

Prevalence, Associated Factors and Preventive Measures of HIV Transmission among Infants Born to HIV Positive Mothers in Two Hospitals in Tiko Health District, Cameroon

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Abstract

Background: HIV is a global public health issue. One way of transmission is through mother to child. Maternal and infant factors such as high maternal viral load, presence of sexually transmitted diseases (STDs) during pregnancy, prolonged duration of membrane rupture, sex and weight of infant at birth among others can affect the transmission rate from mother to child.

Objectives: This study sought to determine the prevalence of HIV transmission among infants born to HIV positive mothers, identify the factors associated with HIV transmission and preventive measures used by nurses in two hospitals in Tiko Health District, Fako Division.

Methods: The study used a retrospective study design, which reviewed files registered over a period of three years in the district hospital and cottage hospital in Tiko randomly selected for the study. Secondary data was obtained from antenatal clinic cards (ANC) cards, delivery files, delivery registers, infants follow up records from the two hospitals. The study was conducted from the 22nd of April 2022 to the 28th June 2022. The files of all HIV positive women who gave birth in these health facilities during the period of 1st January 2018 to 31st December 2020 were studied. Using a checklist, data was collected on maternal age, marital status, occupation, residence, first ANC visit, and time of maternal HIV diagnosis among others. Data was tested by means of logistic regression analysis.

Results: The results of this study revealed a mother to child transmission (MTCT) rate of 7.14%. Maternal factors such as frequency of ANC attendance, late attendance to ANC, late maternal HIV diagnosis and maternal non-adherence to antiretroviral (ARV) drugs influenced this transmission rate. Infant factors such as mixed feeding, baby on ARV for not up to six weeks and poor immunisation status were not significantly associated with MTCT transmission of HIV. Seventy-five (100%) of the infants were given post exposure prophylaxis during each visit as a preventive measure.

Conclusion: The MTCT rate of HIV in Tiko Health District was 7.14.0% which is still a public health concern. Regular ANC attendance and early booking, adherence to antiretroviral therapy (ART), counseling mothers on safe infant feeding mode and proper follow up of mothers during pregnancy and even after delivery will go a long way to reduce MTCT of HIV in Tiko Health District.

Keywords: MTCT Rate of HIV; PMTCT Tiko Health District; Associated Factors; Preventive Strategies; Nurses

Abbreviations

ANC: Antenatal Clinic Cards; ART: Antiretroviral Therapy; ARV: Antiretroviral; HAART: Highly Active; HIV: Human Immunodeficiency Virus; MTCT: Mother to Child Transmission; PMTCT: Prevention of Mother to Child Transmission; STDs: Sexually Transmitted Diseases

Introduction

Human immunodeficiency virus (HIV) is a virus that weakens the immune system of an individual exposing the body to several opportunistic infections [1]. Although the main route of transmission is through unprotected sexual intercourse, a significant number of vertical transmissions also occur from mother to child [1]. Over the last decades, the HIV has been one of the greatest public health challenges especially in low and middle income countries [2]. Despite decades of sensitization and significant advances in its prevention and management, the pandemic continues to spread [2]. The prevalence of HIV/AIDS has rapidly increased since the 1980s in developing countries. As a result, it has led to several demographic, economic and social consequences. More than 2 million people live with HIV/AIDS globally, in which more than 80% of them live in sub-Saharan African countries [2]. For example in 2012, 260,000 new pediatric HIV infections occurred, and most of these infections were in sub-Saharan Africa [3].

The most seriously affected areas include southern and eastern African countries [4]. Ethiopia is one of the eastern African countries with adult HIV prevalence of 1.5% in the population aged 15 - 49 years old. The prevalence is relatively higher among women than men, with a prevalence of 1.9% and 1.0% respectively [5]. In 2013, there were more than 160,000 HIV positive children (age less than 15yrs old) in Ethiopia. Even though there are higher number of children with HIV, ART coverage among children was only 12% in the same year [6]. For this reason, the Ethiopian federal ministry of health adopted a prevention of mother to child transmission program aimed at eliminating mother to child transmission of HIV in 2011 [1].

Vertical transmission (MTCT) refers to a situation where an infant of an HIV infected mother acquires the infection from mother either transplacentally in the uterus during pregnancy, prenatally during the process of labour and delivery, and postnatally during breastfeeding [7]. Globally this accounts for 90% of HIV infection in children under the age of 15yrs [8]. In 2016, 90% of four million children living with HIV resided in sub-Saharan Africa [8]. It is estimated that, 5% - 10% of MTCT occurs during pregnancy, 10% - 20% during labour and delivery and 10% - 20% during breastfeeding [8]. The risk of transmission is 15% - 45% without intervention. With intervention, the risk is reduced to 5% in breastfeeding populations and less than 2% in non-breastfeeding populations [8,9].

