Factors associated with Mother to child transmission of HIV in a Semi-arid County in Kenya, 2014-201

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ABSTRACT

Introduction: To eliminate mother-to-child-transmission of HIV (eMTCT) a rate of <5% was recommended by the WHO in 2015. The rate was 8.3% for Kenya and 8.8% for Kajiado County in 2016. To identify causes of these higher rates, we described factors associated with HIV transmission among HIV exposed infants (HEI) in Kajiado. **Methods:** We reviewed HEI 2014-2017 records downloaded from the national early-infant-diagnosis (EID) database. A case was defined as any record of HEI undergoing EID in Kajiado in 2014–2017. Dependent variable was HIV test result and the independent variables were demographic and clinical characteristics. To describe the study population means were calculated for continuous variables and proportions for categorical variables. We performed Multivariate logistic regression to study the factors associated with MTCT while controlling for other factors and we reported the Prevalence OR and their 95% Confidence Intervals. **Results:** We reviewed 4,195 HEI records. Males were 1,999 (47.7%); median age was 2 months (range of 1.5 – 6months) and 199 (4.7%) tested positive for HIV. Antiretroviral (ARV) prophylaxis was not provided to 308 (7.34%) infants and 291 (6.94%) mothers of the infants. Exclusive-breastfeeding was offered to 2,976 (70.9%) infants and 320 (7.6%) had mixed-feeding. Odds of having a positive HIV result was higher in infants not on ARV prophylaxis compared to those who received ARV prophylaxis (POR: 8.3; 95% CI: 5.9 –11.5); in infants whose mothers received no ARV prophylaxis compared to those whose mothers received ARV prophylaxis (POR: 6.8; 95% CI: 4.9 – 9.6) and in those mixed-fed compared to those who received exclusive breastfeeding (POR: 2.4; 95% CI: 1.3 – 4.3). In infants not on ARV prophylaxis (aOR: 2.86; 95% CI: 1.02 – 6.93); infants whose mothers received no ARV prophylaxis (aOR: 2.45; 95% CI: 1.52 – 3.92) and those mixed-fed (aOR: 2.00; 95% CI: 1.05 – 3.79) were independently associated with a positive HIV result. **Conclusion:** Transmission was higher where infants missed ARV prophylaxis or had mixed-feeding. Infant prophylaxis and exclusive breastfeeding by HIV positive women should be encouraged.

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Introduction

36.7 million people were living with HIV in 2016 globally, 2.1 million of them were children aged less than 15 years [1]. Majority of pediatric HIV infections are transmitted from mother to child and it is estimated that 400,000 infants contract HIV from their mothers yearly [2]. Without intervention, mother to child transmission (MTCT) accounts for 15-45% of pediatric HIV infections, these rates can be reduced to levels below 5% with effective interventions [3,4].

In 2002, the United Nations adopted a four-pronged approach to the prevention of mother to child transmission of HIV, which should be implemented simultaneously: primary prevention of HIV infection among women of childbearing age, prevention of unintended pregnancies among women living with HIV, preventing HIV transmission from a woman living with HIV to her infant, and providing appropriate treatment, care and support to women living with HIV, their children, and families [4,5]. These four prongs represent the cornerstones of comprehensive PMTCT service delivery.

In 2011, WHO launched the Global plan towards the elimination of new HIV infections among children by 2015 and keeping their mothers alive [5]. The rationale for the elimination of MTCT of HIV and syphilis is that dual elimination will help to improve a broad range of maternal and child health outcomes and also directly contribute to the Millennium Development Goals which aim to reduce child mortality and improve maternal health [6]. The successful global movement to start all pregnant and breastfeeding women on antiretroviral therapy (ART) regardless of CD4 T-cell count or clinical staging set the stage for the World Health Organization's (WHO's) aptly named "Treat All" guidelines, which eliminated many long-standing barriers to HIV treatment. The test and treat strategy among HIV positive women was implemented in 2016 to help reduce new HIV infections and AIDS [7]. Kenya is among the countries implementing the global plan and the test and treat strategy.

