BMC Pediatrics

RESEARCH

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Incidence of mother-to-child transmission of HIV and predictors of positivity among HIV exposed infants in South Gondar public hospitals, Northwest Ethiopia: competing risk regression model

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Abstract

Background The principal route of HIV infection in children is vertical transmission. Thus, this study aimed to assess the incidence of mother-to-child transmission of HIV and predictors of positivity among HIV-exposed infants.

Method Institutions-based retrospective follow-up study was conducted in South Gondar Public hospitals, Northwest Ethiopia from December 2019 to November 2021. The data were taken from PMTCT logbooks and patient medical records, with death being the competing event. Data were entered in to Epi info version 7 and exported to STATA version 14 for final analysis. Both bivariable and multiple variable proportional subdistribution hazard analysis were conducted to identify predictors. P-value < 0.05 was level of significance.

Result A total of 469 exposed infant mother pairs records were included. The cumulative incidence rate at the end of the study period was 5.2 per 1000 person months (5.2; 95% CI: 3.4-8.0).Infants' absence of ARV prophylaxis at birth (aSHR = 3.7; 95% CI: 1.33–10.48), Mothers with no PMTCT intervention (aSHR = 5.1; 95% CI: 1.83–14.03), home delivery (aSHR = 4.1; 95%CI: 1.46–11.63) and maternal disclosure of HIV status to partner/families (aSHR = 2.9; 95% CI: 1.06–7.78) were predictors of HIV positivity.

Conclusion The study found that Infants' absence of ARV prophylaxis at birth, mothers without PMTCT intervention, home delivery and mothers who were not disclosing their HIV status to families were predictors of HIV positivity.

Keywords HIV, Incidence, Mother-to-child transmission, Exposed infants, Ethiopia

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Introduction

Globally, in 2020, approximately 4000 new HIV infections were reported daily, with 60% occurring in sub-Saharan Africa and 10% occurring in children [1]. Mother-to-Child Transmission of HIV (MTCT) during pregnancy, labor, delivery, or breastfeeding is the main source of HIV infection, contributing to more than 90% of new HIV infections. The overall MTCT rate varies from 15 to 45% in the absence of any intervention [2]. In 2016, there were 160,000 new pediatric infections and 120,000 AIDS-related deaths worldwide [3]. The implementation of Prevention of Mother-to-Child Transmission (PMTCT) service cascades, consisting of prophylactic antiretroviral (ARV) medication for HIV-exposed infants (HEIs), lifelong antiretroviral therapy (ART) for HIV-positive pregnant and lactating women, serial HIV testing of infants and prompt initiation of ART among infants who become HIV-positive, is crucial for reducing the rates of MTCT of HIV and new infections in children [4, 5]. A number of factors influenced MTCT of HIV. The place of delivery, route of delivery, infant prophylaxis, infant feeding practices [6], residence, antenatal care visits(ANC), CD4 cell counts during pregnancy, and infant birth weight less than 2.5 kg [4, 7] are factors for the acquisition of HIV infection in HEIs.

Ethiopia is among the countries most affected by the HIV/AIDS pandemic. In 2016, 27,104 of the 720,000 people living with HIV were newly diagnosed. However, a noticeable portion of HIV-positive individuals died, with only 67% of predicted individuals knowing their HIV status and 59% enrolling in a highly active antiretroviral therapy (HAART) program [8]. Additionally, Ethiopia had 42,000 children aged 0–14 who were living with HIV, with a 17.9% MTCT rate [9].

To address these challenges, the World Health Organization (WHO) developed the ART guidelines, which recommend three PMTCT approaches (A, B, and B+) to eliminate HIV infection through MTCT. The most recent strategy, the Option B^+ PMTCT initiative, sets an intense focus on providing all HIV-positive women access to universal, lifelong ART, irrespective of their CD4 count and WHO clinical staging [10]. Between 2000 and 2021, PMTCT intervention averted 2.9 million HIV infections and 1.5 million maternal and pediatric deaths globally [11].

