

Determinants of early infant diagnosis and treatment of HIV among exposed infants in informal settlements in Nairobi, Kenya

Makau GM¹, Okwara FN¹, Oyore JP²

¹Department of Paediatrics and Child Health, Kenyatta University, Nairobi, Kenya

²Department of Community Health, Kenyatta University, Nairobi, Kenya

Corresponding author:
Dr F.N Okwara, P.O. Box 19533-00202, Nairobi, Kenya. Email: florenceoringe@gmail.com

Abstract

Background: Paediatric HIV infection is a growing health challenge, especially in sub-Saharan Africa. Most paediatric HIV infections are perinatally transmitted. Early Infant Diagnosis (EID) and immediate initiation of treatment minimizes deaths. Though EID services are widely available in Kenya, uptake remains low, especially in disadvantaged communities.

Objectives: To evaluate determinants of EID and early treatment initiation among HIV exposed children from informal settlements in Nairobi, Kenya.

Methodology: A descriptive cross sectional study was done; where HIV infected mother-infant pairs attending health care facilities were recruited. Consent was sought. Non-biological caretakers were excluded. Structured questionnaires were administered to obtain information on socio-demographics, knowledge and uptake of EID, Prevention of Mother to Child Transmission (PMTCT) and Antiretroviral (ARV) therapy.

Results: A total of 238 mother-infant pairs were interviewed. Majority, (69.2%) were aged below 30 years, 75% had below secondary level of education, 67.6% were married, and 71.4% were of poor social backgrounds. Most (77.4%) had HIV diagnosis made in the preceding year, 68.5% of them during pregnancy. Knowledge on importance of EID was poor, and only 53.8% had knowledge of PMTCT interventions. Only 38.7% had received ARV prophylaxis in pregnancy, while 37.4% were on ARV therapy. Majority, (63.5%) had delivered in a health facility, but only 56.7% had EID at 6 weeks. While 19.7% of infants tested HIV positive, only 10.6% of infected infants were started on treatment immediately. The main determinants of EID at 6 weeks were maternal delivery at a public health

facility ($p = 0.000$, OR 0.171, CI 0.065- 0.451), receiving of psychosocial support ($P = 0.000$, OR 0.173, CI 0.075- 0.398), high maternal knowledge on PMTCT ($p = 0.001$), mothers on ARV therapy ($P = 0.017$, OR 0.284, CI 0.101- 0.795) and mother on ARV prophylaxis ($p = 0.020$, OR 0.306173, CI 0.113- 0.830). Factors associated with early initiation of treatment were delivery in public health ($P = 0.005$) and receiving of psychosocial support ($P = 0.000$).

Conclusion: Knowledge of on PMTCT and EID was low, and this lead to low EID uptake. We recommend integration of PMTCT and paediatric HIV care services to MNCH settings.

Key words: HIV, Infant, Diagnosis, Treatment

Introduction

Paediatric HIV infection is a growing health challenge worldwide, with 2 million children infected by 2010 [1]. Sub-Saharan Africa is home to 68% of all people living with HIV. The region accounts for more than 70% of new HIV infections globally, 90% of who are children [2]. Most, (90%) of paediatric HIV infections are perinatally transmitted. Mother to Child Transmission (MTCT) rates in developing countries were reported to stand at 25-40% [3]. Kenya has experienced one of the world's harshest epidemics. By 2010, the National HIV prevalence stood at 6.3%, with higher prevalence reported among females (8%) [4]. Nairobi County, which is largely urban and the Capital City, had the second highest HIV prevalence in the country at 8.2% after Lake Victoria region [5]. Current PMTCT strategies focus on initiation of ARV therapy for infected pregnant women, and subsequent prophylaxis for infant's. However, less than 50% of eligible pregnant

women receive either intervention [5]. Low utilization of Ante-Natal Care (ANC) services (47%) and low rate of hospital deliveries which stands at 44% were reported to contribute to this status [6].

Previous studies indicated that infected children deteriorate rapidly due to immature immune systems [7] and that if untreated, one third of infected children die by the end of the first year, and 50% by the end of the second year [8,9]. It was further observed that Early Infant Diagnosis (EID) enables infected children to be identified prior to development of clinical disease and that early treatment reduces infant mortality by 76% and HIV progression by 75% [10]. In a South African study, 80% of infected well children at 6 weeks progressed to become eligible for ARV therapy by 6-12 months of age [11].