Prevention of mother to child transmission (PMTCT) is one of the fundamental approaches to control HIV pandemic [10]. This is a program designed to provide effective interventions during pregnancy, labour, delivery and breastfeeding period for the mother and baby. Interventions for the prevention of MTCT of HIV include antiretroviral prophylaxis given to women during pregnancy and labour and to their infants within the first weeks of life, safe obstetric practices and safe infant feeding habits [8]. In the absence of such interventions, the risk of MTCT of HIV is 15% - 45%, but through the use of antiretroviral drugs and appropriate preventive mechanisms, the risk can be reduced to less than 5% in under resource settings Cameroon inclusive [2,3].

The vertical transmission of HIV remains one of the biggest health challenges over the world. The high mortality rate and rapid transmission of HIV virus makes it a worldwide public health problem that is mostly spreading in countries with middle and low financial resources. Transmission of HIV from mother to child resulted in approximately 370,000 infant infections worldwide in 2009 [11]. This same year, an estimated 2.5 million children worldwide were living with HIV, mostly a consequence of MTCT and more than 90% of these children are in sub-Saharan Africa [12]. In the absence of any intervention, the combined risk of MTCT of HIV in utero and intra-partum is 15 - 30% [1]. Globally, 2.6 million of children younger than 15yrs of age are living with HIV, yet only 32% of these children are assessing HAART [13]. Antiretroviral therapy together with postnatal interventions have demonstrated their efficacy in reducing substantially the risk of MTCT in Africa breastfed children to less than 5%. Despite significant efforts and achievements in PMTCT over

the past decades, approximately 240000 children worldwide became newly infected with HIV in 2013 [13]. In an attempt to help curb the proportion of MTCT of HIV, the WHO called for the virtual elimination of pediatric HIV and recommended four approaches. These include primary prevention of HIV infection among women of childbearing age, preventing unintended pregnancies among women living with HIV, preventing MTCT of HIV and providing appropriate treatment, care and support to mothers living with HIV, their children and families [14]. The world health organisation has called for the virtual elimination of pediatric HIV with most efficient and cost effective way to tackle pediatric infections being to reduce MTCT worldwide [14]. However, access to ART and uptake of PMTCT programmes remain limited and children continue to be HIV infected.

Similar to global trends, Cameroon women are disproportionately affected as the prevalence of HIV among adult men and women aged 15 - 49yrs was estimated at 2% - 9% and 5 - 6% respectively with an overall prevalence of 43%, the highest in west and central Africa [15]. In 2010, reports from the international AIDS control committee of Cameroon showed that about 7300 babies were born HIV positive due to MTCT and without intervention; about half of these infected children will die before their second birthday [2]. In Cameroon, the prevalence of HIV was estimated to be 4.3% in the general population, a sero surveillance survey among pregnant women showed an HIV prevalence of 7.6% in 2010 [16]. As a result, a new number of pediatric infections continue to grow in Cameroon and there are still thousands of new HIV infections every year [16]. In 2011, the UNAIDS launched the global plan towards the elimination of new HIV infections among children and keeping their mothers alive. In Cameroon the over all MTCT risk was reported to be about 24% [17]. The implementation of PMTCT programme started at the Bamenda Regional Hospital Cameroon in 2008 [17,18].

Since 2011, Cameroon has tripled its coverage of PMTCT prophylaxis ranging from 6.9% to 36.5%. in 2011, leading to 30% fewer infections among children [17]. In 2011, Cameroon opted for the WHO option regimen for PMTCT prophylaxis. Cameroon has focused on strengthening PMTCT services and caring of new pediatric HIV cases for the 2011 - 2015 period. 94,4% of health districts are equipped to provide HIV treatment services to pregnant women and children living with HIV in 2011. However, even where the most effective PMTCT interventions are available, many women and infants are lost at different steps of the PMTCT cascades and the low cumulative uptake of PMTCT services does not allow controlling the extent of MTCT in Cameroon [17].

A serosurveillance study showed an HIV prevalence of 7.6% among pregnant women and with an estimated 22.1% overall rate of MTCT in Cameroon, worsened by a very low anti-retroviral therapy coverage (27.4%) [16].

In 2010, reports from national AIDS control committee showed that about 73-babies were born HIV positive due to MTCT with an estimated 141 new HIV occurring per day in Cameroon and reports suggest an upsurge of these rates by 2020 [18]. Thus, we determined the prevalence of MTCT, investigated the factors associated with HIV transmission among infants born to HIV positive mothers and the preventive strategies employed by nurses in two hospitals in Tiko Health District, South West Region, Cameroon.

