HIV Free Survival and HIV Positivity of HIV Exposed Infant Attending Elimination of Mother to Child Transmission West Shoa Zone Health Facilities, Oromia Ethiopia

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Abstract

Background: In spite of an intensive progress in improvements of infant mortality due to HIV/AIDS recently, HIV/AIDS is causing an overwhelming impact on the world's children. Pregnancy, labour/delivery and breast feeding are the main source of HIV infection in children, which accounts more than 90%. Therefore, this study was evaluated HIV free survival status and HIV positivity among HIV exposed Infant attending elimination of mother to child transmission in West Shoa Zone Health Facilities, Oromia, Ethiopia, 2017.

Method: An institutional based Retrospective cohort study design was utilized from January 21 - April 20th, 2016. Data were collected from patient Cards and registration books by using data extractor tools. Data were entered in to EPI INFO 7.1 version and exported to SPSS for further analysis. Multivariable Cox regression analysis was conducted to determined incidence density ratio and adjusted Hazard Ratio, survival probability and factors associated with HIV positivity with 95% CI.

Result: This study assessment revealed that the overall cumulative probability of HIV free survival at six weeks by DBS was 98.8% and at 18 months by rapid antibody test was 98.0%.

The current study determined the incidence of HIV positivity showed that the overall incidence rate of HIV infection within the cohort 1.2% were HIV-infected at six weeks and at 18 weeks of survival and 6 weeks of breast feeding cessation were 2.0%.

The result of this study determined the predictors of HIV positivity of HEIs revealed that infant feeding option, PMTCT intervention and maternal breast condition, maternal WHO Clinical stages, Maternal TB Status and CD4 count status were significantly associated with HEIs being positivity and increased risk of likelihood of HIV positivity respectively.

Conclusion and Recommendation: The proportion of HIV free survival and rate of HIV positivity was revealed that 98% and 2% at the end of study programs among HEIs. This study identified factors associated with HIV positivity of HIV exposed infants', therefore, health planners and health professionals should be carefully reconsidered these factors during PMTCT/EMTC program development and training programs in Sub Saharan countries.

Keywords: HIV Positivity; HIV Free Survival Status HEI

Abbreviations

AIDS: Acquired Immunodeficiency Syndrome; ART: Antiretroviral Therapy; AOR: Adjusted Odd Ratio; COR: Crude Odd Ratio; HAART: Highly Active Antiretroviral Therapy; EDHS: Ethiopian Demographic and Health Survey; FMOH: Federal Ministry of Health; HEI: HIV Exposed Infants; HIV: Human Immunodeficiency Virus; MTCT: Mother-to-child Transmission; PMTCT: Prevention of Mother to Child Transmission; PLHIV: People Living with HIV; SPSS: Statistical Package for Social Sciences; SSA: Sub Saran African; WHO: World Health Organization

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Introduction

In spite of an intensive progress in improvements of infant mortality due to HIV/AIDS recently, HIV/AIDS is causing an overwhelming impact on the world's children. Pregnancy, labour/delivery and breast feeding are the main source of HIV infection in children, which accounts more than 90% [1,2]. Pediatric HIV is a large contributor to the excessive infant and child mortality rates in sub-Saharan Africa. One-third of HIV positive infants are estimated to die before their first birthday and over one-half will die by their second birthday [3].

Vertical transmission of HIV is almost totally avoidable through a set of interventions elimination of mother-to-child Transmission (EMTCT) [4]. Previous studies from sub-Saharan Africa have confirmed efficacy of the approach that continues ART during breastfeeding, reducing the risk of transmission to 1.1% and 4.2% at 1 and 6 months, respectively [5]. According to study conducted in Zimbabwe among HIV exposed infants 19% children were HIV infected and 43% lost to follow up before HIV diagnosis. On the other hands of the HIV infected children 43% died before the fifth birthday, 26 (28%) were lost to follow up and 27 (29%) were alive five years after maternal enrolment prior to availability of ART [6].

Ethiopia has adopted the World Health Organization (WHO) four pronged PMTCT strategy as a key entry point to HIV care for women, men and families [7]. The country has also developed Elimination of mother to child of HIV and has adopted WHO 2010 guidelines Option B+ regimen for treatment [8]. Despite marked progress to achieve zero MTCT by year 2015, the magnitude of MTCT still remains high which accounts 30% [3]. Even though there is ambitious global plan to make zero case pediatric new HIV infection in 2015 by option B+ treatment intervention there is no data which evaluates treatment outcome and associated factors or predictors of success in Ethiopia since this intervention is applied for the last two years. But in our country there is no study to assess whether this intervention is effective and associated factors. So this study is extremely valuable to evaluate incidence and predictors of infant HIV infection even though the mother is treated by option B+ intervention. So this research help as baseline for large and comprehensive study and stakeholders in HIV program and policy makers use the result of this study for further planning and to improve patient care if preventable risks are identified.

