

Short Report:

HIV Prevalence and risk factors for infants born to mothers on ARV treatment at CHUB/Rwanda

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Abstract

Objectives

Several factors enhance the possibility of vertical HIV transmission in the pediatric population. Unfortunately, the data of the prevalence of HIV and associated risk factors in these populations remain limited in Rwanda. The study aimed to assess HIV prevalence and risk factors for infants born to mothers on ARV treatment at CHUB/Rwanda.

Methods

A cross-sectional study was carried out on infants who were born to mothers under ARV treatment at CHUB. The associated risk factors were retrospectively assessed using prevention vertical HIV transmission records, and Dried Blood spots (DBS) were prospectively tested using Polymerase Chain Reaction (PCR). Data were analyzed by logistic regression. Ethical clearance (Ref: CMHS/IRB/198/2017) was issued by University of Rwanda to fulfill research ethical consideration.

Results

Among 185(100%) infants born to HIV-positive mothers under ARV treatment, 5(2.7%) were HIV positive. The most associated risk factors were increased to over 1log copies/ml mother's viral load (OR 9.3, 95% CI 1.01-85.45, $P = 0.04$) and mother's CD4 count lower than 350 cells/ μ l (OR 6.4, 95% CI 1.03-40.06, $P = 0.04$). The factors found to reduce the rate of vertical transmission of HIV were health facility as a delivery place ($P = 0.03$), exclusive breastfeeding for 6 months ($P = 0.006$), and attending the antenatal care ($P = 0.01$) while feeding children and vaginal delivery were associated risks but not statistically significant.

Conclusion

The current study supports that the more mothers' viral load and CD4 count decrease, so does the risk of HIV to their infants. A fact which indicates that both prevalence and risk factors remain an alarming issue. Much effort and multi-disciplinary approach are highly recommended.

Keywords: Rwanda, Risk associated MTCT, HIV-exposed infants

Background

As the causative agent of the global AIDS epidemic, the impact of HIV on humanity has been immense. It has been reported that 2/3 of children living with HIV were in sub-Saharan African countries [1]. Moreover, there is a disproportionately high mother-to-child transmission rate of 25-45 % in developing countries compared to 5 % or lower in industrialized nations [2].

The third Sustainable development goal has a target of ending AIDS as a public health threat by 2030. It is remarkable to notice that to achieve this target will require much effort in reducing the HIV infection-associated risk factors. The global target is to achieve at least fewer than 500 000 people newly HIV infection by 2020. Unfortunately, 1.7 million new infection cases were reported in 2019. Besides, 1.8 million people under 14 age are living with HIV infection in 2019 [3].

Without specific interventions, women living with HIV will pass the virus to their infants. Factors contributing to MTCT are high maternal viral load, low maternal CD4 cell count, invasive procedures, placental disruption, and breast pathologies [4].

In Rwanda, various measures have been taken to eradicate the vertical transmission of HIV, including Option B+, innovative infant feeding counseling, antenatal services, and HIV test during pregnancy, measuring viral load for pregnant mothers [5]. However, a study carried out in health facility-based, demonstrated that the prevalence rate of HIV transmission from mother to child was 6.9% in 2008 [6]. Moreover, risk factors are not well documented and form the basis of HIV in Pregnancy guidelines. We aim to assess the prevalence of HIV infection and associated risk factors in infants born to HIV-positive mothers under antiretroviral (ARV) treatment at CHUB.

Methods

Between February and May 2017, we carried out a cross-sectional study on the prevalence of HIV in infants who were born to mothers under ARV treatment at the Centre Hospitalier Universitaire de Butare (CHUB). The centre provides comprehensive HIV care and treatment using a holistic family-centered approach to over 2000 people, including children (0-18 years). The study retrospectively assessed the HIV-associated factors for these infants whose data was available in the PMTCT registers. Their dried blood spot (DBS) for HIV DNA was tested using COBAS Ampliprep (COBAS TaqMan qualitative HIV-1 Test, v2.0). In this study, a high viral load was defined as an increase to over 1 log copies/ml while low CD4 count was considered <350 cells/ μ l during the third trimester. Statistical analysis was done by using IBM SPSS Statistics version 21. Multivariable logistic regression analysis was used to determine the risk factors associated with HIV status.

The sample size was 185 according to the formula of Lwanga and Lemeshaw [15].

