

Risk of HIV and associated factors among infants born to HIV-positive women in northwest Ethiopia

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Abstract

Background: The high rate of HIV morbidity and mortality among pregnant and lactating women, and their infants, is still major health problem in Ethiopia. This study aims to assess the risk and determinants of mother-to-child transmission of HIV among infants born from HIV-positive mothers in West Gojjam Zone, northwest Ethiopia.

Methods: A facility-based, cross-sectional study was carried at prevention of mother-to-child transmission (PMTCT) clinics in West Gojjam Zone. The study participants were HIV-exposed infants enrolled at PMTCT clinics from 01 January to 30 December 2017 who had a recorded DNA-PCR result. The data sources were PMTCT logbooks and patient charts. Data were entered into Epi Info (version 7) and analyzed using SPSS (version 20.0). Both bivariate and multivariate analyses were carried out to identify associations.

Results: A total of 636 infant records were included in the study. There were 39 cases (6.1%, 95% CI: 4.2, 8.2) of transmission of HIV from mother to child. Home delivery (AOR = 4.0, 95% CI: 1.5, 12), infant not receiving antiretroviral prophylaxis at birth (AOR = 5.0, 95% CI: 1.6, 17.1), episiotomy (AOR = 5.1, 95% CI: 1.9, 15.1), and mixed infant feeding practices (AOR = 6.0, 95% CI: 2.1, 16.4) were significantly associated with mother-to-child transmission of HIV in the study.

Conclusions and recommendations: The risk of HIV infection among infants born from HIV-positive mothers was high. Predictors for mother-to-child transmission of HIV were episiotomy, home delivery, mixed feeding and absence of antiretroviral prophylaxis at birth. [*Ethiop.J. Health Dev.* 2019; 33(1):53-58]

Keywords: Mother-to-child transmission, HIV-exposed, infants, Ethiopia

Introduction

An estimated 36.7 million people were living with HIV worldwide in 2016, with the majority located in low- and middle-income countries. Of these, an estimated 25.5 million live in sub-Saharan Africa, including 2.1 million children under 15 years of age (1,2). The transmission of HIV from HIV-positive mothers to their children during pregnancy, labor, delivery or breastfeeding is referred to as ‘mother-to-child transmission’ (MTCT). In the absence of any intervention, transmission rates range from 15% to 45% (3).

In 2015, globally an estimated 1.2 million exposed infants were born HIV positive (1). Globally in 2016, there were 120,000 AIDS-related deaths and 160,000 new infections among children (4). To eliminate new HIV infections, early recognition of HIV and timely management with appropriate prevention, care and treatment are helpful (5,6). Factors for MTCT include HIV viral load, advanced maternal AIDS-related illness, route of delivery, mixed feeding, breastfeeding, and low CD4 cell counts during pregnancy (7).

MTCT of HIV is one of the biggest challenges of the HIV/AIDS pandemic (8,9). Most infections occur during breastfeeding. More than half of new infections among sub-Saharan children occur after the first six weeks of life (10). In 2013, Ethiopia adopted the World Health Organization’s PMTCT Option B+ strategy, which recommends lifelong antiretroviral therapy (ART), regardless of a cluster of differentiations, such as CD4 count or clinical stage (11,12). Even though HIV is among the major contributors of infant mortality, only 54% of children exposed to HIV in the

21 highest-burden countries, most of whom are in sub-Saharan Africa (1,13,14), were tested for the virus within the recommended two months.

About 50% of children living with HIV/AIDS die before the age of 2, and about 33% die before they reach the age of 1, because of recurrent infections (16,10). One third of women living with HIV passed the virus to their children in Middle East and North Africa regions in 2015 (18). Sub-Saharan Africa is the region where 90% of pregnant women with HIV are located (5,17). HIV during pregnancy is associated with various undesirable consequences for the mother, fetus and neonate, such as maternal death, abortion, stillbirth and low birth weight (18-21).

The high rate of HIV morbidity and mortality among pregnant and lactating women, and their infants, is still a health challenge in Ethiopia (11). The average rate of HIV transmission from mother to child was 18% in Ethiopia. Previous studies also indicate that Ethiopia is among the 10 countries with the highest rates of MTCT (7,22). There is little evidence about the risk of HIV infection among infants born to mothers with HIV. Accordingly, this study aims to contribute to the body of evidence on the prevalence of HIV and associated factors among HIV-exposed infants.