Methods

Study setting

The study was conducted from January 21 - April 20th, 2016 at PMTCT clinics of Public hospitals/Health centers in west Shoa zone, Oromia, Ethiopia. Ambo town is a capital city of the zone, located 112 kilometers to the west of Addis Ababa. There are 3 hospitals namely Ambo, Gedo and Gindeberet Hospitals and 18 other health centers which are currently providing both PMTCT and ART services in west shoa zone.

The total number of reproductive health age women living with HIV (WLHIV) attending ART clinic in west zone ART health facilities were 4146 (Zone health Office 2015) of which, 1860 were fulfills inclusion criteria for reviewed and surveyed their follow up cards.

Study design

An institutional based retrospective cohort study design was utilized. Inclusion criteria were all HIV exposed infants who have DNA PCR at the age of enrollment below 18 months or rapid antibody test result during follow up after 6 weeks of cessation of breast feeding.

Sample size calculation

The required sample size was determined using Statecalc program of the EPI INFO 7.1.0 version with 5% desired precision, 95% confidence level, 30% (Estimated risk of MTCT in Ethiopia [2], which is gives 323. By considering correction formula, since the total population was less than 10000 which as was 1860, the final sample size was 275.

Sampling procedure

All hospitals and Health centers found in west shoa zone which providing ART/PMTCT services were identified and randomly selected by computer generated methods to include in the study. List of all HIV exposed infants enrolment between September 2013 to September 2015 G.C was randomly selected study sites were prepared and entered into SPSS window version 20 by using their HEIs numbers from HMIS data base. Simple random sampling technique by computer generated samples was utilized at each hospital and Health center to

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select the study subjects. The number of study respondents were allocated proportionally for all two hospitals and six Health centers, based on their total number of patients.

Definition of terms and operational definition

- **ARV** prophylaxis: Short term use of ARV drugs in infant to reduce MTCT.
- **ART** (Antiretroviral Therapy): Is the use of 3 or more ARVs drugs simultaneously to treat HIV infection. ART is a life-long treatment for the mother and can also significantly reduce MTCT.
- **HIV positivity:** It is based on a positive Antibody test done after 6 weeks of cessation of breast feeding or DNA PCR test after from 6 weeks to18 months of age.
- **Incidence density:** ID means number of HIV exposed infants with Positive rapid diagnostics test per 1000 Person months of at risk of follow-up period.
- **The risk period begins** at the time of enrollment in to the HIV care and ends when HIV Antibody test will be done and after become positive or transfer out, loss, drop, stop or end of the study.
- **Follow-Up of Infants** Born to HIV-Positive Mothers in west zone Oromia, Ethiopia.
  According to the PMTCT 2011 guideline follow-up schedule is at 6 hours, 6 days, 6 weeks, 10 weeks, 14 weeks and then monthly until 6 months and there after every 3 months until 18 months if infant is asymptomatic.
- **Rapid antibody test** is done after 6 weeks of cessation of breast feeding.

Data collection

A retrospective cohort study design was employed from September 2013 to September 2015 among Infants born to HIV infected women were enrolled into this cohort at birth or at the time of diagnosis of HIV exposure in the postnatal period and followed-up at regular intervals. Data were extracted within 3 weeks from medical record and ART follow-up form for socio demographic (age, sex, residence), infant related health (mode of delivery, infant feeding, CPT prophylaxis, Immunization, Birth weight, place of delivery) and maternal characteristics (maternal breast status, HAART status, PMTCT follow up) by using 6 BS nurses as data collector. The ART focal persons were supervised. Throughout the country the same medical chart and electronic ART follow up form are used which was recommended by Federal Ministry of Health of Ethiopia. Simple and structured data collection questioner which was developed based on original medical, ART and HIV exposed infants charts were used to facilitate reliable data extraction.

Data management and analysis

In order to maintain the quality of data, BSc nurses who were trained on pediatric ART/PMTC and working at ART/PMTCT clinic was selected for data collection. Training was given before actual data collection period for two day on the objective of the study, variables on the questionnaire, medical record and follow-up form and how to extract data for this study purpose. The filled questionnaires were collected and checked for consistencies and completeness daily by supervisors and principal investigators. Completed questionnaire were checked for completeness of information and any gap identified was immediately communicated to the data collectors.

