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Factors Influencing the HIV Positivity of Exposed Children in Two Health Facilities in Yaoundé – Cameroon

Article by Judith Maka[1], Robinson Mbu Enow[2], Patrice Takam Soh[3]
[1]MD, MPH, PhD student in Public health, Chief of the International Immunization's center of Yaoundé
[2]Professor of obstetrics and Gynaecology, Department of Family health, Ministry of Public Health Cameroon
[3]Doctor in Statistics, department of mathematics, University of Yaoundé I
Email: judiithmani70@hotmail.com[1], robinsonmbu2000@gmail.com[2], ptakamsoh@yahoo.fr[3]

Abstract

AIDS is a pandemic. Over 90% of HIV infections in children less than 15 years are as a result of Mother-to-child transmission (MTCT) and more than 90% of MTCT occur in sub-Saharan Africa. Several strategies have been developed to reduce HIV infections in children, with variable successes. We aimed to understand factors influencing the infant HIV positivity at the operational level of the Cameroonian health system.

We carried out a prospective and descriptive study that lasted one year. We followed mother-baby (Zero to 18months) pairs enrolled in PMTCT program in Biyem-Assi and Efoulan district hospitals. We addressed questionnaire and structured interviews to mothers and their caregivers to answer research questions. Data were recorded on excel, and analyzed using SPSS version 23. The Chi square was used to analyze the effect of the level of the education, marital status of the mother on the seropositivity of the exposed child.

We recruited 113 HIV exposed children out of which 111 (98.23%) had early infant diagnosis. 7 over 111 children (6.30%) were tested positive, and most of them had low socio-economic situation. We found an association between the sites of the PCR analysis with the sero-status of the HIV-exposed child.

EID is acceptable in these two health facilities and seropositivity of the child is found mostly among women with low socio-economic status (jobless). Better strategies should increase the family sensitization during perinatal period, to reduce the related cost of EID, and the long waiting time.

Keywords: *MTCT, District Hospital, Factors, HIV.*

Introduction

AIDS is a pandemic. Every year nearly 400,000 children are infected with HIV in the world. Over 90% of HIV infections in children under the age of 15 years are due to mother-to-child transmission (MTCT), and more than 90% of this HIV transmission occur in sub-Saharan Africa (UNAIDS, 2017) . Joint efforts (Governments, communities, NGOs etc.) and effective interventions have been engaged since 2010 around the world to eliminate new infections among children and keeping their mothers alive, but HIV incidence is not dropping (WHO, 2010). PMTCT programs have been implemented in many low and middle – income countries with variable successes. According to a study published in 2011 in a remote setting in Thailand on HIV-1 early infant diagnosis by Polymerase Chain Reaction (PCR), 8% of HIV exposed infants in limited resource settings had access to early HIV diagnosis services eight weeks after delivery (Ngo-Giang-Huong et al., 2008). High attrition, particularly after delivery, has limited the impact of many interventions for HIV-exposed infants who remain at risk through the end of breastfeeding (Naiwatanakul et al., 2016), (Obai, Mubeezi, & Makumbi, 2017), (Matos et al., 2018). The inaccessibility and inadequate uptake of EID services have resulted in lack of care for the millions of HIV-exposed infants who remain unidentified (Ghadrshenas et al., 2013). Several strategies have been developed around the world, and particularly in low and middle-income

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countries to reduce HIV infections in children (Tudor Car et al., 2011), (Mnyani, Simango, Murphy, Chersich, & McIntyre, 2014) .

Africa countries face the burden of HIV /AIDS with cultural barriers and lack of resources. Despite a good ART coverage, child's mortality is still high (Landes et al., 2012). Particularly in sub-Saharan Africa, socioeconomic and sociocultural factors have been described as the biggest barriers to the success of PMTCT programs (Muluh, 2014). Other factors such as limited male involvement, flaws in the design of PMTCT and health workers inefficiency were also identified (Okoli & Lansdown, 2014). Low socio-economic status (poor awareness, poverty, illiteracy, or poor accessibility to PMTCT program) of an HIV positive mother can affect the elimination of the MTCT of HIV. Poverty and lack of social support are challenges in accessing EID services (Hassan et al., 2012). Since one of the sources of mother – to - child transmission of HIV is through breastfeeding, poor women unable to afford infant milk and supplement, are left with no option than exclusively breastfeeding their babies. Efforts to achieve population - level success in sub-Saharan Africa (SSA) need to critically address operational issues and challenges to implementation (health system) and utilization (social, economic and cultural barriers (Aizire, Fowler, & Coovadia, 2013) . Integration of perinatal PMTCT measures with other health care services are experimented in many developing countries (Tudor Car et al., 2011). There is paucity of data in some regions (Gourlay, Birdthistle, Mburu, Iorpenda, & Wringe, 2013) , and Factors affecting the PMTCT vary from rural to urban settings (Mugasha et al., 2014).