Methods

Study population and design: A facility-based, cross-sectional study was carried out at PMTCT clinics in West Gojjam Zone. The study participants were HIV-exposed infants enrolled at the clinics from 01 January to 30 December 2017. PMTCT registration books and HIV-exposed infants’ cards were the source of the data. Records of study subjects were selected randomly from

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PMTCT registration books, using their unique identification numbers. HIV-exposed infants who had DNA-PCR test results or rapid antibody test results were included in the study.

Sampling and data collection: There are 48 PMTCT sites in West Gojjam zonal administration. Multi-stage sampling was used, and 30% of the PMTCT sites were selected by lottery method. Therefore, 15 PMTCT sites were selected randomly. Sample size was determined based on a previous study of the rate of HIV among HIV-exposed infants, which was 15% (23), with 4% marginal error, 95% confidence interval of certainty ($\alpha = 0.05$) and design effect of 2, considering 10% non-response rate. The total sample size was 636.

A checklist for data collection was developed by adapting a national HIV-exposed infant follow-up form to compile the required information. Infants enrolled at PMTCT clinics from 01 January to 30 December 2017 with a recorded DNA-PCR test result were included in the study, and subjects were excluded if their records contained incomplete information. The data were collected from records of HIV-exposed infant care follow-ups. It took a month to collect the data from the charts, and 636 infant records were reviewed. Four experienced nurses who were trained in comprehensive HIV care and PMTCT carried out the data collection.

Data analysis

After collection, the data were entered into Epi Info (version 7) and then analyzed using SPSS (version 20.0). The data were reviewed to check for any inconsistencies, coding errors and out-of-range and missing values, and appropriate corrections were made before starting analysis. The dependent variable was infant HIV status. Descriptive analyses of socio-demographic information, infant follow-up information, maternal PMTCT service, and infant final HIV serostatus were carried out. All variables significant at $p < 0.2$ in the bivariate analysis were included in the multivariate logistic regression model,

and a forward stepwise method of model selection was used to select factors that were associated with the outcome variable. Pearson's correlation matrix was used to check for collinearity between all variables and models fitted with and without adjustment for highly correlated variables. Finally, multivariate logistic regression model was done with a 95% confidence interval and adjusted odds ratios were calculated. $P \leq 0.05$ in the final model was considered as significant for infant HIV serostatus.

Ethical consideration: Ethical clearance was obtained from Bahir Dar University, College of Medicine and Health Science, Ethical Review Committee. A support letter was also obtained from Amhara Regional Health Bureau and West Gojjam Health Department. The zonal health department and each district health office offered letters to inform managers of all eligible health facilities. We did not seek informed consent from the study subjects, since the data is secondary. The data retrieved from each health center's HIV-exposed infant records and PMTCT registration logbooks were used entirely anonymously, with no names or identification numbers. The collected data are kept strictly confidential.

Results

Socio-demographic characteristics: A total of 636 infant records, with maternal follow-up data, were included in the study. The mean age of infants' mothers was 28 (SD ± 4.6 years). The minimum and maximum ages of HIV-infected mothers were 18 and 42 years, respectively. The largest proportion of mothers were aged 25 to 34, accounting for 394 (62%) of the sample. Five hundred and eight (79.9%) mothers resided in urban areas and the remaining 128 (20.1%) lived in rural areas (Table 3). The majority of HIV-infected mothers, 460 (72.3%), were not able to read, as shown in (Table 1), and 498 (78.3%) mothers were homemakers.

Table 1. Sociodemographic characteristics of the PMTCT care study subjects in West Gojjam Zone health facilities, northwest Ethiopia

Variables	Frequency	%
Sex of the infant		
Male	292	45.9
Female	344	54.0
Age of the mother		
15-24	152	24
25-34	394	62
≥ 35	90	14
Literacy of the mother		
Able to read and write	176	27.7
Unable to read and write	460	72.3
Occupational status of the mother		
Homemaker	498	78.3
Employee	42	6.6
Others	96	14.9
Place of delivery		
Health institution	592	93.1
Home	44	6.9

Maternal and infant clinical characteristics: The majority (548, 86.2%) of HIV-exposed infants were enrolled into HIV care within six weeks of life. Of these, 94.2% of the infants were given ARV prophylaxis for MTCT of HIV. All HIV-exposed infants received co-trimoxazole preventive therapy (CPT), and 80% of infants started CPT within the six weeks of being born. Regarding infant feeding, 591 (92.9%) infants were exclusively breastfed before six months. The growth pattern was normal for 622(97.8%) HIV-exposed infants. A high proportion of mothers (93.1%) delivered their child at a health institution. The vast majority of births were vaginal

deliveries (92.5%); the remaining were episiotomies (5.7%) and cesarean sections (1.9%). At the time of delivery, 6.8% of mothers were at late-stage AIDS (WHO stage III or IV).