Materials and Methods

A retrospective hospital based study was carried out from the 22nd of April 2022 and 28th June 2022 to determine the prevalence of MTCT and identify the factors associated with HIV transmission among infant born to HIV positive mothers who were on follow up at the HIV exposed infant care clinics in Tiko Health District. Also, the preventive measures used by nurses were determined. A checklist was used to collect information from files and records regarding cases, associated factors and nurses' preventive strategies. The study targeted files of all mothers and infants pair who received care and support between the period of 1st January 2018 to 31st December 2020 in the two selected hospitals.

The Tiko Health District consist of sub-divisional hospitals (CMA), integrated health centers, a district hospital and other private and mission hospitals. The study was carried out in district hospital Tiko and cottage hospital Tiko, which were randomly selected for the

study. The files and records of all HIV positive women who gave birth in these health facilities during the period of 1st January 2018 to 31st December 2020 were studied. Also, the files of all babies born to HIV infected women who were followed up in these health facilities were studied. The researcher reviewed the ANC records, delivery registers and files of the mothers as well as PMTCT register and follow up file for each registered infant from the two health facilities. Tiko is found in Fako Division of the South West Region of Cameroon. It is a cosmopolitan town. Most of the people who live here work with the Cameroon Development Corporation, a giant in the agro industrial sector in Cameroon. The data for each woman was crosschecked for consistency in the three registers. Detailed information on public codes and hospital codes for all records was obtained from the unit heads of the different units.

Data was coded and entered into a Microsoft excel 2010 spreadsheet. The variables were selected based on the PMTCT of HIV interventions that directly affect physiology of the mother and child. The dependent variable is the outcome of interest. The independent variable were infant age at HIV diagnosis, sex, maternal antiretroviral intervention, obstetric intervention, infant on antiretroviral intervention at time of diagnosis and the infant feeding options. Descriptive analysis of sociodemographic information, infant prophylaxis, and infant follow up information, maternal PMTCT intervention and infant final sero-status was done. Bivariate logistic model was used to assess associations of independent variables with the outcome. Variables significant at $p < 0.005$ in the final model was considered an independent factor for infant HIV sero-status. Cross tabulations was done to show the rate of each variable with the outcome. All analysis was conducted using SPSS17.

Ethical approval

This study was authorization by the Department of Nursing, Faculty of Health Sciences, University of Buea, Cameroon. Administrative authorization was first obtained from the Regional Delegation of Public Health. Also, authorization was obtained from the District Health Office Tiko, and then from the heads of the various health facilities.

Results

A total of 1050 delivery files were cross checked in the maternity units of all two health facilities and 75 files (7.14%) were files of HIV positive mothers who put to birth between the period of 1st January 2018 - 31st December 2020. Majority [42 (56.0%)] of the mothers were in the age range 30 - 39, most [39 (52.0%)] of them were married and 31 (41.3%) had secondary school level of education while [29 (38.7%)] had attended just primary school. Some [19 (34,4%)] of the mothers reported business was their source of income while a few of them [20 (26.%)] were housewives, [72 (96.0%)] of the women were Christians (Table 1).

Variables	n (%)
Age	
< 20 - 29	28 (37.3)
30 - 39	42 (56.0)
40 - 49	5 (6.7)
Total	75 (100.0)
Marital status	
Single	39 (52.0)
Married	33 (44.0)
Widow	3 (4.0)
Total	75 (100.0)
Educational level	
Primary	29 (38.7)
Secondary	31 (41.3)
Tertiary	15 (20.0)
None	0 (0.0)
Total	75 (100.0)

Occupation	
Farmer	26 (34.7)
Business	19 (25.3)
Student	4 (5.3)
House wife	20 (26.7)
Others	6 (8.3)
Total	75 (100.0)
Religion	
Christianity	72 (96.0)
Islamism	3 (4.0)
Others	0 (0.0)
None	0 (0.0)
Total	75 (100.0)
Residence	
Rural	69 (92.0)
Urban	6 (8.0)
Total	75 (100.0)

Table 1: Socio-demographic characteristics of HIV positive mothers in Tiko Health District (2018-2020).

Out of the total 75 exposed babies born to 75 HIV positive mothers as found in the records, just [6 (8.0%)] babies tested positive as shown in table 2 below.

Infant HIV Status	n (%)
Positive	6 (8.0)
Negative	69 (92.0)
Total	75 (100.0)

Table 2: Prevalence of HIV transmission among infants born to HIV positive mothers (2018-2020).

Determinants in mothers and infants associated with HIV transmission among infants born to HIV positive mothers (Table 3).