Since 2010, Cameroon adopted the PMTCT program with early free screening test, free ART, and free follow-up for HIV positive pregnant women and their HIV exposed children (Ministry of Public Health Cameroon, 2012) . In 2013 in Cameroon, the prevalence of HIV was 4.3% and 7.6% among pregnant women, with a great number of lost to follow-up (PEPFAR, 2013). A significant proportion of children are lost at each step of the EID continuum of care. The PMTCT is not provided in every health facilities. The goal of the Ministry of Health (MoH) and partners /NGOs is to expand EID testing to link to the country's PMTCT service already provided in the majority of health facilities and other health services (Ministry of Public Health Cameroon, 2012). In the last evaluation activities, there was still a significant gap between the number of HIV positive children and the number of children on an effective HAART. As lessons after the implementation of the option B+, a previous analysis of this study in BDH, shows an important gap between the number of HIV – exposed children registered in the delivery room and the number of children screened for HIV test, means there is still a good number of HEI lost to follow-up.

The BDH and EDH are two reference district hospitals with a good frequentation and trained health care workers to provide PMTCT services. Till January 2018, all the DBS sample were sent to CIRCB for PCR analysis. We aimed to improve the quality of care of the HIV infected women, their HIV-exposed children, and to understand factors which influence the success of the PMTCT at the operational level of the health system to obtain HIV negative new born child from an HIV- positive pregnant woman. We also wanted to provide data base for further studies on this field.

To present this experience, we will explore the generalities on topic, followed by the method used and results. At the end, conclusion, recommendations and some perspectives will be given to contribute to the national targets concerning HIV/AIDS.

Method

Description of site

we randomly selected two study sites at the operational level of the Cameroonian health system; the Biyem-Assi District hospital (BDH) and the Efoulan district hospital (EDH), located in Yaoundé which is an urban area. These two public health facilities have good PMTCT services (high frequentation) with trained personnel. The Centre International de Reference Chantal Biya (CIRCB) was the unique laboratory performing the specific PCR test in the Center region till January 2018.

Study design

During the period from April 2017 to May 2018, we conducted a prospective study with qualitative and quantitative aspects. Every HIV- infected mothers of an identified HIV-Exposed child (zero to

eighteen months), who gave their consent for our study, were asked or assisted to fill the questionnaire.

Data source

We used questionnaires addressed to HIV-positive mothers coming with their children; we also used registers, patient's files with clinical and laboratory information to answer the research questions. With Focus group discussions and interviews addressed to these mothers and their caregivers, we collected information about the barriers to the utilization of the EID.

Data collection method

In this study, registers were used to identify HIV- exposed children. Structured questionnaire was addressed by trained medical personnel to HIV- positive mothers during consultations. Each questionnaire contained socio - demographic information on the parents, information on the pregnancy, on the delivery or the post-partum tests concerning every HIV- exposed child. Any identified child had a number to be followed during the study period.

We followed these pairs (mother-baby) to collect clinical and laboratory information to answer the research questions. With the Focus Group Discussion (FGD), In-depth interview (semi structured interview) addressed to these mothers and their caregivers, we collected information about factors affecting the success of the EID. We obtained a consistent number of HIV positive mothers, a good number of children from 0 to 18 months of age to assess the quality of the service provided or received, and the difficulties encountered at any steps (Identification of the child, HIV - testing, Blood sample transportation, result's registration and reporting, and the antiretroviral treatment) of the EID.

Statistical method

Data were recorded in the platform of excel. Quantitative data were analyzed in the SPSS version 23. The test of proportion helped to compare the frequencies in the two different hospitals. The Chi square helped to analyze the effect of the mother's age, mother's occupation, mother's marital status of the mother on the utilization of the EID and antiretroviral treatment of the child.

Qualitative data analyzed helped to identify some socio cultural, economic or educational factors, and compare information collected from both study's sites and draw some specificities for the effectiveness of the EID in our study population.