Magnitude of HIV among exposed infants: Among HIV-exposed infants in this study, 39 (6.1%, 95% CI: 4.2, 8.2) were HIV-infected (Table 2). Thirty-six (92.3%) of the 39 HIV-infected infants were diagnosed by DNA-PCR, and the remaining seven were confirmed by HIV antibody tests. Of the HIV-infected infants, 15(41.7%) were diagnosed before or at 6 weeks of age.

Table 2: Infant and maternal clinical characteristics at PMTCT follow-up clinics in West Gojjam Zone, Northwest Ethiopia

Variables	Number %
Age of infant at enrolment	
≤ 6 weeks	548 (86.2)
>6 weeks	88(13.8)
Infant ARV prophylaxis at birth	
Yes	606 (95.3)
No	30 (4.5)
Infant feeding option	
Before 6 months	
Exclusive breastfeeding	591 (92.9)
Exclusive replacement feeding	9 (1.4)
Mixed feeding	36 (5.7)
Co-trimoxazole preventive therapy starting time	
≤ 6 weeks	508 (79.9)
> 6 weeks	128(20.1)
Mode of delivery	
Vaginal	588 (92.5)
Episiotomy	36 (5.7)
Cesarean Section	12 (1.9)
HIV stage of mother	
WHO stage I and II	593 (93.2)
WHO stage III and IV	43 (6.8)

Factors associated with MTCT of HIV: Infants' ARV prophylaxis, mixed feeding, episiotomy and delivery at home had significant association for HIV transmission among HIV-exposed infants in multivariate logistic regression. Infants not receiving ARV prophylaxis at birth were at a five times higher risk of HIV infection compared to infants who received prophylaxis (AOR =5.2; 95% CI: 1.6,17.1). Mothers who delivered their infants at home had a four times (AOR=4.4, 95%CI: 1.5, 12) higher risk of MTCT

compared to those who delivered at health institutions. Infants who were mixed-fed before 6 months of age had a six times (AOR=5.7, 95% CI: 2.1, 16.4) greater risk of HIV infection than infants who were exclusively breastfed. Mothers who delivered with episiotomy had a five times (AOR=5.4, CI: 95%1.9, 13.9) higher risk of transmission of HIV than mothers who delivered via spontaneous vaginal delivery. Some factors that are associated with HIV infection among HIV-exposed infants are summarized in Table 3.

Table 3: Predictors of MTCT of HIV among exposed infants in West Gojjam Zone, Northwest Ethiopia

Variable	HIV status		COR (95% CI)	AOR (95% CI)
	Negative	Positive		
Age of infant at enrolment				
≤ 6 weeks	521	21	1	1
> 6 weeks	76	18	5.8(3,11.6)***	2 (0.7,6.6)
Co-trimoxazole preventive therapy starting time				
≤ 6 weeks	486	22	1	1
> 6 weeks	111	17	3.4 (1.7,6.6)***	
Infant's growth pattern				
Normal	589	33	1	1
Growth failure	8	6	1 (4.4,40.8)***	2.6 (0.6,12)
Infant's ARV prophylaxis				
Yes	575	24	1	1
No	22	15	16 (7.5,35.4)***	5.2(1.6,171)**
Place of Residence				
Urban	486	22	1	
Rural	111	17	3.4(1.7,6.6)***	0.7 (0.2,2.2)
Place of delivery				
Health Institution	569			
Home	28			
Mother's HIV stage				
WHO I and II	568	25	1	1
WHO III and IV	28	16	12(5.7,27.4)***	4.4 (1.5,12)*
Infant feeding option <6 months				
Exclusive breast feeding	574	26	1	1
Mixed feeding	23	13	14 (7,30)***	5.7 (2,16.4)**
Mode of delivery				
Vaginal	569	31	1	
Episiotomy	28	8	5 (2.2,15.5)***	5.4 (2,15.1)**