$N = (Z_{1-\alpha})^2 [P(1-P)/D^2]$. [Where: N= the sample size, P= highest prevalence which documented by Rwanda Demographic and Health Survey 2014-2015 in widows was 14% [16], D which is absolute precision=5%; and Confidence interval of 95% = $Z_{1-\alpha}=1.96$].

The researchers received ethical clearance from the Institutional Review Board (IRB) of the University of Rwanda (Ref: CMHS/IRB/198/2017), and permission to conduct the study was obtained from the CHUB management board (Ref: CHUB/DG/SA/04/690/2017). Mothers were assigned a waiver of consent for participating in the study.

Results

185 infants born to HIV-positive mothers under ARV treatment at CHUB were included in this study. The median age was 6 (IQR: 6-12) months. 97.6% of the infants (181/185) were delivered under health facility and they received the prophylaxis drug. Of the 185 mothers, 7 exclusively fed formula milk and 138 breasts fed their infants, respectively, for the first six months. Forty (40) mothers introduced solid food in the first six months. 2.7% (5/185) of the infants were HIV positive [Table1]. A significant increase in viral load (>1 log copies/ml) in the third trimester was observed in 58 mothers on ARV treatment. Risk factors associated with the HIV infection in this cohort were mothers' increase in viral load (>1 log copies/ml) (OR 9.3, 95% CI 1.01-85.45, $P=0.04$) and low CD4 count (<350 cells/ μ l) (OR 6.4, 95% CI 1.03-40.06, $P=0.04$). The factors found to reduce the rate of vertical transmission of HIV were health facility as a delivery place ($P=0.03$), exclusive breastfeeding for 6 months ($P=0.006$), and attending antenatal care ($P=0.01$) [Table 2].

Discussion

To the best our knowledge, the current study evaluated the prevalence of HIV infection among the exposed HIV infants at CHUB/Rwanda. The findings show that the prevalence of HIV in infants born to mothers living with HIV under treatment is 2.7%. It is significantly lower compared to the infants born to HIV positive mothers who do not attend PMTC where it can reach to 30% [6]. The difference may be due to PMTCT services' effectiveness, its contribution, and measures taken by the Government of Rwanda toward EMTCT. Interestingly, the findings are within the EMTCT target of reducing MTCT rate to 5% or lesser. However, the findings from this study could still be alarming.

According to the current study, the prevalence of HIV in the exposed infants is lower to some African countries, reaching 11.4% [7]. However, it is higher to the study conducted in France (1.5%) [18]. The difference might be the sample size, methodology used, PMTCT strategy, awareness, and access to health services in the different countries or it might be high rates of detectable viral load. Therefore, much effort is still needed in less industrialized countries to meet the 2030 UNAIDS target.

The effective use of ARV treatment during pregnancy reduces the risk of vertical HIV transmission as it diminishes maternal viral load and increases maternal CD4 count [8]. The current study's findings demonstrate that the increased viral load (OR 9.3) and low CD4 count (OR 6.4) are the most associated risk factors. The findings are concordant with a study carried out in Zimbabwe which reveals that the positivity for infants is associated with mother's low CD4 count [20]. According to these findings, we suggest that in some cases, maternal viral load can increase during pregnancy as a similar report shows the possibility of the raise of viral load at 1.8 rates during pregnancy and twofold higher after delivery for mothers who were under ARV treatment [9]. Moreover, several factors can impede the PMTCT program, such as later initiation of using ARV treatment during pregnancy and poor adherence, followed by HIV drug-resistant and treatment failure [10]. Although the current study was not intended to assess the ARV adherence information and we did not perform a genotyping test to confirm this hypothesis, this study's information is essential for future research and for designing a follow-up and strategies in PMTCT to achieve 0 new cases of HIV positive in exposed infants.

The antenatal care service has a crucial role in care delivery throughout the pregnancy. The integration of the effective antenatal care with PMTCT can enhance the elimination of MTCT of

HIV. The global target is that 95% women should visit the antenatal care at least once by 2015. But, World Health Organization recommends to meet the health provider 8 times. Fortunately, all mothers have attended at least once, and 93% of all mothers visit antenatal care up to 8 times. The current study shows that to attend the antenatal care effectively protects the exposed infants. The result is consistent with the study carried out in Ethiopia, where the infants born to the mothers who did not visit the antenatal care were more likely to be positive [13]. The protection might be due to the HIV testing during the visit can enhance the early detection, followed with the early treatment. It can be also associated with the education, counseling, follow up, and easier connection of PMTCT and antenatal care for HIV positive mothers.