Ethical consideration

Ethical clearance was obtained from the Cameroon National Ethical Committee. Signed informed consent was received from each mother prior to the inclusion to the study. All subjects who accepted to be interviewed, certified by signing on the informed consent form. Confidentiality was assured by safely and surely storing the questionnaires out of the reach of non-staff persons. Laboratory tests were kept confidential. Mothers received feedback on all the results and were referred where necessary to local health care services for appropriate follow-up. Administrative authorization was sought from each study site administration.

Results

During the period from April 2017 to May 2018, we collected information from HIV positive mothers who visit the health facility with their babies. We recruited a total number of 113 children, with 54 children in BDH and 59 in EDH. All of these HIV- positive mothers gave their consent only to their caregivers.

The table below shows how we recruited the cases in different study's sites.

Table 1. Selection of cases according to different study sites

Selection of Cases	BDH	EDH	Total
Deliveries	**2621**	**1914**	**4535**
HIV positive women	**111**	**126**	**237**
HIV exposed children	**93**	**131**	**224**
HIV exposed children recruited	**54**	**59**	**113**

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Table 2. Distribution of cases according to different study site

Distribution of cases	**(n=113)**	**Absolute percentage (**%)
BDH	54	47.78
EDH	59	52.21
Site of analysis	**(n=109)**	**Absolute percentage (**%)
CIRCB	51	46.78
BDH / EDH	58	53.21

From April 2017 till the 16th January 2018, PCR analyses were performed out of the health facility, in the CIRCB. After the 16th January till today, it was possible to perform PCR analysis in these respective hospitals.

Demographic characteristics of key respondents

Our key respondents were all the HIV positive mothers who gave their consent to the participation of the study. Their Characteristics are summarized in the table below.

Table 3. Demographic Characteristics of the HIV-exposed infant's Mothers (key respondent)

Level of education	**(n=111)**	**Absolute percentage** (%)
None	**03**	2.65
Primary	26	23.42
Secondary	60	54.05
University	20	18.01
Post university	02	1.08
Other	0	0
Profession	**(n=109)**	**Absolute percentage** (%)
Jobless	38	34.86
Student	12	11
Seller	11	10.09
Farmer	1	0.09
Worker	19	17.43
Other	28	25.68
Marital status	**(n=111)**	**Absolute percentage** (%)
Married	31	27.92
Single	48	43.24
Concubine	31	27.92
Widow	1	0.09

About our key respondents, 34.86% of mothers were jobless, 11% were students, followed by others who were esthetician, teacher. Half of them had the level of the secondary school. Concerning the marital status of these mothers, less than 30% are married and most of them were either single (43.24%), or concubine (27.92%), means a total of 71.16% unmarried.

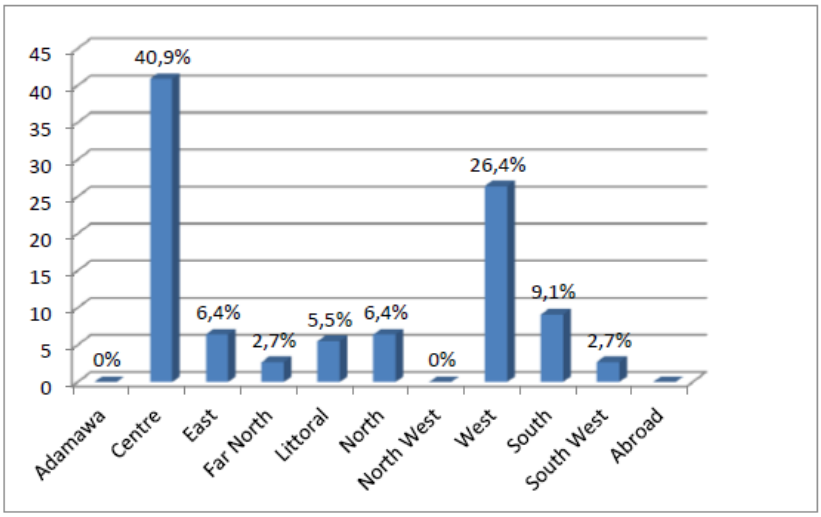

Figure 1. Geographical origin of key respondents

About 40% of our key respondents were originated from the center region, followed by the west region.

HIV prevalence among HIV-exposed children

From the beginning of the study till January 2018, PCR analysis was performed out of the Health facilities. After the 16th January, PCR were performed in each study sites (points of care). The HIV sero status of the male partner was received from the mothers.