P value *= <0.05 ; **= <0.01 ; ***= <0.001 ;COR:crude odds ratio; AOR: adjusted odds ratio

Discuss

This study was conducted to find out the magnitude of HIV and associated factors among HIV-exposed infants in West Gojjam Zone, northwest Ethiopia. In this study, the magnitude of HIV infections among HIV-exposed infants was 39(6.1%, 95% CI: 4.2,8.2). Factors associated with the transmission of HIV from mothers to infants were delivery at home, not receiving ARV prophylaxis at birth, episiotomy during childbirth, and mixed feeding before 6 weeks of age. The proportion of HIV among infants born from HIV-positive mothers was 6.1% (95% CI: 4.2, 8.2), which is a higher rate of transmission compared to high-income countries, and higher than the global target in 2015, which was 2% among non-breastfeeding and 5% among breastfeeding women (1). This relatively high proportion may be due to the low availability of PMTCT services for HIV-positive pregnant women. The magnitude is lower than Ethiopian national MTCT estimate in 2012 (17%), and lower than studies conducted in Dire Dawa (15.7%) and Gondar University referral hospital (10%) (11,22). The rate of MTCT was similar to the findings of studies in East and West Gojjam zones 5.9% (24) and southern Ethiopia 4.2% (7). A much lower MTCT rate (1%) was reported in a study in Enugu, Nigeria (25). According to the WHO, even though the MTCT transmission rate ranges from 15% to 45% in the absence of any intervention, this rate can be reduced to below 5% with effective intervention during pregnancy (3).

Mixed feeding was significantly associated with MTCT of HIV (AOR=5.7, 95% CI: 2.1, 16.4). This finding is similar to the results of a study in Makurdi, Nigeria, where mixed feeding increased by 26 times the risk of HIV for infants born to HIV-positive mothers (26), and is also similar to a study conducted in Angola, where maternal milk exposure before the age of 6 months increased the risk by five times (27). A number of similar studies from resource-limited countries have also reported mixed feeding to be a positive determinant for HIV transmission (28,29), including Ethiopia (22,23,30). This could be due to mixed feeding being associated with gastrointestinal ulceration secondary to diarrheal disease. As a result, the virus can quickly enter the infant's bloodstream through the ulcerated gastrointestinal tissue (31).

Infants born at home were four times more likely to be infected with HIV than those whose mothers delivered at health institutions. This study agrees with other studies from developing countries (22,29,32). The reason for this could be the lack of PMTCT interventions during and after labor and delivery for mothers who gave birth at home. Therefore, the women will miss interventions available at health facilities, such as the use of standard infection prevention practices, the use of partographs to follow the progress of labor, use of ARV prophylaxis, and safe delivery practices (31). ARV prophylaxis at birth was another determinant factor for MTCT of HIV infection. Infants who did not start ARV prophylaxis immediately after

birth were at a five times higher risk of HIV infection than infants who received prophylaxis at birth. This finding is similar to findings of another study conducted in Ethiopia, as well as studies carried out in Kenya and Brazil (23,33,34). Since, HIV transmission from the mother to the newborn is higher during labor and delivery, starting ARV prophylaxis immediately will hinder the replication of the virus.

Mothers who delivered with the help of episiotomy were five times more likely to infect their infant than those mothers who delivered via spontaneous vaginal delivery. This finding agrees with a study in Angola (27), where mothers who delivered vaginally minimized the risk of acquiring HIV by 37%. This may be due to laceration and bleeding in episiotomy, which increase the risk of HIV infection for infants born from HIV-positive mothers.

Generally, this study explained the magnitude of MTCT of HIV and its predictors among mothers following HIV care in West Gojjam Zone health facilities. However, further studies should be considered to explicitly determine those factors associated with MTCT of HIV.

Conclusions and recommendations

The risk of HIV infection among infants born from HIV-positive mothers was 6.1%, which is higher than the WHO report (3) (below 5%, with effective intervention). The risk of MTCT of HIV was higher for infants who do not receive prophylaxis, mothers who practice episiotomy, mothers who deliver their babies at home, and infants with mixed feeding. Zonal health departments should focus on providing health workers with training on how to prevent MTCT of HIV; expanding community education in order to minimize home delivery; and promoting the practice of exclusive breastfeeding.

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Data sharing statement: All unpublished data related to this research project are available from the author.

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