Variables	Frequency/Percentage	Positive n (%)	Negative n (%)	p-value	CI
Age					
<20-29	28	2 (7.1)	26 (92.9)	0.121	8.210-8.521
30-39	42	3 (7.1)	39 (92.9)		
40-49	5	1 (20.0)	4 (80.0)		
Total	75	6 (8.2)	69 (92.8)		
Marital status					
Single	39	3 (7.7)	3 (92.3)	0.211	6.301-7.10
Married	33	3 (9.1)	20 (90.9)		
widow	3	0 (0.0)	3 (100.0)		
Total	75	6 (8.0)	69 (92.8)		

Educational level	29	3 (10.3)	26 (89.7)	0.15	8.521-8.93
Primary	31	2 (6.5)	29 (93.5)		
Secondary	15	1 (6.7)	14 (93.3)		
Tertiary	0	0 (0.0)	0 (0.0)		
None	75	6 (8.0)	69 (92%)		
Total					
Occupation				0.105	5.104-6.20
Farmer	26	2 (8.3)	24 (91.7)		
Business	19	1 (5.3)	18 (94.7)		
Student	4	0 (0.0)	4 (100.0)		
House wife	20	2 (10.0)	18 (90.0)		
Others	6	1 (16.7)	5 (83.3)		
Total	75	6 (8.0)	69 (92)		
Religion				0.131	9.213-9.85
Christianity	72	6 (8.3)	66 (91.7)		
Islamism	3	0 (0.0)	3 (100.0)		
Others	0	0 (0.0)	0 (0.0)		
None	0	0 (0.0)	0 (0.0)		
Total	75	6 (8.0)	69 (92)		
Residence				0.203	7.610-7.83
Rural	69	5 (7.2)	64 (92.8)		
Urban	6	1 (16.7)	5 (83.3)		
Total	75	6 (8.2)	69 (92)		

Table 3: Association between sociodemographic characteristics of HIV positive mothers and HIV transmission among infants born to HIV positive mothers in the Tiko Health District.

Determinants in mothers and infants associated with HIV transmission among infants born to HIV positive mothers in Tiko Health District.

There was a significant relationship between 1st ANC visit and transmission rate. 100% of the babies born to women who did not attend any ANC during pregnancy tested positive while just 3.8% of the babies born to women who attended ANC between 3 - 5 times tested positive. Also, there is a significant relationship between mother on ART and outcome of their babies; 80% of the babies born to mothers who did not attend ANC tested positive. While just 1.4% of the babies born to women who did not attend ANC tested positive (Table 4).

Variables	Frequency	Positive	Negative	p-value	CI
1 st ANC visit in months				0.021	3.76-4.21
1 st trimester	11 (14.7%)	0 (0.0)	11 (100.0)		
2 nd trimester	53 (70.7%)	2 (3.8)	51 (96.2)		
3 rd trimester	7 (9.3%)	0 (0.0)	7 (100.0)		
None	4 (5.3%)	4 (100)	0 (0.0)		
Total	75 (100.0)	6 (8.0)	69 (92.0)		

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Total number of ANC prior to delivery					
<3	11 (14.77)	0 (0.0)	11 (100.0)	0.013	5.89-6.02
3-5	54 (72.0)	2 (3.7)	52 (96.3)		
>6	6 (8.0)	0 (0.0)	6 (100.0)		
None	4 (5.3)	4 (100.0)	0 (0.0)		
Total	75 (100.0)	6 (8.0)	69 (92.0)		
Time of maternal HIV diagnosis				0.030	1.10-1.20
Before pregnancy	67 (89.3)	4 (6.0)	63 (94.0)		
During pregnancy	6 (8.0)	0 (0.0)	6 (100.0)		
During delivery	2 (2.7)	2 (100.0)	0 (0.0)		
Total	75 (100.0)	6 (8.2)	69 (92.0)		
Gravidity				0.131	1.85-1.98
Primigravida	24 (32.0)	3 (12.5)	21 (87.5)		
Multigravida	49 (65.3)	3 (6.1)	46 (93.9)		
Grandmultigravida	2 (2.7)	0 (0.0)	2 (100.0)		
total	75 (100.0)	6 (8.0)	69 (92.0)		
Mother on ART during pregnancy				0.041	3.11-3.20
Yes	69 (92.0)	1 (1.4)	68 (98.6)		
No	1 (1.3)	1 (100.0)	0 (0.0)		
Yes but not compliant	5 (6.7)	4 (80.0)	1 (20.0)		
Total	75 (100.0)	6 (8.0)	69 (92.0)		
Maternal antiretroviral intervention regimen				0.202	3.94-3.98
AZT+3TC+NVP	40 (53.3)	0 (0.0)	40 (100.0)		
AZT+3TC+EFV	28 (37.3)	1 (3.6)	27 (96.4)		
Others	1 (1.3)	0 (0.0)	1 (100.0)		
None/non-compliant	6 (8.0)	5 (83.3)	1 (16.7)		
Total	75 (100.0)	6 (8.0)	69 (92.0)		
Anemia in pregnancy				0.320	1.69-1.80
Yes	17 (22.7)	1 (5.9)	16 (94.1)		
No	54 (72.0)	4 (7.4)	50 (92.6)		
Unknown	4 (5.3)	1 (25.0)	3 (75.0)		
Total	75 (100.0)	6 (8.0)	69 (92.0)		
History of STI during pregnancy				0.401	5.83-5.92
Yes	12 (9.0)	1 (8.3)	11 (91.7)		
No	62 (82.7)	4 (6.5)	58 (93.5)		
Unknown	4 (5.3)	1 (25.0)	3 (75.0)		
Total	75 (100.0)	6 (8.0)	69 (92.0)		
Duration of labour				0.101	8.77-8.90
> 8hrs	44 (58.7)	3 (6.8)	41 (93.2)		
≤ 8hrs	31 (41.3)	3 (9.7)	28 (90.3)		
Total	75 (100.0)	6 (8.2)	69 (92.0)		
Duration from membrane rupture to time of delivery				0.121	8.66-8.90
> 4hrs	19 (25.3)	3 (15.8)	16 (84.2)		
≤ 4hr	56 (74.7)	3 (5.4)	53 (94.6)		
Total	75 (100.0)	6 (8.0)	69 (92.0)		