Table 4. HIV status of Fathers and children

HIV status of fathers	**(n=100)**	**Absolute percentage** (%)
HIV Positive	35	35
HIV Negative	43	43
Unknown	22	22
HIV Status of children	**(n=111)**	**Absolute percentage** (%)
HIV positive	07	6.30
HIV negative	104	93.7

In our study population, fathers were relatively older than mothers; The Mean age of fathers was 36.82 compare with 31.47 for mothers. Fathers of HIV exposed children were more educated than their sexual partners; 30% of them reached the level of the university compared to 20% of mothers. But we lack much other information on fathers because we obtained them through mothers; only 78.00% of fathers had their HIV status known. Among fathers who had their HIV status known by their partner, 43 over 78 (55.12%) were HIV negative.

The mean duration of the PCR analysis out of the hospital (in the CIRCB) was 1070.72 hours (more than a month), compare to 2.00 hours (less than one day) when the test was performed in the health facility.

In total, 111 children have their HIV status known with 104 (93.69%) HIV negative and 7 Children were positive giving a prevalence of 6.30%.

About the HIV positive children obtained in our study, we selected some variables summarized in the table below

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Table 5. Summary of variables on HIV-infected children

	HIV infected child						
Characteristic of child	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Health facility	EDH	EDH	BDH	BDH	BDH	BDH	BDH
Test site	CIRCB	CIRCB	CIRCB	CIRCB	CIRCB	BDH	BDH
Age	6weeks	9months	9months	1 year	18 months	18 months	10 weeks
Characteristic of mother	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Age	22	27	35	29	36	25	28
Profession	Jobless	Teacher of the primary	Jobless	Jobless	Jobless	Jobless	Jobless
Marital status	Single	Single	Concubine	Married	Married	Single	Concubine
Education level	Secondary	Secondary	University	Secondary	Secondary	Secondary	None
Characteristic of father	**1**	**2**	**3**	**4**	**5**	**6**	**7**
HIV status	Negative	Positive	Positive	Unknown	Positive	Unknown	Negative
Period of the hospital visit	During Delivery	Unknown	After Delivery	Unknown	unknown	After Delivery	After delivery

We found in our study population, a total of 7 HIV positive children, diagnosed at different stages of live. 5 of them are relatively late diagnosed. 6 over 7 mothers of these children were jobless (85.71%) during the study period even though they reached the secondary level of education, 5 over 7 (71.42%) of them are not married, these mothers were either single or concubine. 4 fathers over seven (57.14%) visit the hospital after the delivery of their child.

Associated factors to the HIV positive sero -status of the children

We performed the chi square test analysis. With 5% significance, we found no association between the child's age when performing the HIV test, mother's or father's marital status, occupation, region of origin, level of education, and the HIV sero-status of the HIV – exposed child.

There was no relationship between the times spent from the sample collection to the result with the sero-status of the child.

Table 6. Relationship between the Site of PCR analysis and the sero-status of an HEI

Sero-status of the HEI	**Site of the PCR analysis /HIV test of the child (n=106)**			
	CIRCB	**BDH**	**EDH**	**Total**
Positive	5	2	0	7 (6.60%)
Negative	50	24	25	99 (93.39%)
Total	55	26	25	106 (100%)
Chi square value	31.584			
Significance	*** (0.000)			

We found a statistically significant association between the site of the PCR analysis and the sero-status of the child.

Analysis of interviews and focus group discussions revealed key ideas to complete the list of different factors which could influence the HIV seropositivity of the child at different levels like: health system, health care facility, community, family and individual level, where specific actions need to be done for the successful of the PMTCT program.

Discussion

This study investigated factors associated with the non-success of the EID among HEIs at Biyem-Assi and Efoulan District Hospitals in the Capital town of Yaoundé in Cameroon.