Without antiretroviral therapy, approximately 50% of HIV infected infants die by the age of two [5,8,9]. However, the provision of highly active antiretroviral therapy during pregnancy, provision of infant ARV prophylaxis, elective caesarian section, and the use of replacement feeding options have reduced the transmission rate to less than 2% and led to near elimination of mother to child transmission [10,11]. Still, barriers to access to healthcare, cultural and social norms, gender inequality and mixed feeding practices still exist in resource-limited settings and continue to contribute to transmission of HIV from mothers to infants [12]. Identifying infected infants early by early HIV testing, prompt return of results and initiation into care is key to slow the progression from HIV infection to AIDS and prolong their life [4].

In 2016, about 1.6 million people were living with HIV in Kenya with 120,000 being children aged less than 14 years [7]. HIV transmission rate remained high at 8.3% in the country despite efforts to reduce MTCT of HIV. Currently PMTCT coverage is estimated at 80% with about 79% of HIV positive women receiving antiretroviral drugs (ARVs) for prophylaxis. However, only 54% of HIV exposed infants (HEI) receive a PCR test at 6 weeks after birth [9]. Kajiado County had a HIV prevalence of 4.7%, by end of 2015 a total of 20,268 people were living with HIV, 8.9% of whom were children aged less than 15 years. Kajiado County has a higher MTCT rate (8.8%) than the expected eMTCT target of less than 5% which is the recommended rate for intervention towards the elimination of MTCT [13]. A high MTCT rate leads to an increase in HIV positive children and rise in infant mortality figures.

Data from the Early Infant diagnosis (EID) surveillance system for Kajiado County has not been adequately analyzed. This study used data from the national EID surveillance system database to describe factors associated with HIV transmission among HIV exposed infants in Kajiado County. Findings from this study could be helpful in improving the surveillance system, reduction of MTCT rates and in formulation of policies on MTCT.

Methods

Study Site and design

The study was conducted in Kajiado County which has 5 Sub-counties and had a projected 2018 population of 944,913. Women in the reproductive age bracket of 15 - 49 years were 224,004 and 440,614 were children under 15 years of age. It has

93 public health facilities which provide healthcare including HIV services. The county follows the national EID surveillance system. HIV DNA PCR for an HEI is done within 6 weeks or at first contact, if the test results are positive the infant is presumed HIV-infected, ARV prophylaxis is discontinued and started on ART. A new sample for confirmatory DNA PCR is collected. Negative HEIs continue follow-up with a second DNA PCR test at 6 and 12 months. If infant is negative at 12 months, an antibody test is done at 18 months and 6 weeks after cessation of breastfeeding.

Kenya has seven central laboratories that test EID samples. Dried blood spots (DBS) are collected from the infants at the facility level, labelled and dried. They are then packaged using glycine envelopes and sealed plastic bags under sterile conditions and sent to the testing laboratory via courier system accompanied by a laboratory request form. At the testing laboratory, results are stored in an online accessible Laboratory Information System database. The results are sent to the facilities via E-mail or the facilities can access the database to view results. In 2016 the Kajiado county had a HIV prevalence of 4.7%, MTCT rate of 8.8% and PMTCT coverage of 89% [14].

We conducted a cross-sectional study which involved review of records of HEI stored in the national EID database for Kajiado County from 2014 through 2017. A case was defined as any record of HEI who had EID done in Kajiado County from January 2014 through December 2017.The national early-infant-diagnosis (EID) database was retrospectively accessed to extract the relevant data (https://eid.nascop.org/). Some of the variables collected in the EID data base are; the age and sex of the infant, mother´s HIV status, breastfeeding status, point of entry, ARVs given to the mother, prophylaxis given to the baby, sub-county, health facility, year tested and initial DNA PCR result.