Data were coded manually, entered and cleaned using EPI-INFO version 7.1.0 and exported to SPSS version 20 for descriptive and inferential analyses. Frequencies and cross tabulations were used to check for missed values and variables. HIV free survival times were estimated for different feeding options and Maternal PMTCT intervention type by using Kaplan-Meir curve. Log rank test was used in order to test whether the observed difference is significant or not. Multivariable Cox regression analysis was conducted between HIV positivity of infants and maternal PMTCT intervention type and feeding option adjusted for all possible confounding effect of other variable associated with HIV positivity. P-value < 0.05 was considered as statistically significant.

For Incidence Density ratio (IDR), Crude and Adjusted Hazard Ratio, survival probability, 95% confidence interval and p-value was used to present the result of independent prediction of HIV positivity.

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Result

Demographic data of infants

According to retrospective cohort study done among HIV exposed infant attending Elimination of mother to child transmission in West Shoa Zone Health Facilities, Oromia Regional state west Ethiopia showed that 195 (76.8%) were attended ANC follow regular, 58 (22.8%) were newly diagnosed and started ART during current pregnancy, of which 45 (77.6%) were HIV test under opt out approach during ANC follow up and 196 (77.2%) were known HIV infected and on ART reproductive age women.

From total respondents 246 (96.9%) were attended Prevention of mother to child transmission of HIV intervention while 8 (3.1%) were not attended PMTCT intervention.

From the total participants 146 (57.5%) were male and 120 (47.2%) were resided in urban area.

From total HIV exposed infants 241 (94.9%) were skilled delivery in health facilities (Health center and Hospitals) while 13 (5.1) were home delivery, of total delivery 247 (97.2) were spontaneous vaginal delivery and all institutional delivery which 241 (94.9%) infants were enrolled at delivery.

Of total HEIs almost all 251 (98.4%) were taken nevirapine prophylaxis for six weeks and have good adherence to NVP which was 100%.

The majority of HEIs breast feeding options which revealed that 241 (94.9%) were exclusive breast feeding and only 5 (2%) were mixed feeding for the first six months.

From total breast fed HEIs stop/ceased breast feeding at less than 12 month 47.2% and 52.9% were at 12 to 18 months after delivery.

This study identified that as mothers' reported that of total respondents 98.8% were normal breast, but only 1.2% were diseased during breast feed of which 2 mothers were ulcer and 1 was mastitis and 78.3% were completed /fully immunized and completed recorded on their cards while 6 (2.4%) were not immunized at all antigens (See table 1).

Socio-demographic variables	Categories	Frequency (n)	Percent (%)
ANC status of the mother	Nil/not attendants	13	5.1
	Regular	195	76.8
	Irregular	46	18.1
Newly diagnosed and started on ART	Yes	58	22.8
	No	196	77.2
If yes for the above question started on ART at	ANC	45	77.6
	L@D	11	19.0
	PCNC	2	3.4
Known HIV +ve)	On Art	194	99.0
	Not On Art	2	1.0
PMTCT INTERVENTION	Yes	246	96.9
	No	8	3.1
Gestational age	< 37 WK	4	1.6
	37 - 42 WK	250	98.4
Place of Delivery	Hospital	93	36.6
	Healthy center	148	58.3
	Home	13	5.1
Mode of delivery	Vaginal	247	97.2
	C/S	7	2.8
Delivery Outcome	Live birth	254	100.0

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Birth Weight	2 - 4 Kg	252	99.2
	> 4 Kg	2	.8
Sex of Infant	Male	146	57.5
	Female	108	42.5
Membrane status	PROM	20	7.9
	Not PROM	234	92.1
Duration of labor	< 24 hrs	205	80.7
	24 - 48 hrs	49	19.3
Infant age at enrolment	At delivery	241	94.8
	< 6 WKS	7	2.8
	6 wks to 6 month	6	2.4
Age at DNA PCR done	6 - 12wk	229	90.2
	12 wk - 12 month	10	3.9
	> 12 month	15	5.9
Development of infant	Appropriate	250	98.4
	Delay	4	1.6
Infant nevirapine	Yes	251	98.8
	No	3	1.2
Adherence to NVP	Good	251	100.0
Infant feeding	EBF	241	94.9
	ERF	8	3.1
	MF	5	2.0
Stop breast feeding	< 12 month	116	47.2
	12 - 18 month	130	52.85
Maternal breast status	Normal	251	98.8
Mastitis-1 and ulcer -2	Diseased	3	1.2
Immunization status	Complete	199	78.3
	Unimmunized	6	2.4
	Incomplete	49	19.3

Table 1: *Sociodemographic characteristics of infants born from HIV positive mothers who have follow up in West Shoa Zone Health Facilities, Oromia, Ethiopia 2017.*

Maternal ART/PMTCT

From total PMTCT/ART attendants' their baseline WHO stage showed that 30.7% and 43.3% were WHO stage 1 and 2 respectively, of which almost half of them which 53.9% were 200 to 350 cells/m^3 while only 31% were greater than 350 cells/m^3 by recent CD4 count and 96.6% were on first line drugs while 8 (3.1%) were on second line drugs, of which the major eligibility criteria for ART initiation were pregnancy 23.6% and CD4 count 50.4%.