We observed missing data in the ART and early infant's diagnosis register concerning the control of second PCR analysis or the confirmation's test to be performed at 18 months of age. This can be explained by the complexity of the data to collect and the overwork load that was described by the Health care providers. With the multiple HIV tests (minimum 2 before the age of 18months) to be performed for an HEIS, there were neither motivation, nor an additional health personnel in the pediatric service of EDH. Additional testing is associated with an increase workload which can affect the quality of the service (Gill et al., 2018). This led to missing data in the file and the increasing number of loss to follow up of HEIs. Hassan et al. in the study of the dynamics and constraints of early infant diagnosis of HIV infection in rural Kenya, found that loss to follow up and missing data on EID could partly be explained by the inadequate training of the health care personnel (Hassan et al., 2012) or misunderstanding of EID by the caregivers (Tomlinson et al., 2016). Another reason could be a lack of social support, or poverty in accessing EID source. Due to the vulnerability that is known from these HIV-positive responders, they accepted only to discuss with the nurse or the pediatrician in charge of the baby's care. We could not call for additional information and no home visit were allowed.

Concerning our responders, half of them had the level of the secondary school, less than 30% were married and most of them either single (43.24%) or concubine (27.92%) means a total of 71.16% unmarried. This is probably a reason of missing data on male partners; since we obtained information through mothers, only 78% of fathers had their HIV status known. Sometimes these women wanted only to be pregnant and did not want to know more about the man (sometimes already married). It has

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been described that relationship within couple and particularly the HIV status disclosure to the male partner may play an important role in the maternal uptake of early infant HIV testing. Hampanda et al.(2017) shows that uptake of early infant HIV testing was associated with female –directed emotional intimate partner violence (aOR 0.41; 95% CI 0.21-0.79; p<0.01), HIV status disclosure to the male partner (aOR 13.73; 95% CI 3.59-52.49; p<0.001) (Hampanda, Nimz, & Abuogi, 2017) .

During our study period, over the 113 participants, 57 have their PCR analysis performed in the health facilities with the mean duration of 2 hours, comparing to 50 PCR analysis performed out of the health facilities. Among the 50 PCR analysis performed out of the health facilities (CIRCB), the mean turnaround time (TAT) between blood draw for DNA-PCR tests to delivery of a test results to the respective health facility was 44 days, giving more risk of baby's infection. This TAT is more than 36 days as a Median TAT found by kedede et al. (2012) in a multicentre retrospective cohort study in Ethiopia. It was a larger sample size of 266 HIV-exposed infants. In a study conducted in Myanmar by Thiha et al. from 2013 to 2015, long distance between ART center and PCR facility was associated with long Turn Around time for EID(Thiha et al., 2017) .

Among the 113 participants recruited, 111 (98.23%) children had their HIV status known at different stage of their life; compare to only 109 over 266 (41.0%) in Ethiopia. 92.04% of children were negative during the data collection and 7 children HIV positive giving the prevalence of 6.30%, fast the same as 6.5% found among HIV- exposed children in rural Uganda (Kahungu, Kiwanuka, Kaharuza, & Wanyenze, 2018). This prevalence is nearly the same as the national prevalence of HIV among HIV - exposed children in Cameroon, less than 8.7% found in Brazil (Matos et al., 2018) and 13.2% found among 266 HIV- exposed Ethiopian children (Kebede, Gebeyehu, Jain, Sun, & Haubrich, 2014). This high prevalence and high loss to follow up found in the Ethiopian study can be explained by the fact that in 2012, the option B+ was not yet implemented.

After a focus Group discussion (FGD) conducted with health care workers involved in PMTCT process, when we addressed the question to know factors associated with the unsuccessful EID, they talked about Denial, guilt, lack of money to access the service, HIV related stigma in their environment. The overwork load, poor motivation, Lack of personnel and the staff training were the main difficulties facing by the care givers. Ahmed et al.(2017) in a qualitative study on mothers and caregivers of HIV positive children in Swaziland found also the tuberculosis and HIV co-infection as barriers to ART initiation among children from 2 to 18 months of age (Ahmed et al., 2017).

Among the 7 HIV –positive children registered in our study, it was indicated 6 over 7 (85.71%) late diagnosed (over 8weeks of age). Even with a good education, and counseling, it is also found some unexplained retardation on the follow up of HIV-positive mothers which can affect their babies heath care. Mirkuzie et al. found that among the 219 HIV exposed live born in Addis Ababa, only115 (52%) were brought for EID at Six weeks of age (Mirkuzie, Hinderaker, Sisay, Moland, & Mørkve, 2011). Tariq et al. found in a study conducted in United Kingdom (UK) and Ireland, a strong relation between black ethnicity and late presentation to ANC, which could also be explained by many socio cultural consideration of the pregnancy and baby's care in the family (Tariq, Elford, Cortina-Borja, Tookey, & National Study of HIV in Pregnancy and Childhood, 2012).