Data analysis

To describe the study population, we calculated frequencies and proportions for categorical variables and measures of central tendency for continuous variables. Chi squared test was used to assess the statistical significance of association between the independent variables (demographic and clinical characteristics) and the dependent variable (HIV test result). Prevalence odds ratios (POR) with their 95% confidence intervals (CI) were calculated. Variables that had association with P values of ≤0.2 at bivariate analysis were included in a multivariate logistic regression model using backward stepwise elimination to identify independent factors associated with HIV positive result. Associations with P-values of ≤0.05 were considered statistically significant. Cochran trend test was used to calculate trends. Data analysis was done using Microsoft Excel 2013 (Microsoft office, Seattle, USA), Epi-info version 7.2 (CDC-Atlanta) and Stata version 13 (StataCorp LP 12, College Station, Texas, USA).

Ethical considerations

We obtained permission to access the data from National AIDS and STI Control Programme (NASCOP) and Kajiado County department of health. De-identification was done to preserve the participants´ privacy and password protection for electronic devices used and for the database.

Results

Demographic and clinical characteristics of study participants

Of the 4,195 HIV-exposed infant records reviewed, 199 (4.7%) were found to be HIV positive. Males were 1,999 (47.6%) and 1,797(42.8%) of the infants were aged 2- 8 months. The median age at PCR testing was 2 months (IQR 1.5 - 6 months). Thirty four percent (1,452) were tested in 2017 Table 1.

Samples were collected from various testing points; 2,970 (70.80%) were from PMTCT clinic at Mother Child Health (MCH), while 622 (14.83%) were collected from Comprehensive Care Centre (CCC), 164 (3.91%) from maternity wards, 129 (3.08%) from Out Patient Department (OPD) and 33 (0.79%) from pediatric ward Table 2. About 3,723 (88.75%) of the women were confirmed to have received PMTCT intervention while 3,773 (89.94%) of the infants were provided with ARV prophylaxis. Exclusive breastfeeding was offered to 2,976 (70.94%) of the infants and mixed breastfeeding was practiced by 320 (7.63%) of the infants.

Factors associated with MTCT

At bivariate analysis, the odds of having a positive HIV result were higher in infants aged more than 12months compared to those aged more than 2 months (POR: 5.23, 95% CI: 3.16 - 8.66). Infants whose mothers were not taking PMTCT prophylaxis had higher odds of having HIV infection when compared to those whose mothers received PMTCT prophylaxis (POR: 6.8, 95% CI: 4.9 - 9.6). For infants not on prophylaxis, the odds of having HIV infection were higher compared to those who were on prophylaxis (POR: 8.3, 95% CI: 5.9 -11.5). Infants who were categorized as mixed breastfed had 2.4 times the odds of having HIV infection compared to exclusively breastfed infants (POR: 2.4, 95% CI: 1.3 - 4.3). Year of enrollment, Sub- County were not significant.

In multivariate analysis, infants aged >12months had nearly thrice the odds of having HIV infection compared to those aged <2months (aOR: 2.95, 95% CI: 1.59 - 5.47). Higher odds of having HIV positive result were observed in infants not on ARV prophylaxis (aOR: 2.86, 95% CI: 1.02 - 6.93) and in infants whose mothers did not receive PMTCT prophylaxis (aOR: 2.45, 95% CI: 1.52 - 3.92). Infants who were mixed breastfed had double the odds of having HIV infection compared to those exclusively breastfed (aOR: 2.00, 95% CI: 1.05 - 3.79). Gender and point of entry were not significant at multivariate analysis. Table 3.

Discussion

We found out that the prevalence of MTCT of HIV was lower (4.7%) than the rate recommended by WHO (<5%) for intervention towards the elimination of MTCT. A majority of the HEI were enrolled through MCH/PMTCT clinic that could have led to the increased uptake of EID [15]. The integration of PMTCT services with MCH immunization services to capture all children under 24 months could have contributed to early diagnosis using PCR at the median age of 60 days. This was similar to findings in a study done in Ethiopia even though the study found that there was delay in mothers taking their infants for the recommended HIV testing at 6 weeks post-delivery [10]. It was evident that the mothers and infants who did not receive ARV prophylaxis had had higher odds of having a positive HIV result.

