).* Global and Regional data HIV/SIDA pag: 2017:12–16.
4. Wang H, Wolock TM, Carter A, et al. Estimates of global, regional, and national incidence, prevalence, and mortality of HIV, 1980–2015: the global burden of disease study 2015. *Lancet HIV.* 2016;3(8):e361–e87. doi:10.1016/S2352-3018(16)30087-X
5. Shanaube K, Schaap A, Chaila MJ, et al. Community intervention improves knowledge of HIV status of adolescents in Zambia: findings from HPTN 071-PopART for youth study. *AIDS.* 2017;31(Suppl 3):S221. doi:10.1097/QAD.0000000000001530
6. Nachega JB, Uthman OA, Anderson J, et al. Adherence to antiretroviral therapy during and after pregnancy in low-, middle and high income countries: a systematic review and meta-analysis. *AIDS.* 2012;26(16):2039. doi:10.1097/QAD.0b013e328359590f
7. Ethiopian Health and Nutrition Research Institute Federal Ministry of Health. HIV Related Estimates and Projections for Ethiopia - 2012. Available from: <http://files.unaids.org/en/media/unaids/contentassets/documents/data-and-analysis/tools/spectrum/Ethiopia2012report.pdf>. Accessed March 9, 2020.
8. Deribew A, Biadgilign S, Deribe K, et al. The burden of HIV/AIDS in Ethiopia from 1990 to 2016: Evidence from the Global Burden of Diseases 2016 Study. *Ethiop J Health Sci.* 2019;29(1):859–868.
9. World Health Organization. Consolidated guidelines on HIV testing services for a changing epidemic: policy brief. Consolidated guidelines on HIV testing services for a changing epidemic: policy brief 2019. Available from: <https://www.who.int/publications-detail/consolidated-guidelines-on-hiv-testing-services-for-a-changing-epidemic>. Accessed March 9, 2020.
10. Bachore B, Tafese F, Gebissa F, Mekango D. Quality of Prevention of Mother to Child Transmission (PMTCT) of HIV Services in Public Hospitals of Hadiya zone, Southern Ethiopia. *Health Syst Policy Res.* 2018;5(2):73.
11. Tadele T, Tamiso A, Tadele T. Incidences and predictors of HIV positivity among infants who born from HIV positive mother who have follow up at two hospitals of southern Ethiopia, 2014. *Sci J Public Health.* 2014;2(5):431–439.
12. Mitiku I, Arefayne M, Mesfin Y, Gizaw M. Factors associated with loss to follow-up among women in Option B+ PMTCT programme in northeast Ethiopia: a retrospective cohort study. *Journal of the International AIDS Society.* 2016;19(1):20662.
13. Wubneh CA, Endalamaw A, Tebeje NB. Predictors of mortality among HIV exposed infants at University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia. *Italian Journal of Pediatrics.* 2019;45(1):137.
14. Money D, Tulloch K, Boucoiran I, et al. Guidelines for the care of pregnant women living with HIV and interventions to reduce perinatal transmission: executive summary. *Journal of Obstetrics and Gynaecology Canada.* 2014;36(8):721–734.
15. Assefa Y, Van Damme W, Williams OD, Hill PS. Successes and challenges of the millennium development goals in Ethiopia: lessons for the sustainable development goals. *BMJ Global Health.* 2017;2(2):e000318. doi:10.1136/bmjgh-2017-000318
16. Wudineh F, Damtew B. Mother-to-child transmission of HIV infection and its determinants among exposed infants on care and follow-up in Dire Dawa city, Eastern Ethiopia. *AIDS Res Treat.* 2016;2016:1–6. doi:10.1155/2016/3262746
17. Koye DN, Zeleke BM. Mother-to-child transmission of HIV and its predictors among HIV-exposed infants at a PMTCT clinic in north-west Ethiopia. *BMC Public Health.* 2013;13(1):398. doi:10.1186/1471-2458-13-398
18. Agency ECS. *2007 Population and Housing Census of Ethiopia (Administrative Report).* Central Statistical Agency of Ethiopia; 2012.

19. Birlie B, Diriba T, Sisay K, Gurmessa A, Seyoum D, Tadesse M. Mother to child HIV transmission and its predictors among HIV-exposed infants: a retrospective follow-up study in Southwest Ethiopia. *J AIDS Clin Res.* 2016;7(605):2. doi:10.4172/2155-6113.1000605
20. Health EFMo. *Guidelines for Paediatric HIV/AIDS Care and Treatment in Ethiopia.* Addis Ababa: HIV/AIDS Prevention and Control Office; 2008.
21. Berhan Z, Abebe F, Gedefaw M, Tesfa M, Assefa M, Tafere Y. Risk of HIV and associated factors among infants born to HIV positive women in Amhara region, Ethiopia: a facility based retrospective study. *BMC Res Notes.* 2014;7(1):876. doi:10.1186/1756-0500-7-876
22. Zeng H, Chow EP, Zhao Y, et al. Prevention of mother-to-child HIV transmission cascade in China: a systematic review and meta-analysis. *Sex Transm Infect.* 2016;92(2):116–123. doi:10.1136/sextrans-2014-051877
23. Anigilájé E, Dabit O, Ageda B, Hwande S, Bitto T. The prevalence and predictors of HIV infection among children of mothers who missed prevention of mother to child transmission of HIV interventions in Makurdi, Nigeria. *J AIDS Clin Res.* 2013;4(11):1000249.
24. Fondoh VN, Mom NA. Mother-to-child transmission of HIV and its predictors among HIV-exposed infants at Bamenda regional hospital, Cameroon. *Afr J Lab Med.* 2017;6(1):1–7. doi:10.4102/ajlm.v6i1.589
25. Sourabie Y, Ouedraogo S, Bazie W, Sanodji N, Barro M. Impact of art mother and child on the HIV status of the child born to HIV-positive mothers in burkina faso: towards the adoption of an effective PMTCT policy. *J Hematol Thrombo Dis.* 2015;3(198):2.
26. Sherman GG. HIV testing during the neonatal period. *South Afr J HIV Med.* 2015;16:1. doi:10.4102/sajhivmed.v16i1.362
27. Mandala J, Kasonde P, Badru T, Dirks R, Torpey K. HIV retesting of HIV-negative pregnant women in the context of prevention of mother-to-child transmission of HIV in primary health centers in rural Zambia: what did we learn? *J Int Assoc Providers AIDS Care.* 2019;18:2325958218823530. doi:10.1177/2325958218823530
28. Zorrilla C. Obstetric factors and mother-to-infant transmission of HIV-1. *Infect Dis Clin.* 1997;11:109–118. doi:10.1016/s0891-5520(05)70345-7
29. Lopez M, Figueras F, Hernandez S, et al. Association of HIV infection with spontaneous and iatrogenic preterm delivery: effect of HAART. *AIDS.* 2012;26(1):37–43. doi:10.1097/QAD.0b013e32834db300
30. Gonfa M, Gebre-Selassie S. A study on maternal viral load, CD4 cell counts and time of mother-to-child transmission of HIV-1 in two hospitals in central Ethiopia. *Open Access Lib J.* 2014;1(03):1.
31. Tsehay AK. Factors associated with HIV positive sero-status among exposed infants attending care at health facilities in bahir dar administration, Ethiopia: evidence from medical records. *Cogent Med.* 2019 (just-accepted);6(1):1623754.

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