As part of its national policy to improve maternal survival and prevent new HIV infections in children, Ethiopia has been implementing the Option B^+ program since 2013 [2, 12]. The percentage of women receiving PMTCT services in Ethiopia increased from 25.5% in 2010 to 73% in 2015. As of 2016, only 35% of HIV-positive children were receiving ART [13]. Despite its best efforts, Ethiopia continues to face a significant health challenge due to the high rate of HIV morbidity and mortality among pregnant and lactating women and their infants, placing it among the 10 countries with a high HIV burden, with an MTCT rate of 18% [6, 10].Other studies indicated that the rate had reached up to 30% [13]. Even though a variety of studies on the incidence, predictors, and MTCT of HIV have been performed in various regions of the country, the effect of competing risks like death, was overlooked. Therefore, this study aimed to estimate the incidence and Predictors on MTCT of HIV among HIV-exposed infants in South Gondar public hospitals, Northwest Ethiopia: Competing risk regression model from December1, 2019 to November 30, 2021.

Methods and materials

Study area

The study was carried out in the South Gondar Zone, which is located in the center of the Amhara region and Northwest part of Ethiopia. The zone is approximately 668 km from Addis Ababa, the capital city of Ethiopia, and 103 km from Bahir Dar, the regional state of Amhara. Debre Tabor is the administrative center of the South Gondar Zone.The Zone has 18 districts, with a total population of 2,609,823 (1,304,911 females and 1,304,912 men) [14]. There are 48 Health centers and 8 hospitals which provide PMTCT services for the zone; all of them are government health facilities. Among the hospitals, Debre Tabor Hospital is the only comprehensive and specialized referral hospital but the rest are primary hospital [15].

Study design and period

A facility-based retrospective follow-up study was carried out at all PMTCT clinics of the study hospitals. Data were taken from PMTCT logbooks and medical records of mother-infant pairs from December 1, 2019 to November 30, 2021.

Eligibility criteria

All HEIs up to the age of 24 months who had a DNA/PCR test result at the age of enrollment or a rapid antibody test result at or over 18 months of age after 6 weeks of breastfeeding cessation during the follow-up period were included in the study. Besides those HEIs who died before their HIV status were known included in the study as competing risks. Infants enrolled in HIV/AIDS chronic care with no DNA /PCR or rapid antibody test results (is suspected of having symptomatic HIV or displays any severe classification possibly due to HIV or has positive antibody test under 18 months and has 2 or more of the following: oral thrush, severe pneumonia or severe sepsis. Cases with severe acute malnutrition or moderate acute malnutrition that does not respond normally to treatment can also enrolled to the chronic care)

or incomplete records and those lost to follow up at the time of enrolment were excluded from the study.

Study populations and sampling procedure

To illustrate the Fine and Gray model [16], in this paper, all mother-infant pairs enrolled in PMTCT service registered in randomly selected hospitals were included. The selected facilities include: Debre Tabor Comprehensive and Specialized Hospital, Ibinat and Addis Zemen primary hospitals.

The study population consists of 506 HEIs paired with their mothers who had enrolled at the PMTCT clinic in the study hospitals. Of these, 469 infant-mother pairs were included in the study. Among HEIs 21and 8 of them were HIV positive and died respectively. Death as a competing risk in the analysis of incidence of MTCT of HIV to exposed infants can alter the possibility or completely impede the occurrence of mother-to-child transmission of HIV. This differs from censoring, which simply prevents the observation of the time at which vertical transmission occurred. Those who encounter a competing event are regarded as censored in standard Kaplan-Meier analysis. This analysis will overrate the likelihood of MTCT of HIV in exposed infants, as it can no longer occur in dying individuals. As a result, the Fine and Gray sub-distribution hazard model approach is preferred over the Cox regression model in the presence of competing risk [16–19]. The sampling procedure is shown in (Fig. 1). The st power command of software Stata 14 at 95% CI and 80% power with Hazard ratio of 2.31 [7] was used to estimate the minimum sample size for incidence and predictors, resulting in 428 sample size.

Data collection

A checklist derived from a national HIV-exposed infant follow-up form was used to gather the data. The data were collected from PMTCT logbooks and medical records of infants exposed to HIV. Four experienced