There was an increase in uptake of EID from 2014 through 2017 and reduced infant HIV positivity. This could be due to integration of PMTCT/MCH services as proposed in the UNAIDs 90-90-90 initiative. The initiative focuses on identifying all HIV positive people and linking them to care to make sure they are virally suppressed hence reducing risk of transmission especially for pregnant women to their children. With the growth of PMTCT programs more patients are getting into care in Kajiado county. Similar findings were reported by Matilu and others who found that most of the infected infants in Kenya were identified through the PMTCT programs [11].

We observed higher odds of infection among infants who did not receive ARV prophylaxis and whose mothers did not receive PMTCT intervention. Some infants are still becoming HIV infected each year because their mothers are not enrolled in care. Some of the barriers that could contribute to low enrollment to care include distance to health facilities, transport costs, facility inefficiencies and HIV stigma as was identified by a studies conducted in Kenya, Tanzania and Ethiopia [11,16-18]. Many expectant women do not go to health facilities to seek antenatal care services until late in pregnancy [12] and some deliver at home [19,20], hence putting their infants at risk for HIV transmission . Furthermore, there could be inconsistencies in health care provided by providers among women and infants enrolled in PMTCT. A study conducted in western Kenya showed that infants were more likely to be infected with HIV if their health care provider did not follow maternal and infant ART guidelines [21]. Reinforcement of guidelines through trainings and supportive supervision has been found to strengthen PMTCT programs.

Some infants were still receiving mixed breastfeeding; a practice that has been highlighted in various studies to be a contributor to increased risk of HIV transmission [22-24]. This could be due to the fact that the mothers have not been educated on proper infant feeding options. Some of the factors that could contribute to mixed feeding include fear of stigma and discrimination as was identified by a study conducted in Nairobi, Kenya [25]. Health education and counselling as well as male partner support could help to reduce stigma.

Limitations

The study data used were from a national EID surveillance system; thus, there were missing data for some indicators that may limit the interpretation of results. Despite the study limitations, we identified factors associated with mother to child transmission of HIV in Kajiado County.

Conclusion

The findings of this study indicated that Kajiado County MTCT was high compared to the WHO recommended level of <5% and transmission of HIV was higher in instances where infants missed ARV prophylaxis or had mixed feeding. MTCT rate serves as the most sensitive index of PMTCT hence early identification, management and care of infants are likely to reduce MTCT and significantly improve quality of life among infants.

Recommendations

HIV positive women should be educated on importance of Exclusive Breast Feeding (EBF) and infant prophylaxis. How this can be done safely will need further engagement with policy makers and implementers (Health workers). There is need for Kajiado County to enhance EID surveillance at facility level to identify strategies to reduce MTCT of HIV, mixed feeding and increase efforts to reach those not coming for PMTCT services.

What is known about this topic

- Majority of pediatric HIV infections are transmitted from mother to child. Early infant diagnosis is a key strategy that can significantly lower rates of MTCT.

What this study adds

- This study identifies the modifiable factors that influence MTCT of HIV and hence is useful in developing targeted interventions towards elimination of MTCT in Kajiado County.

Competing interests

The authors declare no competing interests.

Authors' contributions

CGN and EO conceptualized the study, CGN and EK did data abstraction from the national EID data base. All the authors participated in data entry and analysis. CGN drafted the manuscript. All authors reviewed and approved the manuscript.