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Gestational age at delivery					
< 37 weeks	4 (5.3)	1 (25.0)	3 (75.0)	0.101	7.933-7.90
≤ 37wks	71 (94.7)	5 (7.0)	66 (93.0)		
Total	75 (100.0)	6 (8.0)	69 (92.0)		
Mode of delivery				0.312	6.81-6.93
Normal vagina	58 (77.3)	4 (6.9)	54 (93.1)		
Elective CS	12 (16.0)	2 (16.7)	10 (83.3)		
Emergency CS	5 (6.7)	0 (0.0)	5 (100.0)		
Total	75 (100.0)	6 (8.0)	69 (92.0)		
Perineal or cervical tear				0.102	6.871-6.83
Yes	11 (14.7)	2 (18.2)	9 (81.8)		
No	64 (85.3)	4 (6.3)	60 (93.8)		
Total	75 (100.0)	6 (8.0)	69 (92.0)		

Table 4: Determinants in mothers associated with HIV transmission among infants born to HIV positive mothers in Tiko Health District.

Determinants in infants associated with HIV transmission amongst infants born to HIV positive mothers in Tiko Health District, the results showed that there was no significant relationship between infant feeding mode and transmission rate. 100% of the babies who were mixed fed had HIV while just 3.1% of the babies who were exclusively breastfed were infected. Also, all (100.0%) of babies who were not given Nevirapine during the first six weeks of life tested positive while only 4.3% of the babies who received Nevirapine during the first six weeks of life were positive. There was no significant relationship between the sex of the child and transmission rate (Table 5).

Variables	Frequency	Positive n (%)	Negative n (%)	p-value	CI
Sex of the infant				0.210	8.44-8.51
Male	34 (45.3)	3 (8.8)	31 (91.2)		
Female	41 (54.7)	3 (7.3)	38 (92.7)		
Total	75 (100.0)	6 (8.0)	69 (92.0)		
Infant birth weight				0.120	7.81-7.89
<250g	2 (2.7)	1 (50.0)	1 (50.0)		
>250g	73 (97.3)	5 (6.8)	68 (93.2)		
Total	75 (100.0)	6 (8.0)	69 (92.0)		
Nevirapine given to baby at birth					
Yes	75 (100.0)	6 (8.0)	69 (92.0)		
No	0 (100.0)	0 (0.0)	0 (0.0)		
Total	75 (100.0)	6 (8.0)	69 (92.0)		
Infant on ARV during the first 6 weeks of life				0.012	1.965-1.97
Yes	72 (96.0)	3 (4.2)	69 (95.8)		
No	3 (4.0)	3 (100.0)	0 (0.0)		
Total	75 (100.0)	6 (8.0)	69 (92.0)		
Infant feeding mode				0.013	5.12-5.17
Exclusive breastfeeding	66 (88.0)	2 (3.0)	64 (97.0)		
Formula	6 (8.0)	1 (16.7)	5 (83.3)		
Mixed feeding	3 (4.0)	3 (100.0)	0 (0.0)		
Total	75 (100.0)	6 (8.2)	69 (92.0)		
Infant immunization status				0.034	6.242-6.53
Up to date	71 (94.7)	3 (4.2)	68 (95.8)		
Not up to date	4 (5.3)	3 (75.0)	1 (25.0)		
Total	75 (100.0)	6 (8.0)	69 (92.0)		

Table 5: Determinants in infants associated with HIV transmission among infants born to HIV positive mothers in Tiko Health District.