Of all mothers on HAART the majority 97.2% had good adherence on ART drugs and 11.4% were TB screening positive, 8 (3.1%) were TB treatment completed, on the other hands maternal age showed that 78.3% were 18-35 years old (See table 2).

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Variables	Categories	Frequency (n)	Percent (%)
Residence (n = 254) Address of the mother	Urban area	120	47.2
	Rural area	134	52.8
WHO clinical stage	Stage 1	78	30.7
	Stage 2	110	43.3
	Stage 3	63	24.8
	Stage 4	3	1.2
CD4 status	< 200	37	14.6
	200 - 350	137	53.9
	> 350	80	31.5
ART regimen of the mother	First line	246	96.9
	Second line	8	3.1
Eligibility criteria	Pregnancy	60	23.6
	CD4 count	128	50.4
	WHO Stage	66	26.0
Maternal adherence	Good	247	97.2
	Fair	7	2.8
Maternal TB Status	TB screen positive	29	11.4
	TB screen negative	217	85.4
	Completed TB treatment	8	3.1
Maternal MUAC	> 22 cm	161	63.4
	22 - 18	88	34.6
	< 18	5	2.0
Age of mother in years (n = 254)	< 18 years	13	5.1
	18 - 35 years	199	78.3
	> 35 years	42	16.5
Parity	Zero	11	4.3
	One	64	25.2
	2 - 4	141	55.5
	> 5	38	15.0

Table 2: Maternal PMTCT/ART of HIV exposed Infant of Mothers attending PMTCT program in West Shoa Zone Health Facilities, Oromia Regional state west Ethiopia 2017G.c.

Survival experience for different category

The overall cumulative probability of HIV free survival at the end of the six weeks by DBS was 98.8% and mean for survival time was 98.8% (95% CI, 97.2 - 100) months.

The cumulative probability of HIV free survival time was 94.5 (95% CI, 91.7 - 97.2) months for exclusive breast feeding option and 2.0 (95% CI, 0.4 - 3.9) months for mixed feeding and 3.1 (95% CI, 1.2 - 5.5) months for formula feeding option. Log rank test for infants feeding option strata was significant (p-value < 0.001) (See figure 1).
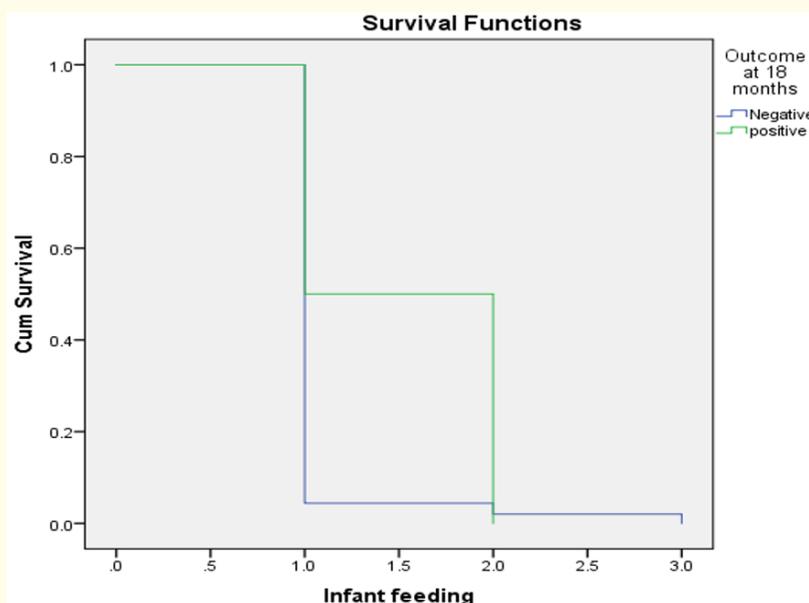
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Figure 1: *HIV free survival times were estimated for different feeding options and Maternal PMTCT intervention type by using Kaplan-Meir curve 2017.*

The overall cumulative probability of HIV free survival and mean for survival time for PMTCT intervention was 96.9% (95% CI=, 94.5 - 98.8) months for PMTCT non-utilized mother was 3.1 (95% CI = 1.1 - 1.2) months for HAART with the logrank test (p-value of 0.001).