Kenyan guidelines recommend EID at 6 weeks and immediate initiation of treatment within 2-4 weeks of diagnosis to minimize deaths [12]. Notwithstanding, by 2010, only 28% of HIV Exposed Infants (HEI) were tested within 2 months, and only 23% received cotrimoxazole prophylaxis [13]. Efforts were put in place to provide wider access of EID services and treatment for HEI, including those in resource poor settings. These services became available for free in all public facilities [12]. By 2011, 64% exposed infants had EID, and of 170,000 Kenyan children eligible for treatment, only 21% were started on treatment [2] which is still much below the required figure according to WHO guidelines. The objective of this study, therefore was to determine the factors that influence uptake of these services in informal settings in Nairobi, Kenya.

Materials and Methods

This was a cross sectional descriptive study conducted at two informal settlements in Nairobi, Kenya. The two health facilities selected offered EID and HIV treatment services for free. Subject enrollment started from January 2013 to June 2013. Random sampling of HIV infected women attending health care facilities at Child Welfare Clinics (CWC), Comprehensive Care Clinics (CCC) or sick child services was conducted. Structured interview schedules were used to get socio-demographics information, HIV diagnosis and treatment, PMTCT and EID knowledge and practice. Non-biologic caretakers were excluded in the study. Focus Group

Discussions (FGDs) with HIV infected women and Key Informant Interviews (KII) with staff at the health centers provided secondary data. Ethical approval was obtained from Kenyatta University Ethics Review Committee, the Kenya National Council of Science and Technology, and the health facility in-charges. Signed consent was sought from the mothers after successful explanation of purpose of the study.

Data collected was coded, entered and analyzed using Statistical software; SPSS version 19.1. Household characteristics are presented as frequencies, percentages, means and ratios. Cross tabulations were done and associations were established by chi-square (X^2). Inferential statistics (P-value, confidence intervals, X^2) were used to establish factors that predicted EID uptake. Statistical significance level was fixed at $P < 0.005$. Logistic regression was used to test the relationship of variances of EID uptake and treatment.

Maternal characteristics: There were a total of 238 mother – infant pairs enrolled; age range was 18 – 45 years of whom the majority (69.2%) were aged below 30 years (Table 1). Most (76.0%) had primary level of education or below, 67.6% were married, and 71.4% were from poor social backgrounds, with monthly household income of less than US \$ 22.2. Regarding the timing of the HIV diagnosis, 37.4% were diagnosed more than 2 years prior to the study, 39.9% 1-2 years and 27% were diagnosed less than one year earlier. Based on the term of pregnancy, HIV diagnosis was made during pregnancy in 68.5% of the mothers while 19.7% were diagnosed during a sickness episode. Regarding their PMCTC, knowledge level, only 5.9% recorded high levels whereas 53.8% recorded low awareness levels. Only 77.3% respondents had heard about EID, 55.5% of who heard had about it during pregnancy from a health worker. None reported to have heard of it from mass media. On importance of EID, majority (68.1%) reported that it allowed them to know the child's HIV status, while 22.7% did not understand its importance. On the treatments recommended for HIV Exposed Infants (HEI), 70.4% of the women knew of ARV therapy and only 48.9% knew about cotrimoxazole prophylaxis. However, 18.9% were not aware of any medications required by HEI. Findings on their PMTCT care information indicated that 38.7% received ARV prophylaxis, 37.4% were on ARV therapy and 23.9% were not on any intervention. Most (63.5%) had delivered in a health facility while 26.5% delivered at home.

Table 1: Maternal demographic and health related characteristics (n=238)

Characteristic	(%)
Age(years)	
<20	15
21-30	54.2
23-40	28.6
<40	2.1
Level of education	
Non-formal	4.6
Primary	71.4
Secondary	18.9
Tertiary	5.0
Marital status	
Married	67.6
Single	12.6
Separated/divorced	17.6
Widowed	2.1
Monthly household income(Ksh.)	
<2000	71.4
2001-5000	16.4
5001-10,000	9.2
>10,000	2.9
Maternal PMTCT knowledge	
Low	53.8
Average	40.3
High	5.9
Maternal knowledge on importance of EID	
To know child's status	68.1
Identify the HIV infected	8.4
No importance	22.7
Prevent HIV infection in child	0.8
Knowledge of treatment of HEI	
ARV	70.4
Cotrimoxazole	48.9
Other	5.0
Time since last HIV diagnosis(Months)	
<6	5.9
6-12	16.8
12-24	39.9
>24	37.4
When HIV diagnosis was made	
During pregnancy	19.7
Sickness/Unwell	19.7
VCT	9.6
Home based DTC	0.8
PMTCT intervention received	
ARV prophylaxis	38.7
ARV therapy	37.4
None	23.9
Place of delivery	
Home	26.5
Public health facility	36.1
Private health facility	37.4

Infant characteristics: Out of the 238 study infants, 43.3% were aged below 9 months and the median age was 6 weeks, and male: female ratio was 1:1. Majority, (96.0%) were on exclusive breastfeeding. On postnatal PMTCT interventions received, 65.5% were on ARV prophylaxis, while 47.8% were on cotrimoxazole. However, only 56.7% of the infants were examined for HIV by dried blood spot at 6 weeks. Diagnosis by PCR HIV DNA tested positive for 19.7% of the infants. Treatment data indicated that only 10.6% of the infected infants were started on treatment immediately.