Concerning the socio - economic and cultural factors, there was no statistical association between the mother's occupation and marital status with the sero-status of the HIV- exposed child in our study. But among the HIV positive children, 6 over 7 (85.71%) of their mothers were jobless and 5 over 7 mothers (71.42%) were unmarried, mean they have poor financial or psychosocial support to give help and taking care of their children. Mothers without a transport fees to attempt the health care facility will delay the visit of the center and also delay the early diagnosis or the initiation of ART. Poverty and distance to the clinic were described by Ahmed et al. as one of the barriers to the initiation of ART among children from 2 to 18months of age (Ahmed et al., 2017). Okoli et al.(2014) found in a critical literature review that socio-economic and socio-cultural factors were the biggest barriers to the success of PMTCT programs in Malawi and Nigeria (Okoli & Lansdown, 2014). Poor partner and community support were also described as barriers to the uptake of ART drugs to prevention of MTCT of HIV in Sub Saharan Africa (Gourlay et al., 2013).

Conclusion

This study aimed to describe factors which negatively influencing the EID services and impact the HIV positivity of the exposed child. We attained most of our objectives. The lack of service commodity like the absence of PCR analysis in the health facility is linked to a long turnaround time from the DBS collection to the reception of the Baby's HIV result. This reduces the adherence to the EID continuum services and increases the risk of HIV infection among HEI. Good community follow up need to be organized, integrated community sensitization should be addressed. More staff training with more implication of gynacologists and pediatrician in the family counseling during the perinatal period, availability of better commodities may accelerate the early identification of HIV in infants, their retention in care and the elimination of the mother to child transmission of HIV.

Difficulties

During data collection, we faced difficulties to obtain consent or additional information from HIV positive mothers in the absence of their health care providers. There were multiple studies during the same period on the same target population. The high work pressure and insufficient motivation of health care personnel make the work too heavy. The difficulty to obtain information on male partner and patients lost to follow - up could be explained by the ignorance or resistance of our key respondents, lack of transport fees. No home visit was allowed.

List of abbreviations

ABC	:	Abacavir
AIDS	:	Acquired Immune Deficiency Syndrome
ANC	:	Antenatal Care
ART	:	Antiretroviral Therapy
ARV	:	Antiretroviral
AZT	:	Zidovudine
BDH	:	Biyem-Assi District Hospital
CDC	:	Center for Disease Control and Prevention
CIRCB	:	Centre International de Référence Chantal Biya
CD4	:	Cluster Differentiation 4 cells-T4 helper cells
DBS	:	Dried Blood Spot
EDH	:	Efoulan District Hospital
EFV	:	Efavirenz
EID	:	Early Infant Diagnosis
FTC	:	Emtricitabine
HAART	:	Highly Active Antiretroviral Treatment
HCW	:	Health Care Worker
HEI	:	HIV Exposed Infant
HIV	:	Human Immunodeficiency Virus
IEC	:	Information, Education and Counseling
LPVr	:	Lopinavir ritonavir
LTFU	:	Lost to Follow Up
MCH	:	Mother and Child Health
MOH	:	Ministry of Health
MTCT	:	Maternal to Child Transmission
NVP	:	Nevirapine
PCR	:	Polymerase Chain Reaction
PMTCT	:	Prevention of Mother to Child Transmission
TDF	:	Tenofovir
UNICEF	:	United Nations Children Education Fund
WHO	:	World Health Organization
3TC	:	Lamivudine

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Recommendations

Health system and NGO's politics

Increasing funds allocated to phone calls, transport and health care of HIV positive mothers and children to reduce the percentage of patients lost to follow-up.

Organizing HIV screening strategies particularly around the perinatal period at any point of contact with the health system by gynecologists and pediatrician to capture HIV exposed children and their parents.

Health care facility

Organizing integrated services for all couple mother-child (before 18months of age) visiting the Health facility (post-partum rendezvous, immunization's visit, circumcision, pediatric consultation, etc.). The personal in charge will quickly check their needs and follow the parent or child HIV screening tests. This could reduce the high work pressure, the number of lost to follow-up, and complete the EID cascade.

Limits of the study

Due to the complexity of data collection in the PMTCT cascade, we had some missed information to complete our interpretation as the opinion of the fathers on their HIV - exposed children. There was information's bias, for example HIV-positive mothers sometime forgot the real time of the beginning of the ART intake.

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