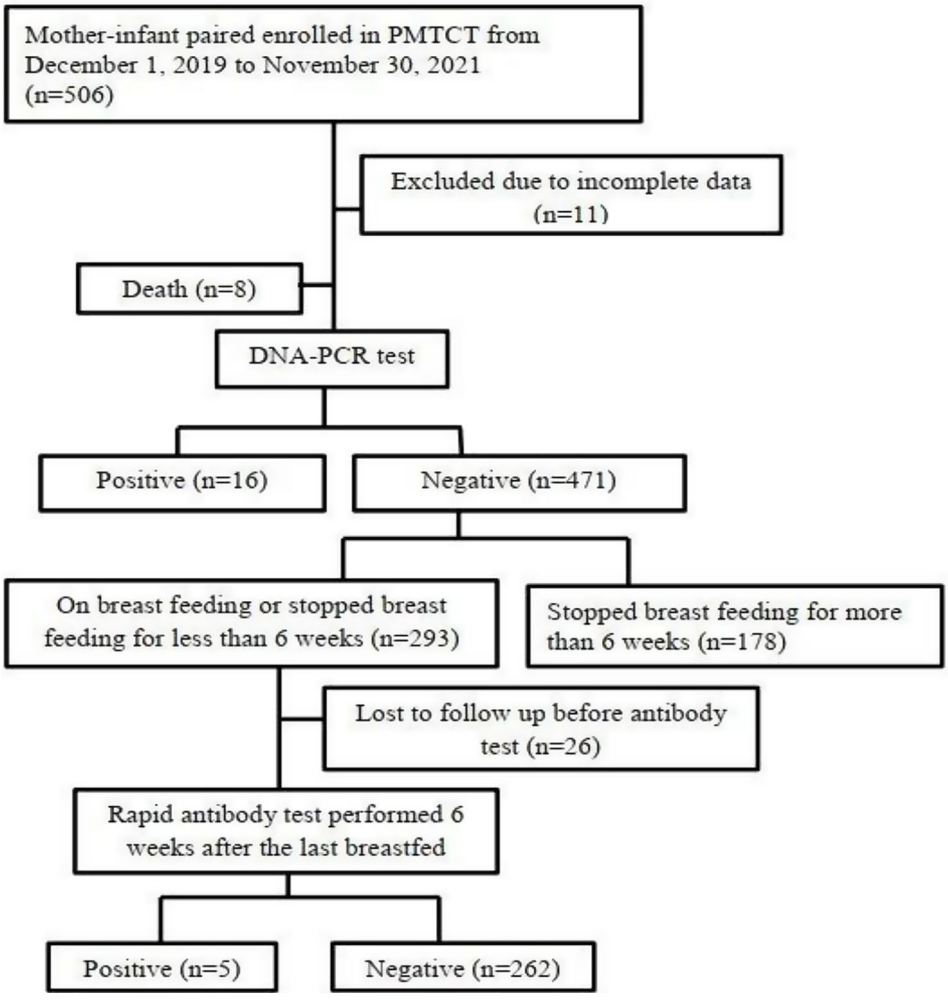

Fig. 1 Schematic presentation of the sampling procedure for incidence and predictors on mother-to-child transmission of HIV among HIV-exposed infants

nurses trained in PMTCT and comprehensive HIV care collected the data.

Data analysis

After collection, the data were checked for consistency and completeness, entered into Epi Info version 7, and exported to Stata version 14 for further analysis. The variables under study were described using descriptive statistics, including frequency, percentage, and mean. To predict the cumulative incidence, which was expressed per 1000 person-months, we employed competing risk regression with a proportional subdistribution hazard model. Variables in the bivariable proportional subdistribution hazard model with p values less than 0.25 were included in the multivariable analysis. For the overall model fitness, the model assumption was tested using the Schoenfeld residual and the Cox-Snell residual plots. The results were considered statistically significant at $p<0.05$. The strength of the association was assessed using the crude subhazard ratio (cSHR) and adjusted subhazard ratio (aSHR) with their respective 95% confidence intervals.

Dependent variable

Incidence of MTCT of HIV was the outcome variable, while death was a competing event. At the end of the study period, subjects were categorized as either HIV-positive, died, lost to follow up or censored.

Independent variables

HEIs and their mothers' socio-demographic variables (age of the mother, maternal educational status, residence).

Follow up history during pregnancy (antenatal follow-up).

Intrapartum influences (place of delivery, mode of delivery).

Therapy and clinical variables (maternal ARV therapy, infant ARV prophylaxis, and maternal CD4 count).

Operational definition

Sero-status

Dried blood spot (DBS) or rapid antibody test results were considered positive or negative for HIV during the 24-month follow-up period, as indicated by the infant registration chart (6).

HIV exposed infants (HEIs)

Infants born to HIV-infected mothers or HIV antibody test positive for infants < 18 months of age.