HIV-free survival after 18 months by rapid antibody test result after 6weeks of cessation of breast feeding was 98.0% (95% CI, 96.1 - 99.6) person months.

Infants' follow up information

Two of the 254 pregnancies were twin pregnancies, for a total of 146 infants (male 57.5%, female 42.5%). Cumulative infant follow up was 254.0 patient-years.

This retrospective cohort study done in west shoa health facilities in Ethiopia between September 2013 and September 2015 G.C showed that the overall incidence rate of HIV infection was 2.0/1000 PM (95% CI, 0.4 - 3.9) (See table 3).

Variables	Categories	Frequency (n)	Percent (%)	95% Confidence Interval	
				Lower	Lower
Outcome at 6 WK DBS	HIV Negative	251	98.8	97.2	100.0
	HIV positive	3	1.2	0.0	2.8
Outcome at 12 wks	Negative	16	6.3	3.1	9.4
	Positive	3	1.2	0.0	2.8
	not determine	235	92.5	89.0	95.7
Outcome at 18 months Rapid HIV antibodies	Negative	249	98.0	96.1	99.6
	Positive	5	2.0	0.4	3.9

Table 3: *Survival Experience for Different Category of HIV exposed Infant of Mothers attending PMTCT program in West Shoa Zone Health Facilities, Oromia Regional state west Ethiopia 2017G.c.*

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Predictors of HIV Positivity of HIV exposed Infant at six weeks of survival

The result of this study stated the overall incidence rate of HIV infection within the cohort, 3 children (1.2%) were HIV-infected 1.2 (95% CI, 0.0 - 2.8) with predictors of HIV positivity of exclusive breast feeding HEIs were increased hazard of positivity 1.06 times 95% CI [AHR = 1.06 (1.025 - 1.12) and mixed feeding infants were 1.7 times (1.03 - 2.32)] more likelihood would been HIV positive as compared to exclusive replacement feeding.

The likelihood of HIV positivity of not utilized PMTCT intervention was 2 times with 95% CI [AHR = 2.0 (1.02- 4.32)] more likelihood would been HIV positive as compared to PMTCT utilized group and maternal breast condition of diseased were 1.33 times with 95% CI [AHR = 2.0 (1.02 - 4.32)] more likelihood would been HIV positive as compared to normal/not diseased maternal breast during lactations were increased adjusted hazard ratio of HIV positivity at six weeks among HEIs in the study area (See table 4).

Variables	Category	Outcome at 6 WK DBS (n = 254)		P. value	Adjusted HR (95% CI)
		HIV Negative (%)	HIV positive (%)		
Infant feeding	EBF	240 (94.5)	1 (0.4)	0.000	1.06 (1.025 - 1.12)
	ERF	8 (2.4)	0 (0.0)	1:00	
	MF	5 (2.0)	2 (0.8)	0.000	1.667 (1.03 - 2.32)
Maternal breast status	Normal	249 (98)	2 (0.8)	1:00	
	Diseased	2 (0.8)	1 (0.4)	.000	1.33 (1.08 - 2.0)
PMTCT Intervention	Yes	246 (96.9)	0 (0.0)		
	No	5 (2.0)	3 (1.2)	0.000	2 (1.02 - 4.32)
Parity	Para zero	11 (4.3)	0 (0.0)	1:00	
	Para one	63 (24.8)	1 (0.4)	0.021	3.95 (3.91 - 3.995)
	Para 2 - 4	37 (14.6)	1 (0.4)	0.000	3.5 (2.52 - 4.48)
	>= 5 para	34 (11.2)	1 (0.4)	0.021	3.95 (3.90 - 3.99)

Table 4: *Predictors of HIV Positivity of HIV exposed Infant at six weeks of survival in West Shoa Zone Health Facilities, Oromia Regional state west Ethiopia 2017G.c.*

Predictors of HIV Positivity HIV exposed Infant after 18 weeks of survival and 6 weeks of breast feeding cessation by Rapid HIV antibody test

The result of this study revealed that the overall incidence rate of HIV infection within the cohort, 5 children (2.0%) were HIV-infected 2.0 (95% CI, 0.4 - 3.9) with predictors of HIV positivity of exclusive breast feeding were increased hazard of positivity 2.2 times 95% CI [AHR = 2.2 (1.52 - 4.12) and mixed feeding infants 1.8 times (1.4 - 3.32)] more likelihood would been HIV positive as compared to exclusive replacement feeding.

The likelihood of HIV positivity with breast feeding duration of less than (< 12 months were increased hazard of positivity by 1.59 times 95% CI [AHR = 1.59 (1.52 - 4.12) and 12 - 18 months were 1.60 times AHR = 1.60 (1.12 - 2.08)] more likelihood would been HIV positive as compared to exclusive replacement feeding.