With respect to strategies used by nurses during ANC to prevent MTCT of HIV, majority [71 (94.7)] of the women were screened for HIV during ANC and results checked for positive cases while a few of them (5.3%) were not screened. Also 94.7% of the mothers underwent a confirmatory test, 94.7% of them had a viral load result during pregnancy (Table 6).

Variables	n (%)
Initial rapid test done/results checked	
Yes	71 (94.7)
No	4 (5.3)
Total	75 (100)
Confirmatory test done/results checked	
Yes	71 (94.7)
No	4 (5.3)
Total	75 (100)
Arrange viral load test for mother and give out results	
Yes	71 (94.7)
No	4 (5.3)
Total	75 (100)
Screening for STIs and other routine test	
Yes	71 (94.7)
No	4 (5.3)
Total	75 (100)
Mother placed on ART/Compliance to treatment checked	
Yes	
No	71 (94.7)
Total	4 (5.3) 75 (100)

Table 6: Strategies used during ANC to PMTCT of HIV in Tiko Health District.

With regards with strategies used by nurses during the delivery period, 100% of the women underwent HIV screening during labour. Also all (100%) of the women had their vulvas cleaned with antiseptic solution before each vaginal exam (Table 7).

Variables	n (%)
Prenatal screening done before delivery/results confirmed for known cases	
Yes	75 (100)
No	0 (0.0)
Total	75 (100)
Number of vagina exams	
< 4	65 (86.7)
> 4	10 (13.3)
Total	75 (100)
Vulva wiped with antiseptic solution before VE	
Yes	63 (84.0)
No	12 (16.0)
Total	75 (100)

Infant wiped with antiseptic solution at birth	
Yes	75 (100)
No	0 (0.0)
Total	75 (100)
Infant administered Nevirapine at birth	
Yes	75 (100)
No	0 (0.0)
Total	75 (100)

Table 7: Strategies used by nurses during the delivery period in Tiko Health District.

Strategies used by nurses during the postnatal period in the prevention of MTCT of HIV showed all [75 (100%)] of the women underwent counseling during each visit after delivery. Also, [75 (100%)] of the infants were given post exposure prophylaxis during each visit (Table 8).

Variables	Frequency	Percentage (%)
Counseling done on infant feeding mode, immunization status etc. during visits		
Yes	75	100.0
No	0	0.0
HIV screening done on infant at 6wks, 36wks and 72wks		
Yes	75	100.0
No	0	0.0
Physical exams done on new born during each hospital visit		
Yes	75	100.0
No	0	0.0
ARV prophylaxis for baby dispensed during visits		
Yes	75	100.0
No	0	0.0

Table 8: Strategies used by nurses during the postnatal period in the prevention of MTCT of HIV in Tiko Health District.

Discussion

This study was conducted to determine the prevalence of MTCT, investigate the factors associated with HIV transmission among infants born to HIV positive mothers and the preventive strategies employed by nurses in two hospitals in Tiko Health District, South West Region, Cameroon. Worthy of note is the fact that proper counseling, education and care given to HIV positive mothers by nurses will create awareness, enhance adherence to HIV medications and good practices. This might reduce vertical transmission and hence, curb the morbidity and mortality associated with MTCT of HIV.

According to the findings of this study majority of the mothers were single, which is similar to a study carried out in South Africa by Goga, *et al.* [19]. Also, majority of the mothers were within the age 30 - 39 years, which is contrary to a study carried out in a rural area in the North West Region of Cameroon by Sama, *et al.* [2], who reported that majority of the participants were in the age range 14 - 25 years.

The prevalence of HIV transmission among infants in this study was 8.0%. This result is similar to the results obtained from a study carried out in Ethiopia by Gebrehiwot, *et al.* [20] and Sama, *et al.* [2] in Bamenda, North West Region, Cameroon whose results were 8.1% and 7.1% respectively. The prevalence rate from our study is much lower when compared to a 5 year retrospective based follow up study

conducted by Kassa, *et al.* [1] in Dire Dawa City, Eastern Ethiopia and the study by Noubiap, *et al.* [21] in Bertoua Eastern Cameroon whose results showed a prevalence rate of 15.7% and 17% respectively. This high prevalence rate could have resulted from the fact that, the Ethiopian study was carried out in a referral hospital which receives clients from all other health facilities including health centers and very minute clinics, as such parturient who may not have been on PMTC follow up during pregnancy were included in the study. The difference in the high prevalence rate in Bertoua could probably be due to the fact that, the inhabitants of Bertoua are mostly the pigmies who still believe and practice the use of traditional medicine in the treatment of diseases. Hence, their uptake of PMTCT services might have been poor despite sensitization efforts [22].