Mother to child transmission (MTCT) of HIV

Determined by the infant's final (confirmed) HIV test result and classified as:

- For breastfed infants: - HIV DNA/PCR result for infants aged < 18 months after cessation of breastfeeding or HIV antibody test result for infants aged ≥ 18 months 6 weeks after cessation of breastfeeding.
- For non-breast-fed infants: - HIV DNA-PCR result for infants aged < 18 months or HIV antibody test result for infants aged ≥ 18 months.

Competing risks are events which prevent the occurrence or modify the risk of the primary event or outcome of interest [16].

Ethical consideration

Ethical approval was obtained from Debre Tabor University, College of Health Sciences, Ethical Review Committee. A consent letter was then sent to the study hospital to collect data with no informed consent from the study subjects as the data was secondary. The data retrieved from the study hospitals' HEIs' records and PMTCT registration logbooks were used totally anonymous. The data are all kept confidential.

Results

Socio-demographic characteristics of infant

The study population comprised 506 HEIs - mothers' pairs who attended PMTCT clinics in the study public hospitals. The study involved 469 participants and had a retrieval rate of 92.7%. At the time of enrolment, the mean age of exposed infants was 5.12 (±2.5). About half of the participants were male. Most mothers (62.9%) were married, 25.4% were single, and 11.7% were divorced and widowed, with 72.7% living in urban and more than two thirds (69.3%) of the participants being literate.

Most mothers (91%) delivered through the vagina spontaneously. More than two-thirds of HEIs (69.5%) were born at health facilities with 83.2% of the mothers having antenatal follow-ups. The majority of the mothers (86.4%) disclosed their HIV- status to their partners and families. Roughly 80% of both mothers and their exposed infants were on HAART and ARV prophylaxis respectively. The majority of HEIs (74.2%) were fed on exclusive breastfeeding in the first six months (Tables 1).

Cumulative incidence rate (CIR) of MTCT

A competing risks analysis correctly determines the absolute risk of a time-to-event outcome of interest by incorporating the competing event into the analysis [20]. A total of 469 participants were followed for a minimum of 4.25 months and a maximum of 24 months, with a median follow-up time of 9.27 months. The total risk observed during the follow-up period was 4048.88 person-months. The overall CIR by the age of 24 months

Table 1 Demographic and clinical characteristics of HIV-infected women and their exposed infants

	Frequency	%
Maternal age		
15–24	176	37.53
25–34	234	49.89
>=35	59	12.58
Marital status		
Married	295	62.90
Single	119	25.37
Divorced and widow	55	11.73
Residence		
Urban	341	72.71
Rural	128	27.29
Educational Level		
Primary and above	326	69.51
Illiterate	143	30.49
Maternal Disclosure of HIV status to partners/families		
Yes	405	86.35
No	64	13.65
ANC		
Yes	390	83.16
No	79	16.84
Place of delivery		
Health facility	377	80.38
Home	92	19.62
Mode of delivery		
Spontaneous vaginal delivery	427	91.04
Caesarean section	42	8.96
PMTCT		
Yes	378	80.60
No	91	19.40
Sex		
Female	232	49.47
Male	237	50.53
Birth Weight of the infant		
≥ 2500 gram	418	89.13
< 2500gram	51	10.87
Infant ARV prophylaxis		
Yes	371	79.10
No	98	20.90
Feeding (1st six months)		
EBF	348	74.20
ERF	45	9.59
MF	76	16.20
Maternal CD_4count during pregnancy		
≥ 350	323	68.87
< 350	146	31.13

was 5.2 per 1000 person-months 5.2 (95% CI: 3.4-8.0) as shown in Table 2. At the end of the study period, the highest CIR (about 11 per 1000 person-months) was observed in children born at home, those whose mothers did not disclose their HIV status to one's partner/families and mothers who were not on PMTCT. The overall transmission rate of HIV infection from HEIs was estimated to be 4.5% by the end of the study period (4.5%;95% CI: 3–7%).

Predictors of mother-to-child transmission of HIV

The subdistribution hazard ratio (SHR) for selected covariates with death as a competing event was obtained from Fine and Gray competing risk survival regression model [16] for different predictors of HIV positivity for HEIs are given in Table 3.

Schoenfeld residual global test was 0.3502 which fulfilled the sub-hazard proportionality assumption and showed that the goodness-of-fit test was satisfactory (Fig. 2).

Several factors in the bivariate subdistrbution hazard analysis < 0.25 were included in the multi variate analysis (Table 3).