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Tables

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Table3: Factors associated with a positive HIV test result in HIV exposed infants, Kajiado County, Kenya, 2014-2017

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Table 1: Demographic characteristics of HIV-Exposed Infants in Kajiado County, 2014–2017, N=4,195

Variable	Frequency	Percent (%)
Age group		
<2months	1577	37.59
2-8months	1797	42.84
9-12months	461	10.99
>12months	178	4.24
Missing data	182	4.34
Gender		
Male	1999	47.65
Female	1927	45.94
Missing data	269	6.41
Sub-County		
Kajiado North	1456	34.71
Kajiado East	1139	27.15
Loitoktok	727	17.33
Kajiado Central	644	15.35
Kajiado West	47	1.12
Missing data	182	4.34
Year of enrolment		
2014	746	17.78
2015	647	15.42
2016	1168	27.84
2017	1452	34.61
Missing data	182	4.34

Table 2: Clinical characteristics of HIV-Exposed Infants in Kajiado County, 2014–2017, N=4,195		
Variable	**Frequency**	**Percentage (%)**
Entry point		
Mother and Child Health clinic (MCH)	2970	70.80
Comprehensive Care Centre (CCC)	622	14.83
Maternity	164	3.91
Outpatient Department (OPD)	129	3.08
Pediatric ward	33	0.79
Others	17	0.41
Missing data	260	6.20
Received infant Antiretroviral prophylaxis		
Yes	3773	89.94
No	308	7.34
Missing data	114	2.72
Received Maternal PMTCT intervention		
Yes	3723	88.75
No	291	6.94
Missing data	181	4.31
Infant feeding methods		
Exclusive Breastfeeding (EBF)	2976	70.94
Mixed Breastfeeding (MBF)	320	7.63
No Breastfeeding (NBF)	245	5.84
Exclusive Replacement Feeding (ERF)	101	2.41
Breastfeeding (BF)	292	6.96
None	68	1.62
Missing data	193	4.60
Polymerase Chain reaction (PCR) HIV test result		
Positive	199	4.7
Negative	3744	89.25
Missing data	252	6

Table 3: Factors associated with a positive HIV test result in HIV exposed infants, Kajiado County, Kenya, 2014-2017.

Variable	HIV test result		Prevalence odds ratio (95% Confidence interval)	Adjusted odds ratio (95% Confidence interval)
	Positive frequency (%)	Negative frequency (%)		
Gender				
Male	87(4.4)	1876 (96.6)	Ref	
Female	108(5.7)	1787 (94.3)	1.30 (0.98- 1.74)	1.37(1.00-1.86)
Missing data	4 (4.7)	81 (95.3)	1.06(0.38- 2.97)	0.68(0.22-2.11)
Age group				
<2 months	49 (3.2)	1498 (96.8)	Ref	
2-8 months	79 (4.5)	1684 (95.5)	1.43(0.01-2.08)	1.27(0.86-1.88)
9-12months	45 (9.9)	410 (90.1)	3.36(2.21-5.10)	2.14(1.25-3.66)
>12months	26 (14.6)	152 (85.4)	5.23(3.16-8.66)	2.95(1.59-5.47)
Infant prophylaxis				
Yes	126 (3.3)	3413 (96.7)	Ref	
No	67 (22.2)	235 (77.8)	8.32(5.99-11.55)	2.86(1.80-4.54)
Missing data	15 (13.5)	96 (86.5)	4.56(2.57-8.10)	2.66(1.02-6.93)
Maternal PMTCT intervention				
Yes	126 (3.6)	3358 (96.4)	Ref	
No	58 (20.4)	226 (79.6)	6.84(4.87-9.60)	2.45(1.52-3.93)
Missing data	15 (8.6)	160 (91.4)	2.49(1.43-4.37)	1.09(0.49-2.39)
Point of entry				
Maternity	4 (2.5)	158 (97.5)	Ref	
Pediatric ward	10 (31.3)	22 (68.8)	3.05(1.12-8.28)	3.76(0.89-15.86)
Outpatient Department	25 (19.7)	102 (80.2)	1.64(0.74-3.64)	1.76(0.46-6.73)
Feeding options				
Exclusive breastfeeding	97 (3.3)	2825 (96.7)	Ref	
Mixed breastfeeding	41 (13)	275 (87)	2.37(1.31-4.27)	1.99(1.05-3.79)
No Breastfeeding	24 (9.9)	218 (90.1)	1.75(0.92-3.34)	1.5(0.75-2.98)