The health facility has an invaluable role in fighting the burden of HIV, as HIV-positive mothers would be given antiretroviral prophylaxis to prevent MTCT of HIV during labor and delivery. Also, HIV-exposed newborns may have the opportunity to receive ARV prophylaxis immediately and reduce the risk of vertical HIV transmission [11]. The current study found that 98% of all mothers gave birth at the health facility received the prophylaxis drug. The result shows that MTCT of HIV is high in home delivery than using health facility. This is concordant with another study conducted in Ethiopia (OD:3.35) [17]. This might be due to the safe delivery, and the intervention of prophylaxis given to the new born. However, the study found out that vaginal delivery is the associated risk (OD 1.6), even if it is not statistically significant. This reveals that the place of delivery and the way of giving a birth can be associated with infant positivity. Therefore, we suggest the raising awareness to pregnant mothers regarding the need for the use of skilled delivery service, hereby minimizing the risk of acquiring HIV infection during delivery.

HIV-positive mothers are recommended to exclusively breastfeed their infants for the first 6 months in developing countries [12]. However, complementary foods were introduced in 21% of

infants before six months (OR 2.4). It is significantly high compare to the report of 2009 in Rwanda as it was 43% [19]. The difference might be due the knowledge gained in the PMTCT program.

These findings on exclusively breastfeeding are also considerably high than the findings reported in the study carried out in sub-Sahara Africa (36%-88.8%) [14]. The difference might be due to the habit of Rwandan women toward the breastfeed. According to these results, there might be a possibility of vertical HIV transmission associated with feeding before six months, even if it is not statistically significant. This further highlights the need for the World Health Assembly's recommendation to exclusively breastfeed infants for the first six months of life to achieve optimal growth, development, and health.

The study was limited to a single health facility-based (CHUB), so the results could not be generalized in the whole country.

Conclusion

The current study reveals that ARV antiretroviral therapy combined with the Effective PMTCT program in Rwanda can eliminate the MTCT. However, the more mothers' viral load and low CD4 count are associated with the prevalence of exposed HIV infants.

Recommendation

To collaborative partners in Health: The study recommends continuous support to overcome this health problem in terms of increasing the training of health professionals, especially concerning all programs that aim to eradicate all possible modes of HIV transmission to these infants.

To community Health workers: The current study recommends these health assistants that a further community mobilization toward eradicating new positive cases of exposed HIV infants, should be carry out in raising mothers' awareness to attend the PMTCT program efficiently.

To researchers: The researchers should carry out different studies to indicate maternal viral load and CD4 cells concerning the EMTCT of HIV.

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Competing for interest

We declare that we have no conflicts of interest.

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Table 1. Prevalence of HIV among infants born to mothers under ARV treatment

Infants' HIV Status	Frequency	Percentage (%)
HIV Positive	5	2.7%
HIV Negative	180	97.3%
Total	185	100%

Table 2. Risk factors associated with exposed HIV infants born to mothers under ARV

Factors	Cases		Controls		OR	95% CI	P value
	Yes(%)	No(%)	Yes (%)	No(%)			
Infants born to mothers with high viral load	4(80)	1(20)	54(30)	126(70)	9.3	1.01-85.45	0.04
Infants born to mothers with low CD4 count	3(60)	2(40)	34(19)	146(81)	6.4	1.03-40.06	0.04
Vaginally delivery way	4(80)	1(20)	125(69)	55(31)	1.7	0.19-16.11	0.6
Feed infants before 6 months	2(40)	3(60)	38(21)	142(79)	2.4	0.4-15.4	0.3
Health facility as a delivery place	4(80)	1(20)	177(98)	3 (2)	0.06	0.005-0.8	0.03
Exclusive breastfeed for 6 months	3(60)	2(40)	172(96)	8(4)	0.06	0.01-0.47	0.006
Attending the antenatal care	4(80)	1(20)	178(99)	2(1)	0.04	0.003-0.6	0.01

OR: Odd ratio, CI: confidence interval, bolded P values are statistically significant