The likelihood of HIV positivity of HEIs based on maternal WHO Clinical stage 2, 3 and 4 were 1.95 times, 2.6 times and 1.97 times with 95% CI [AHR = 1.95 (1.86 - 2.05), AHR = 2.6 (1.6 - 4.012) and AHR= 1.97 (1.87 - 3.599)] more likelihood would been HIV positive as compared to baseline WHO Clinical stage 1 mothers.

The likelihood of HIV positivity of HEIs based on maternal CD4 count status < 200 cells/m^3 was 2.17 times with 95% CI [AHR = 2.17 (2.09 - 5.25) and 200 - 350 cells/m^3 was 2.2 times 95% CI (AHR= 2.2 (1.5 - 2.93)] more likelihood would been HIV positive as compared to greater than or equal to >= 350 cells/m^3 mothers.

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The likelihood of HIV positivity of HEIs based on maternal TB status of TB screen positive was 1.95 times with 95% CI [AHR = 1.96 (1.89 - 3.43) and TB treatment completed was 1.87 times 95% CI (AHR = 1.97 (1.87 - 2.24)] more likelihood would been HIV positive as compared to TB screen negative mothers (See table 5).

Variables	Category	Rapid HIV antibodies (n = 254)		P. value	Adjusted HR (95% CI)
		HIV Negative (%)	HIV positive (%)		
Infant feeding	EBF	240 (94.5)	2 (0.8)	0.04	2.2 (1.52 - 4.12)
	ERF	8 (2.4)	0 (0.0)	1:00	
	MF	5 (2.0)	2 (0.8)	0.012	1.8 (1.4 - 3.32)
Breast feeding duration	ERF	8 (3.15)	0 (0.0)	1:00	
	< 12 month	114 (44.9)	2 (0.8)	0. 011	1.59 (1.52 - 4.12)
	12 - 18 month	127 (50.0)	3 (1.2)	0.003	1.60 (1.12 - 2.08)
WHO Clinical Stage	Stage 1	77 (30.3)	1 (0.4)	1:00	
	Stage 2	110 (43.3)	0 (0.0)	0.000	1.95 (1.86 - 2.05)
	Stage 3	60 (24.0)	3 (1.2)	0.035	2.6 (1.6 - 4.012)
	Stage 4	2 (0.8)	1 (0.4)	0.045	1.97 (1.87 - 3.599)
CD4 Status	< 200 cells/m^3	36 (14.2)	2 (0.8)	0.042	2.17 (2.09 - 5.25)
	200 - 350 cells/m^3	135 (53.1)	1 (0.4)	0.024	2.2 (1.5 - 2.93)
	>= 350 cells/m^3	79 (31.1)	0 (0.0)	1:00	
Maternal TB Status	TB screen negative	214 (84.3)	0 (0.0)	1:00	
	TB screen positive	28 (11.0)	3 (1.2)	0.005	1.95 (1.89- 3.43)
	Treatment Completed		1 (0.4)	0.00	1.75 (1.25- 2.24)

Table 5*: Predictors of HIV Positivity among HIV exposed Infant after 18 weeks of survival and 6 weeks of breast feeding cessation by Rapid HIV antibody test in West Shoa Zone Health Facilities, Oromia Regional state west Ethiopia 2017G.c.*

Discussion

This study result indicated that mean HIV free survival time at the end of the six weeks by Dry Blood Spot test was 98.8% (95% CI, 97.2 - 100) months which was very high as compared to study done in two hospital of Southern Ethiopia showed that the mean for survival time was 20.054 (95% CI, 19.43 - 20.68) months [9]. This great difference might be due to recentness of study after implementation of test and treat strategy (option B+).

The current study revealed that HEIs feeding practice were almost all 94.5% (95% CI, 91.7 - 97.2) were exclusive breast feeding, only 2.0 (95% CI, 0.4 - 3.9) were mixed feeding, the rest 3.1 (95% CI, 1.2 - 5.5) were formula feeding option for the first six months as compared to study done in Rakai, Uganda 41% were formula-fed, while 59% were breast-fed, Exclusive breast-feeding was practiced by only 25% of breast-feeding women at one month postpartum [10]. In general the current study findings were better than previous result of Uganda (EBF 94.5% vs 25%, 3.1% vs 41%) this might be due to socioeconomically difference, and recentness of the current study after exclusive breast feeding was recommended by WHO for the first six month irrespective of sero-status of the mother.