Infants who did not receive ARV prophylaxis at birth (aSHR = 3.7; 95% CI: 1.33–10.48), mothers who did not receive PMTCT intervention (aSHR = 5.1; 95% CI: 1.83–14.03), mothers who did not disclose their HIV status to partners/ families (aSHR = 2.9; 95% CI: 1.06–7.78) and mothers who delivered at home (aSHR = 4.1; 95%CI: 1.46–11.63) had a significant association with HIV transmission among HIV-exposed infants according to multivariate subhazard regression analysis.

Discussion

Predictors on MTCT of HIV among HIV-exposed infants include the absence of infants' ARV prophylaxis, mothers with no PMTCT intervention, mothers failing to disclose their HIV status to their partners or families, and home delivery. By the age of 24 months, the overall incidence rate of MTCT of HIV among HEIs in the study public hospitals was 5.2 per 1000 person-months, with an overall vertical transmission rate of 4.5% which is a substantial burden for our society. The finding of this study was consistent with retrospective studies conducted in Ethiopia, like Dessie (3.8%) [21], Gondar (5.5%) [3], and west Guji zone (3.8%) [22]. The similarity might be due to the implementation of a similar PMTCT program.

The result of our study was lower than studies conducted in India, Vietnam and Southwest Ethiopia [7, 12, 23] but higher than studies in Northern Ethiopia(2.1%) [24] Nigeria(2.8%) [4] and Rwanda(2.2%) [25].This discrepancy might be attributed to spatial differences, as our study was conducted during a period of high ART coverage for pregnant and lactating women, unlike earlier research in the country. The study findings could also be influenced by variations in sociodemographic characteristics [13, 26].

Table 2 Cumulative incidence rate (per 1000 person-months) by the end of the 24 months

Variables	HIV Negative infants	HIV positive infants	Death	Person-months	CIR	(95% CI)
Maternal age						
15–24	166	7	3	1333.69	0.0052	(0.0025–0.0110)
25–34	222	9	3	2045.87	0.0044	(0.0023–0.0085)
>=35	52	5	2	669.320	0.0075	(0.0031–0.0179)
Marital status						
Married	280	11	4	2441.45	0.0041	(0.0022–0.0076)
Single	111	6	2	1012.2	0.0069	(0.0033–0.0145)
Divorced and widow	49	4	2	595.23	0.0067	(0.0025–0.0179)
Residence						
Urban	321	15	5	2812.91	0.0050	(0.0029–0.0084
Rural	119	6	3	1235.97	0.0057	(0.0027–0.0119)
Educational Level						
Primary and above	307	15	5	2635.59	0.0057	(0.0034–0.0094)
Illiterate	133	6	3	1413.29	0.0042	(0.0019–0.0094)
Maternal Disclosure of HIV status to partners/families						
Yes	384	15	6	3502.81	0.0043	(0.0026–0.0071)
No	56	6	2	546.07	0.0110	(0.0049–0.0245)
ANC						
Yes	371	14	5	3046.10	0.0046	(0.0027–0.0078)
No	69	7	3	1002.78	0.0070	(0.0033–0.0146)
Place of delivery						
Health facility	361	12	4	3250.11	0.0037	(0.0021–0.0065)
Home	79	9	4	798.77	0.0113	(0.0059–0.0217)
Option B^+ PMTCT						
Yes	359	12	5	3246.56	0.0037	(0.0021–0.0065)
No	81	9	3	802.32	0.0112	(0.0058–0.0216)
Mode of delivery						
SVD	401	19	7	3648.17	0.0052	(0.0033–0.0082)
C/S	39	2	1	400.71	0.0050	(0.0012-0.0200)
Sex						
Female	217	10	5	2073.23	0.0048	(0.0026–0.0090)
Male	223	11	3	1975.651	0.0056	(0.0.0031–0.0101)
Birth Weight of the infant						
≥ 2500 gram	395	17	6	3561.10	0.0048	(0.0030–0.0077)
< 2500gram	45	4	2	487.78	0.0082	(0.0031–0.0218)
Infant ARV prophylaxis						
Yes	353	13	5	3198.66	0.0041	(0.0024–0.0070)
No	87	8	3	850.22	0.0094	(0.0047–0.0188)
Feeding in 1st six months						
EBF	331	13	4	2764.61	0.0047	(0.0027–0.0081)
ERF	42	2	1	418.36	0.0048	(0.0012–0.0191)
MF	67	6	3	865.91	0.0069	(0.0031–0.0154)
Maternal CD_4 at pregnancy						
≥ 350	302	15	6	2562.02	0.0059	(0.0035–0.0097)
< 350	138	6	2	1486.86	0.004	(0.0018–0.0090)
Total	**440**	**21**	**8**	**4048.88**	**0.0052**	**(0.0034–0.008)**

The multivariate analysis included several covariates from the bivariate subhazard analysis with p-values < 0.25.