This prevalence rate is much higher when compared to a study carried out in Tigray Northern Ethiopia by Desta, *et al.* [23] and Mesfin, *et al.* [24] in Ethiopia, where the transmission rate were 2.1% and 3.7% respectively. This lower rate when compared to our study could possibly be as a result of the fact that three quarter of the population were urban inhabitants who had adequate knowledge on PMTCT services. In addition, they probably had sufficient finance to ensure follow up of their infants unlike the participants in our study who were mostly rural inclined who probably did not have adequate knowledge about PMTCT and its importance due to their low level of education.

This study revealed no significant relationship between demographic characteristics of the mothers and transmission rate. These results are consistent with the findings of Kasa, *et al.* [1] in Dire City, Eastern Ethiopia which also revealed no association between the demographic characteristics of the mothers and transmission rate ($P = 0.120$ 95%CI [8.210 - 8.521]). Our findings contradicts the findings from a case control study carried out in Ethiopia by Gebrehiwot, *et al.* [20] which revealed a significant association between the maternal educational level and transmission rate (OR = 3.43% 95%CI). The difference could have resulted from the fact that, the study was conducted in a rural area in Ethiopia where majority of the mothers were uneducated as such, there was little or no drug compliance among them.

In this study, it was revealed that there is a significant association between women who did not attend any ANC visit and transmission rate of HIV among infants ($p = 0.021$, 95%CI [3.76 - 4.21]). The results of this study showed that majority of the babies born to women who did not attend any ANC tested positive. This findings are similar to those of a study carried out by Alemayehu, *et al.* [25] in Ethiopia and Emawayish, *et al.* [26] in North West, Ethiopia, which revealed that mothers who did not attend ANC follow up were 4.6 times more likely to transmit the virus to their infants than those who attended ANC visits ($p = 0.029$, $p = 0.030$ [95%CI]).

The study also revealed that pregnant women diagnosed with HIV during delivery were at higher risk of transmitting the virus to their babies. This can be seen in the results which revealed that all the women who were diagnosed positive at the time of delivery gave birth to HIV positive babies ($p = 0.032$, 95%CI [1.10 - 1.20]). This results are similar to the results obtained in a study carried out in Brazil by Martinez, *et al.* [27], which found that mothers diagnosed HIV positive at delivery stage had a 48.8% risk of transmitting HIV to their babies ($p = 0.032$, 95%CI).

In this study, there was a significant relationship between mothers adherence to ART and transmission rate. The results showed that mothers who were not on ART during pregnancy were at higher risk of transmitting HIV to their babies than those who were on ART during pregnancy ($P = 0.04$, 95%CI [3.11 - 3.20]). The results of this study are similar to the results of a study carried out in Bamenda Regional Hospital by Victor, *et al.* [28] which revealed that mothers on ARV therapy were 2.46 times less likely to transmit HIV than those who were not on ART.

Concerning the determinants in infants associated with transmission, infant feeding options in the first six months of life was found to be a very important determinant for MTCT of HIV. Infants who were nursed with mixed feeding during this period were positively and significantly associated with HIV transmission (100%, $p = 0.030$, 95%CI [6.242 - 6.53]). This finding is similar with other related studies conducted in Ethiopia by Alemu, *et al.* [29] ($p = 0.032$, 95%CI) and Desta, *et al.* [23] in Tigray, northern Ethiopia ($p = 0.012$, 95%CI). They

found that mixed feeding significantly affects immature gastrointestinal tract due to additional foods which might facilitate entry of viral particles from mothers' breast milk into the baby's blood stream.

The duration of ARV therapy given to infants was significantly associated with transmission rate. All of the infants who were on ARVs for less than six weeks tested positive. This results are similar to those obtained from studies carried out in Burundi by Nyandwi, *et al.* [30] ($p = 0.0123$, 95%CI) and in South Africa Potty, *et al.* [31] ($p = 0.042$, 95%CI), which showed that most (94.8% and 98.7% respectively) of the infants who were given ARVs for six weeks tested positive.

Investigating the strategies used by nurses in PMTCT during ANC, our study revealed that most of the mothers were rapidly screened and confirmatory test done for the unknown cases and for the known cases, status was checked and confirmed. Also, most of the women had undergone a viral testing. Again, most of them were screened for STDs and other related diseases. Furthermore, most of the women were placed on ART for new cases, and the old cases were given ART refills. These results are similar to the results obtained from a study carried out in Brazil by Castihlos, *et al.* [32], which revealed an HIV rapid screening rate of 96.7%, a confirmatory test rate of 92.7%, an STI screening rate of 95.0% and ART dispensation rate of 92.7% during prenatal care.

The results are slightly different from a study conducted in Mekelle City Ethiopia by Hiluf, *et al.* [33], which revealed that just 62.0% positive mothers during their pregnancy underwent the testing. The difference could have resulted from the fact that some of them might have refused taking the rapid test and also did not want to disclose their HIV status to the health personal. In addition, the difference could be explained by the fact that some women in the Ethiopian study gave birth without attending any ANC during pregnancy.