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This study findings revealed that the cumulative probability of HIV free survival time was 94.5% (95% CI, 91.7 - 97.2) months for exclusive breast feeding option and 2.0 (95% CI, 0.4 - 3.9) months for mixed feeding and 3.1 (95% CI, 1.2 - 5.5) months for formula feeding option. Log rank test for infants feeding option strata was significant (p-value < 0.001) which was very high as compared to study done in in two hospital of Southern Ethiopia showed that the mean for survival time was 20.2 (95% CI, 19.62 - 20.78) months for exclusive breast feeding option and 17.50 (95% CI, 15.46 - 19.54) months for mixed feeding and 16.83 (95% CI, 16.30 - 18.36) months for formula feeding option. Log rank test for infants feeding option strata was significant (p-value < 0.001) [9]. This descriptive difference might be due to study design difference retrospective versus correctional study design, but analytical in line with southern study which means that breast feeding option of HIV exposed infant has great impact on HIV free survival.

The current study determined the incidence of HIV positivity among HEIs showed that the overall incidence rate of HIV infection within the cohort, 3 children (1.2%) were HIV-infected 1.2 (95% CI, 0.0 - 2.8) at six weeks and at 18 weeks of survival and 6 weeks of breast feeding cessation by Rapid HIV antibody test 5 children (2.0%) were HIV-infected 2.0 (95% CI, 0.4 - 3.9) respectively which are lower than previous study done in Shashemene referral Hospital the rate was 4.1% at six weeks by dry blood spot (DBS) and 5.5% at 18 months by rapid antibody test [11], but higher than National prevention of Mother to child transmission of HIV target which was less than 2% and Elimination of mother to child transmission of HIV which zero new pediatric infection which are higher than national target of PMTCT, so it would be better to reconsidered by health planners real practice with proposed target [12].

The current study overall cumulative probability of HIV free survival and mean for survival time for PMTCT intervention 96.9 (95% CI = 94.5 - 98.8) months and for not PMTCT utilized mother was 3.1 (95% CI = 1.1 - 1.2) months for HAART with the log rank test (p-value of 0.01) which has great difference as compared to study done in two hospital of Southern Ethiopia which showed that mean for survival time for PMTCT Intervention type was 18.8 (95% CI = 17.3, 20.3) months for PMTCT non-utilized mother and 13.1 (95% CI = 1.45, 10.34) months for NVP utilized mother and 20.1 (95% CI = 19.3, 20.9) for HAART with the logrank test (p-value of 0.001) [9]. This descriptive difference might be due to government and Nongovernment involvements PMTCT get great attention recently, but analytical in line with southern study which means that PMTCT intervention for HIV exposed infant has great impact on HIV free survival.

The current study result identified that HIV-free survival at 18 months by rapid antibody test result after 6 weeks of cessation of breast feeding was 98.0% (95% CI, 96.1 - 99.6) person months which are similar with study done in rural Haiti which was 90.6% [13].

The result of this study revealed that the overall incidence rate of HIV infection within the cohort, 5 children (2.0%) were HIV-infected 2.0 (95% CI, 0.4 - 3.9) with predictors of HIV positivity of breast feeding duration of less than (< 12 months were increased hazard of positivity by 1.59 times 95% CI [AHR = 1.59 (1.52 - 4.12) and 12 - 18 months were 1.60 times AHR = 1.60 (1.12 - 2.08)] more likelihood would been HIV positive as compared to exclusive replacement feeding which were similar with study conducted in rural Haiti within the cohort, 9 children (3.5%) were HIV-infected. Community controls were more likely to be breastfed (P = 0.003) and more likely to introduce food early (P = 0.003) than PMTCT-program households [13].

The result of this study identified predictors of HIV positivity of HEIs showed that exclusive breast feeding were increased hazard of positivity 1.06 times 95% CI [AHR = 1.06 (1.025 - 1.12) and mixed feeding infants were 1.7 times (1.03 - 2.32)] more likelihood would been HIV positive as compared to exclusive replacement feeding at six weeks and predictors of HIV positivity of exclusive breast feeding were increased hazard of positivity 2.2 times 95% CI [AHR = 2.2 (1.52 - 4.12) and mixed feeding infants 1.8 times (1.4 - 3.32)] more likelihood would been HIV positive as compared to exclusive replacement feeding at 18 weeks as compared to previous study revealed that an infant with mixed feeding option was 8.23 times at higher risk of developing HIV infection than infants on exclusive breast feeding counterparts. But there are no significant differences between exclusive replacements feeding and exclusive breast feeding. The finding was consistent with the study done in South Africa that mixed feeding on infants increase the hazard of HIV infection and there is statistically significant difference between exclusive breast feeding and exclusive formula feeding [5,9]. And also which are similar previous study conducted in Urban Hospital in Angola reported that overall, exposure to maternal milk (mixed or exclusive breastfeeding) was associated with a significantly higher risk of HIV transmission or death (unadjusted odds ratio: 5.70, 95% CI 1.89 - 17.2, p = 0.002) [14], but not in line with study done in Uganda reported that there were no statistically significant differentials in HIV-free survival by feeding choice (86% in the formula-fed compared to 96% in breast-fed group (Adjusted RH = 2.8 [95% CI = 0.67 - 11.7, P-value = 0.16] [10]. This