Absence of infants' ARV prophylaxis at birth was nearly three times more likely to contract HIV than infants who got prophylaxis. This study was congruent with previous studies in Northwest Ethiopia [2, 6, 27], Uganda [28] and Nigeria [29].Since MTCT of HIV is greater during labor and delivery, starting ARV prophylaxis for the HEIs immediately after birth will hinder the replication

Table 3 Predictors on MTCT of HIV among HIV-exposed infants on the PMTCT clinics by the end of 24 months

Characteristics	cSHR (95% CI)	aSHR (95%CI)
Maternal age		
15–24	1	
25–34	0.79(0.29–2.16)	0.92(0.33–2.53)
≥ 35	0.45(0.15–1.38)	0.52(0.14–1.92)
Residence		
Urban	1.68(0.71–3.95)	1.24(0.41–3.66)
Rural	1	
Educational status of mothers		
Primary and above	1	
Illiterate	0.38(0.16–0.95)	0.44(0.16–1.23)
Maternal Disclosure of HIV status to partners/families		
Yes	1	
No	3.75(1.53–9.20)**	2.88(1.06–7.78) **
ANC		
Yes	1	
No	0.44(0.17–1.13)	0.50(0.16–1.61)
Place of delivery		
Health facility	1	
Home	2.87(1.16–7.09)*	4.12(1.46–11.63) ***
PMTCT		
Yes	1	
No	4.84(2.0611.43)***	5.07(1.83–14.03) ***
Maternal CD4 at pregnancy		
≥ 350	1	
< 350	0.33(0.1–0.92	0.63(0.20–2.03)
Infant ARV prophylaxis		
Yes	1	
No	2.67(1.01–7.07)*	3.73(1.33–10.48) **
Feeding in the first six months		
Exclusive breastfeeding	1	
Exclusive replacement feeding	0.70(0.20- 2.41)	0.61(0.070–5.22)
Mixed feeding	0.45(0.15–1.31)	0.54(0.13–2.21)

P value *=<0.05; ** =<0.01; ***=<0.001.

of the virus thereby reducing the chance of vertical HIV infections in newborns. The study by Trials Network 040/Pediatric AIDS Clinical Trials Group 1043 found that 2-drug or 3-drug short-course regimens provided equivalent protection against infection in infants of mothers who delivered before treatment with peripartum transmission rates of 2–3% [30].Therefore commencing ARV prophylaxis promptly will reduce MTCT unlike previous studies [12, 13].

This study found that HAART during pregnancy and delivery significantly reduce the risk of HIV infection in infants exposed to the virus.

The hazards of mothers without PMTCT intervention were four times more likely to have HIV-positive children at the end of the follow-up period. This finding

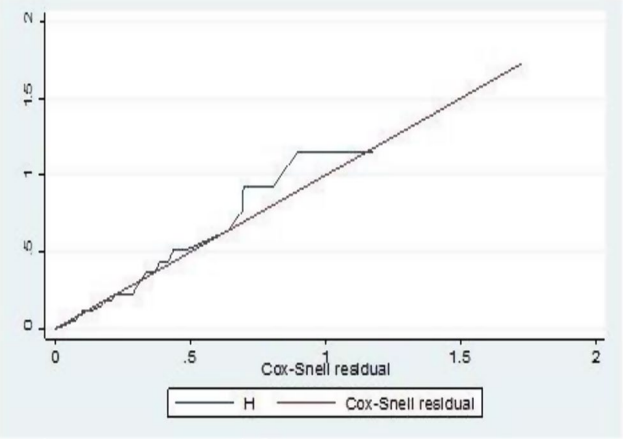

Fig. 2 Goodness-of-fit test for the Cox-Snell residual plot for incidence and predictors on MTCT of HIV among HEIs

was similar with studies in Ethiopia [12, 13, 27, 31, 32], and studies in other African countries [33, 34]. The rational could be PMTCT interventions reduces maternal viral load during pregnancy, labor or in breast milk and, therefore, could substantially lower the risk of mother-to-child HIV transmission. The rate of MTCT has been decreasing over time in parallel with the increased coverage of ART intervention for women during pregnancy. In Africa, during the analysis of 32 countries with generalized HIV epidemics, Hill et al. noticed that an average 10% increase in PMTCT coverage was related to a 3–3.5% reduction in MTCT rate [35].