Determinants of EID in HIV exposed infants: Socio-demographic factors that were significantly associated with EID were mother's age ($p = 0.024$) and household income ($p = 0.000$). Mother's knowledge of EID ($p = 0.000$), PMTCT intervention ($p = 0.000$), and public facility delivery ($p = 0.000$) were other statistically significant determinants. The factors that determined EID is presented in Table 2.

Table 2: Maternal factors that determined early infant diagnosis at 6 weeks

Characteristic	EID at 6 weeks				
	No.	(%)	No.	(%)	Chi-square
Age (years)					
<20	22	16.3	14	13.6	$X^2=9.423$ $df = 3$ $p = 0.024$
21-30	82	60.7	47	45.6	
23-40	28	20.7	40	38.8	
<40	3	2.2	2	1.9	
Level of education					
Non-formal	5	3.7	6	5.8	$X^2=2.327$ $df = 3$ $p = 0.507$
Primary	96	71.1	74	71.8	
Secondary	25	18.4	20	19.4	
Tertiary	9	6.7	3	2.9	
Marital status					
Married	13	9.6	17	16.5	$X^2=5.819$ $df = 3$ $p = 0.121$
Single	97	71.1	64	62.1	
Separated/Di- vorced	24	17.1	18	17.5	
Widowed	1	0.7	4	3.9	
Monthly household income(Ksh)					
<2000	81	60.0	89	86.4	$X^2=21.589$ $df = 3$ $p = 0.000$
2001-5000	30	22.2	9	8.7	
5001-10,000	18	13.3	4	3.9	
>10,000	6	4.4	1	1.0	
Maternal PMTCT Knowledge					
Low	46	34.1	82	79.6	$X^2=52.981$ $df = 2$ $p = 0.000$
Average	76	56.3	20	19.4	
High	13	9.6	1	1	
Maternal PMTCT intervention during pregnancy					
ARV prophylaxis	58	56.0	34	26.2	$X^2=29.478$ $df = 2$ $p = 0.000$
ART	62	45.9	27	40.8	
No intervention	15	48.1	42		
Place of delivery					
Public health facility	65	48.1	21	20.4	$X^2=33.793$ $df = 2$ $p = 0.000$
at home	18	13.3	45	43.7	
Private facility	52	38.5	37	35.9	

Infant characteristics associated with EID uptake were age of infant ($p = 0.000$), immunization status ($p = 0.000$), ARV prophylaxis therapy ($p = 0.000$), and cotrimoxazole prophylaxis therapy ($p = 0.000$). Service delivery determinants of adherence to EID and treatment of HEI were belonging to a support group ($p = 0.000$). On logistic regression to determine variables that had a relationship with EID, the factors that showed statistical significance were delivery at a health facility ($p = 0.000$, OR 0.171, CI 0.065 - 0.451), receiving of psychosocial support ($p = 0.000$, OR 0.173, CI 0.075 - 0.398), high maternal knowledge on PMTCT ($p = 0.001$), and mothers on ARV therapy ($p = 0.017$, OR 0.284, CI 0.101- 0.795) and mothers on ARV prophylaxis ($p = 0.020$, OR 0.306173, CI 0.113- 0.830).

Determinants for initiation of ARV treatment: Factors associated with initiation of treatment were mainly health facility factors. Those who had delivered in public health facility were more likely to start treatment ($p = 0.005$). Membership to a support group was associated with early treatment initiation ($p = 0.000$). From the FGDs and KII, the factors that constrained adherence to EID included accessibility of the health facilities, long waiting times especially at the pharmacy, lack of training of staff on EID and ARV therapy, weak linkages and communications between children attending MNCH to CCCs for prophylaxis or ART or cotrimoxazole prophylaxis for HEI. On the other hand, reasons given for failure to initiate ARV therapy was mainly lack of time to take child to the CCC (54.8%), lack of information from health care providers (26.0%), and poor counseling offered by staff (11.9%). Denial of mothers to accept their own and subsequently infant's HIV status was also a common barrier to uptake.