Regarding the strategies used by nurses during the intra-natal period in PMTCT of HIV, our study revealed that majority of the women had vaginal examination done on them less than or equal to 4 times during labour and delivery as a strategy in PMTCT. The study also revealed that all of the women vulvas were cleaned with antiseptic solution before vaginal examination. Furthermore, all of the neonates were wiped with antiseptic solution at birth. These results are similar to the results obtained from a study carried out in Kenya by Mahendra, *et al.* [34]. The study revealed that majority of the women had Vaginal Examination (VE) less than or equal to five times during labour and delivery, almost all of the women's vulvas were cleaned with antiseptic solution before VE and most of the newborns were cleaned with antiseptic solution at birth.

This results are slightly different from those of Kasa, *et al.* [1] in Dire Dawa city Eastern Ethiopia which showed that not up to half of the women had VE done less than or equal to four times during labour, 50.2% of the women's vulvas were cleaned before VE, and 66.7% of the infants cleaned with antiseptic solution at birth. The difference in study findings could have resulted from the fact that a greater proportion of the women gave birth through a caesarian section, as such there was little or no need for VE and cleaning of the vulva with antiseptic solution. Also, a handful of the infants not wiped with antiseptic solution at birth could probably be due to the fact that all of their mothers were strictly on ART during pregnancy, which could have suppressed their viral load and reduced the possibility of intra-natal infections even after exposure to cervical fluids.

With respect to the strategies used during the postnatal period in PMTCT, our study revealed that all the mothers received counseling (on feeding, medication adherence, immunisation for child), were given ART during visits, and physical examination was done on neonates. Also, their immunisation status was checked and Clotrimazole syrup administered to them. These results are consistent with those obtained from a study conducted in Kwazlu-Natal-South Africa by Jin, *et al.* [35]. The study showed that at the HIV exposed infant clinic most of the infants had their immunisation status checked, most of the mothers were counseled on the aspects of breastfeeding during visits on PMTCT, and all the infants were given ARVs and clotrimazole syrup during visits.

The findings are slightly different from the finding of a previous study carried out in Uganda by Hoorwood, *et al.* [36]. Their study revealed that at the immunisation clinic, 63.5% of the women received counseling on infant feeding mode, 47.6% of the babies had a PCR

screening done, 47.0% received clotrimazole and 80% of the infants were given ARVs. This difference could be explained by the fact that recently there has been great improvement in the fight against mother to child transmission of HIV globally.

Conclusion

The findings of this study revealed that the prevalence of HIV transmission among exposed infants on follow up care at the exposed infant care clinics in Tiko Health District was 7.14%, which is still a problem. Also, it was found that the demographic characteristics of the mothers had no effect on transmission rate. In addition, no ANC attendance, late maternal HIV diagnosis and non-adherence to ART during pregnancy were not significantly associated with higher risk of MTCT of HIV. Mixed infant feeding, shorter duration of ARV of less than six weeks and infant immunisation status not up to date were the infant factors that put infants at higher risk of MTCT of HIV.

Again, our study showed that prenatal strategies such as rapid testing, confirmatory testing, and mother placed on ART were some of the strategies used in PMTCT. Intra-natal strategies such as cleaning the vulva with antiseptic solution, administering Nevirapine to the baby at birth, and cleaning the baby with antiseptic solutions were not left out in PMTCT. Furthermore, postnatal strategies like counseling of mother on infant feeding mode, physical exams done on the new born and dispensing ARVs to mother for baby's consumption during visits were implemented by the nurses. However, nurses need to be empowered with more knowledge and skills to ensure that they properly and adequately counsel mothers and family in order to prevent mother to child transmission of HIV and reduce its prevalence among child born to HIV positive mothers.

Limitations of the Study

This research was based on data collected from secondary sources, which were routinely recorded information that may not have covered all risk factors of MTCT. Some records had incomplete information which was excluded, however, the number was insignificant. This study included just infants who were being followed up in the health facility where they were born. As such, every infant who came in from another health facility was excluded from the study reason why the sample size was small. However, the study design is advantageous in that, there was easy access to information especially as this was a sensitive topic. The information and data were gotten from past medical records and not from the participants who might have refused to give out information.

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Authors' Contribution

Eta VE. Ayamba, Keron B. Achu, and Fokam Pius participated in all steps of the study from its commencement to writing. That is, conception and design, acquisition of data, analysis and interpretation of data as well as drafting and or revising and approving the final manuscript. Laurence A. Tabi participated in analysing the data and interpretation of results. Eyong C contributed in the discussion and references as well as in editing the final manuscript.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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