Mothers who did not reveal their HIV status to their partners /families were about two times more at risk of passing HIV to their children than who did. This study was in line with studies in Kenya [36, 37], Malawi [38] and South Africa [39]. Maternal HIV status disclosure facilitate timely access to PMTCT and other services for women and their exposed infants, as it encourages them to seek support from their partners and family [1, 39].

Home-delivered mothers were found to be three times more likely to experience MTCT of HIV compared to those who gave birth in hospitals. Our study results are similar to results from studies conducted in Ethiopia and China [2, 23, 27, 31, 32]. The absence of PMTCT interventions during and after labor and delivery for mothers who gave birth at home might cause their HEIs to contract HIV infection. Home-delivered women will also miss interventions offered at health institutions, such as the use of standard infection control procedures, the use of partographs to track labor progress, the use of ARV prophylaxis, and safe delivery procedures [6]. Moreover, home-born infants are more vulnerable to harmful traditional practices such as cord-cutting, placental blood contamination, uvulectomy, unplanned circumcision, and pre-lacteal feeding [27], hence increasing the risk of HIV infection.

Conclusion and recommendation

The study found that infants' absence of ARV prophylaxis at birth, mothers without PMTCT intervention, home delivery and mothers who were not disclosing their HIV status to partner/families were predictors of HIV positivity. To avert new HIV infection, all HIV positive pregnant women should start lifelong ART regardless of CD4 count and WHO clinical staging since over 90% of all new pediatric HIV infections are due to MTCT.

To eliminate the global MTCT of HIV, it is necessary to expand the PMTCT interventions. So, MTCT of HIV can be almost completely prevented if both the mother and the infant receive ARV treatment as early as possible during pregnancy and after birth. As a result, there is still more to be done to further reduce MTCT in Ethiopia, as the MTCT rate in the UK has already dropped to less than 1%, while HIV MTCT has been eliminated in Cuba, Thailand, and Belarus.

Strength and limitation of the study

Strength

our study applied competing risk variable (death) using Fine and Gray competing risk model.

Limitation

Since this research was based on data collected retrospectively from follow up records, all risk factors of MTCT data were not fully available. Besides, our study doesn't indicate cause and effect relationships as it is not randomized controlled trial.

Abbreviations

ANC	Antenatal care
ART	Antiretroviral therapy
ARV	Antiretroviral
aSHR	Adjusted sub hazard ratio
CIR	Cumulative incidence rate
cSHR	Crude sub hazard ratio
DBS	Dried blood spot
DNA-PCR	Deoxyribonucleic acid polymerase chain reaction
EBF	Exclusive breastfeeding
EID	Early infant diagnosis
HAART	Highly active antiretroviral therapy
HEI	HIV-exposed infant
HIV	Human immunodeficiency virus
MTCT	Mother to child transmission PMTCT: Prevention of mother-to-child transmission

Acknowledgements

We would like to express our heartfelt gratitude to Debre Tabor, Ibinat and Addis Zemen Hospitals administrators, technical staffs and all those who have contributed to this research project to be true.

Author contributions

Authors(BAT, HSH, FDB, MKH, GBM, GA, BMB, NST, NM) participated in the design, data collection, data analysis and interpretation. And authors (BAT, HSH, FDB, MKH) participated in the drafting of the manuscript. All authors read and approved the final manuscript.

Funding

This research didn't receive any grant from any funding agency in the public, commercial, or not-for-profit sectors.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Competing interests

The authors declare no competing interests.

Ethical approval and consent to participate

Ethical approval was obtained from Debre Tabor University; College of Health Sciences and a formal letter of cooperation was written to the administrators of the respective hospitals. Since the study was a retrospective follow up study, waiver of consent was approved by the ethical review committee of the college of health science of Debre Tabor University. The collected data were kept confidential.

Consent for publication

Not applicable.

Received: 1 March 2024 / Accepted: 5 September 2024
Published online: 20 September 2024

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