Discussion

In Kenya 170,000 children were eligible to treatment by 2011, but only 21% accessed it [2]. Kenyan guidelines recommend EID at 6 weeks and immediate initiation of treatment within 2-4 weeks of diagnosis to minimize infant mortality [12]. The 56.7% of adherence observed in the current study, which is higher than the national average of 35% [14], is yet too low to make a significant impact in the reduction of HIV infant mortality rate. As regards PMTCT treatments instituted, 65.5% of the infants were on ARV prophylaxis, while 47.8% were on cotrimoxazole. Majority, 93.4% of respondents had attended at least one ANC clinic visit and 97% were tested during pregnancy and the rates were more or less similar to the national figures of ANC attendance of 92%, and that of HIV counseling and testing of 92% [6]. The improved EID uptake was attributed to successful integration of EID to routine Maternal Neonatal and Child Health (MNCH) activities. Similar findings were reported in an earlier report that compared service delivery in MNCH

and CCC settings in Kenya [15] and concluded that HEI were more adherent to follow-up if they attended MNCH rather than CCCs. Other reports observed that lack of integration of EID and HIV treatment services in MNCH setting was a great hindrance to adherence to EID [16]. Young maternal age was associated with poor EID uptake [17].

The site of study in the disadvantaged community area of Nairobi City was reported to have a large population of people with low levels of formal education or none at all [18]. However, low levels of formal education or no formal education did not significantly influence the uptake of infant early diagnosis ($P = 0.507$) in this study. At least 17.8% of respondents were separated or divorced, and these tended to have lower uptake. This site had much higher separation/divorce rates compared to the national separation/divorce rate among women of 6% [6]. Mother's monthly household income was found to be significantly associated with EID uptake. Improvement of household economic stability through income generating activities could improve EID uptake by eliminating competing priority interests.

Majority, 93.4% of respondents had attended at least one ANC clinic visit and 97% were tested during pregnancy but only 38.5% of women accomplished the number of visits recommended by WHO [4-6], in order to ensure improved PMTCT knowledge necessary to improve the EID [12]. Our data is more or less similar to the national estimates where pregnant women attendance of a single ANC was 92%, and that of HIV counseling and testing was 92% [6]. Regarding the timing of diagnosis of mother's HIV status, 39.9% had been diagnosed in the last 12-24 months, while 5.9% were diagnosed in the preceding 6 months. This meant that they were diagnosed after the index pregnancy, indicating missed opportunities to test pregnant women in perinatal period. Majority, 53.8% of respondents demonstrated low knowledge of PMTCT which could be the cause of none adherence to EID. Only 76.1% of women received a PMTCT intervention, probably due to delayed ANC attendance and low PMTCT knowledge. Some 77.3% of the respondents had heard about EID, 55.5% of whom had heard about it during pregnancy, from a health worker, which was below the national average of 82% [6].

The method of delivery of PMTCT could influence the assimilation of the pertinent knowledge to the mothers. Despite having undergone PMTCT intervention, other studies observed that most of the mothers had not heard about EID and only 18.9% respondents had knowledge of care of HEI [7]. Good maternal knowledge of EID, and initiation of PMTCT interventions in pregnancy were both predictors of early EID uptake in our study.

High delivery at public health facilities were reported in this study at 73.5% compared to national estimates of 44% [6]. This was attributed to Output Based Aid

(OBA), reproductive health vouchers that were available in this community through the provincial administration. Delivery in public health facility was associated with improved EID uptake. This could have been related to better staff familiarization with ARV guidelines. Moreover, being a member of support groups promoted adherence to EID, observations was also reported in an earlier report [19]. Two main themes on role of support groups emerged, mainly, the socio-emotional support received from other members and they also served to provide health education information for mothers of HEI.

Infants coming for the 6 week immunizations program were more likely to adhere to EID [15,20]. Majority, 43.3% of infants were aged between 6-9 months, the age group likely to be attending CWC. In the data on ARV, 66.4% of the children were initiated to ARV prophylaxis at birth, which compares to the national figure of 63% [14]. Various constraints expressed by the respondents as negative factors influencing EID uptake included inaccessibility of health services due to long distances, lack of transport fare and long waiting time at the clinic. This was in line with the previous report that ineffective linkages of MNCH and CCC clinics factored negatively on EID uptake [21] in which high attrition rates from PMTCT care, high MTCT rates, and late infant diagnosis were noted in cases of separate programs for maternal and infant HIV prevention and care services. However, our study focused on mother–infant pairs attending health care services and may not be a reflection of those who kept away from these services or declined testing.