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might be due to the majority of the Ugandan study participants were practiced formula feeding. This study finds strengthen the evidence of ongoing exposure will increases the hazard risk of HIV positivity among HEIs.

This study identified that factors increases hazard risks of HIV positivity among HEIs were duration of breast fed, Advanced WHO clinical stages, low CD4 counts and Maternal TB screened positive and TB treatment completed were significantly associated with HEIs being positivity and which are newly identified factor on this study which are supported by previous study done identified that similarly some of the defined risk factors for MTCT include prenatal maternal factors such as high viral load, low CD4 cell count, and advanced clinical stage; obstetric factors such as prolonged rupture of membranes and invasive obstetrical procedures; and postnatal factors such as breastfeeding itself and breast conditions such as mastitis [4]. This means that maternal health condition during pregnancy and breast feeding has great contribution for being HIV positive of HEIs.

Conclusion

This study determined HIV free survival status of HEIs in health facilities of West Shoa Zone Oromia, Ethiopia showed that the overall cumulative probability of HIV free survival at six weeks by DBS was 98.8% and at 18 months by rapid antibody test after 6weeks of cessation of breast feeding was 98.0% respectively.

This study assessed that the survival of Infants Born from HIV-Positive Mothers, by Feeding modality revealed that HIV free survival were 94.5% for exclusive breast feeding option, 2% for mixed feeding and 3.1 for formula feeding option. Log rank test for infants feeding option strata was significant (p-value < 0.001).

The current study determined the incidence of HIV positivity among HEIs showed that the overall incidence rate of HIV infection within the cohort, 3 children (1.2%) were HIV-infected 1.2 (95% CI, 0.0 - 2.8) at six weeks and at 18 weeks of survival and 6 weeks of breast feeding cessation by Rapid HIV antibody test 5 children (2.0%) were HIV-infected 2.0 (95% CI, 0.4 - 3.9) respectively.

The result of this study determined the predictors of HIV positivity of HEIs revealed that infant feeding option (exclusive breast and mixed feeding), not utilized PMTCT intervention and maternal breast condition of diseased were increased adjusted hazard ratio of HIV positivity at six weeks and feeding option (exclusive breast and mixed feeding and duration of breast feeding, maternal WHO Clinical stages, maternal TB Status of TB screen positive and TB treatment completed and maternal CD4 count status < 200 cells/m^3 and 200 - 350 cells/m^3 were increased adjusted hazard likelihood of HIV positivity at 18 weeks, which were factors significantly associated with HEIs being positivity respectively.

Recommendation

Health profession working in PMTCT/ART would be better give greater emphases to address infant feeding practice options by using mass media, community mobilization and health education in more comprehensive manner to increase and to sustaining the recommended way of infant feeding practice among HIV infected women.

Health Facilities would be better give great emphasis on evidenced based counselling for informed planned pregnancy among reproductive age women living with HIV and strength implementation of PMTCT services by integrated maternal neonatal child health in order to realize zero new pediatrics HIV free generation.

This study identified predictors of HIV positivity among HIV exposed infants', therefore, Policy makers and health professionals should be emphatically considered these factors during PMTCT/EMTC program development and training programs in developing countries of Sub Saharan special in Ethiopia for better outcome of option B+ PMTC/EMTC programs to contributing to HIV free generation which contributed to meet zero new pediatrics HIV infection of HIV target.

Ethical Considerations

Ethical clearance was obtained from the Ethical review committee of Ambo University CMHSs. Formal letter of cooperation was written to respective hospitals/health centers.

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The right to refuse was respected and information collected from this research project was kept confidential and the collected information was stored in a file, without the name of study participant.

Competing Interests

The author(s) declare that they have no competing interests.

Authors' Contributions

Dereje Bayissa Demissie, Merid Tadessa Debele and Gizachew Abdissa Bulto conceptualized the study, designed the study instrument and conducted the data analysis and wrote the first draft and final draft of the manuscript.

DBD and MTD: Approved the research proposal with some revisions, participated in data analysis, revised subsequent drafts of the paper and involve in critical review of the manuscript. All authors read and approved the final manuscript.

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