Conclusions

The level of knowledge on PMTCT and in particular EID among the study population was low. The main determinants of EID were maternal age, average household income, maternal knowledge and practices on PMTCT and EID. The study identified poor referral systems and lack of integration of PMTCT and paediatric CCC as the main service delivery barriers. We recommend integration of PMTCT and paediatric HIV care and treatment services in the MNCH setting as well as establishment of effective linkages and referral mechanisms between PMTCT and treatment services.

Competing interests

The authors declare that they have no competing interests.

Acknowledgements

We are grateful to the Medical Officers in-charges of the two health facilities in which the study was conducted

(Kariobangi and Babadogo Health Centers) for their time and invaluable input during data collection.

References

1. UN joint program on HIV/AIDS (UNAIDS), (2011) - Global plan towards elimination of new HIV infections among children by the year 2015 and keeping their mothers alive, Geneva.
2. WHO /UNAIDS/ UNICEF (2011). Global HIV/AIDS Response: Epidemic update and health sector progress towards universal access 2011, Geneva.
3. UN joint program on HIV/AIDS (UNAIDS) (2011) - Global Report on the global AIDS Epidemic: 2010, Geneva.
4. National AIDS Control Council (NACC), (2010): United Nations General Assembly. Special session on HIV and AIDS (UNGASS) Country Report- Kenya.
5. National AIDS and STI control program (NASCO), (2011). Guidelines for antiretroviral therapy in Kenya, 4th edition, Nairobi.
6. National AIDS and STI control program (NASCO), (2011). National Health indicators for Kenya, Nairobi.
7. Kenya Demographic Health Survey (KDHS), (2008/9).
8. World Health Organization. Antiretroviral therapy for HIV infections in infants and children: Towards universal access: Recommendations for a Public health Approach, 2010 Revision, Geneva.
9. Marie-Louise N, Coovadia H, Cortina-Borsa M, Rollinset N. *et al.* Mortality of infected and uninfected infants born to HIV – infected mothers in Africa: A pooled analysis. *The Lancet.* 2004; **364** (9441):1236 -1243.
10. Pendergast A, Tudor- Williams G, Jeana P, Burchett S and Goulder P. International perspectives, progress, and future challenges of paediatric HIV infection. *Lancet.* 2007; **370**: 68- 80.
11. Violari AM, Mark FC, Gibb DM, Babiker AG, Steyn J, *et al.* Early antiretroviral therapy and mortality among HIV- infected infants. *New Eng J Med.* 2008; **359** (21): 2233- 2244.
12. World Health Organization. Antiretroviral therapy for treating pregnant women and preventing HIV infections in infants, Recommendations for a public health approach, 2010 version, Geneva. (WHO/ NASCO, 2011).
13. Ministry of Health (2010): Prevention of mother to child transmission and paediatric HIV care and treatment, Joint IATT technical review Mission Report, Nairobi.

14. National AIDS and STI control program (NASCO), (2012). Sentinel surveillance for HIV for HIV and syphilis among pregnant women, Nairobi.
15. Ongech JO, Heather JH, Kose J, Audo M *et al.* Provision of services and care for HIV- exposed infants: a comparison of maternal and child health clinic and HIV comprehensive care clinic models. *J Acq Immune Def Synd.* 2012; **61**(1): 83- 89.
16. Cherutich P, Inwani I, Nduati R and Mbori-Ngacha D. Optimizing paediatric HIV care in Kenya: challenges in early infant diagnosis. *Bull World Health org.* 2008; **86** (2): 155-160. PMID 18297171.
17. Amin SH, Sakwa EM, Nabwera HM, Taegtmeier MM, Kimutai RM, *et al.* Dynamics and constraints of early infant diagnosis of HIV in rural Kenya. *AIDS Behav.* 2012; **16**(1): 5-12.
18. African Population and Health Research Center (2008), Nairobi Urban Demographic Surveillance System (NUHDSS).
19. CDC/UNICEF report on paediatric HIV (2008).
20. Rollins N, Mzolo S, Moodley T, Esterhuizen T, and van Rooyen H. Universal HIV testing of infants at immunization clinics: an acceptable and feasible approach for early infant diagnosis in high HIV prevalence settings. *AIDS.* 2009; **23**(14): 1851- 1857.
21. Braun M, Kabue MM, McCollum ED, Ahmed S, Kim M, *et al.* Inadequate co-ordination of maternal and infant HIV services detrimentally affects early Infant diagnosis outcomes in Lilongwe, Malawi. *J Acq Immune Def Syndrome.* 2011; **56**(5):122-128.