

Provider-initiated HIV testing for paediatric inpatients and their caretakers is feasible and acceptable

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Summary

OBJECTIVES Early diagnosis of HIV-infected children remains a major challenge in Africa. Children who are hospitalised represent an opportunity for HIV diagnosis and appropriate treatment. We introduced HIV Counselling and Testing (HCT) for hospitalised children and their caretakers in Mulago teaching hospital in Uganda to assess its feasibility.

METHODS We analysed routine program data for children and caretakers who were tested between February 2005 and February 2008 to assess the proportion of children and caretakers who were HIV-infected. We also assessed the level of immune suppression (CD4 percentage) in a subset of HIV infected children tested between January 2007 and December 2007.

RESULTS Caretakers agreed to HIV testing for 8990 (92.8%) of the 9687 children who were offered HIV testing. Among the caretakers, 89.8% agreed to be tested. At the time of hospitalization, 41.3% of the caretakers had previously tested for HIV. Although 313 parents (mothers and fathers) reported that they had previously tested HIV positive, only 113 (36.3%) of these had tested their children prior to hospitalization. Overall HIV prevalence among caretakers was 16.7%. HIV prevalence among children was 12.4%, highest on the nutrition ward (30.8%). Of those children who underwent CD4 counts, 56.4% had a CD4 percentage of <20%.

CONCLUSION HCT for hospitalized children and their caretakers identified a significant number of HIV infected children and caretakers. More than half of the children had advanced HIV disease. More intensive efforts are needed to ensure earlier diagnosis and linkage to care for HIV infected children.

keywords provider initiated HIV testing and counselling (PITC), hospital, children, HIV prevalence, Africa

Introduction

The number of new HIV infections among children remains high at an estimated 2.7 million (UNAIDS 2009). The risk of HIV transmission from a HIV-positive mother to her child is reduced when the mother and child are given antiretroviral therapy, but only an estimated 33% of pregnant HIV-positive women in need receive such treatment in low- and middle-income countries (UNAIDS 2008; UNICEF 2008).

The link between PMTCT programs and post-natal care for HIV infected mothers and their exposed children in these settings also remains weak resulting in delays in diagnosis of HIV infected children (Mbori-Ngacha 2006). About half of HIV infected children in Africa die

before their second birthday if they are not treated (Newell *et al.* 2004; Brahmbhatt *et al.* 2006). The majority of the HIV infected children who die have never been diagnosed as HIV infected or present too late to the health care system, with advanced disease (Naidoo 2007). Clinical guidelines issued by WHO in 2008 recommend the immediate initiation of antiretroviral therapy for infants under one year of age diagnosed as infected with HIV (WHO 2008). To fulfil this recommendation, interventions to ensure diagnosis of HIV infection among infants will need to be expanded. The WHO guidelines for provider-initiated counselling and testing (PITC) are being implemented by several countries (MOH 2005; UAC 2008), but mainly focusing on adults.

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To conduct paediatric testing, a family testing and care approach is required for consent and to ensure that children receive adequate support and linkage to care if they are HIV infected. HIV testing for family members of paediatric patients would also identify HIV-infected household members and enhance access to HIV-related services by the entire family. The majority of hospital patients in Uganda receive supplemental supportive care from family members while hospitalized which provides an opportunity for their involvement.

We introduced HIV testing for hospitalized children and their caretakers in Mulago teaching hospital in Uganda in February 2005; within a hospital-wide PITC program. CD4 testing was done in a subset of HIV infected children who were tested between January 2007 and December 2007 to assess the feasibility of incorporating CD4 testing for children in the wards. We analysed program data for all children who were tested from February 2005 to February 2008, to assess the proportion of children who were HIV infected, and CD4 data for all children who had a CD4 count to assess ART eligibility at the time of diagnosis.

Methods**Setting**

This program took place in Mulago Hospital, the largest tertiary, public and university teaching hospital in Uganda. Mulago hospital serves about 115 000 inpatients (including 15 000 children) per year. The hospital has six paediatric units. The paediatric outpatient HIV clinic has been operational since 1998 and provides free care and treatment for children. Expanded HIV care services for children and adults in Uganda became available in 2004. However, lack of paediatric HIV testing was the major barrier to access to care for children. Before the implementation of the PITC program there was no HIV testing facility for hospitalized children and adults in the hospital (Wanyenze *et al.* 2006).

The PITC program

Provider initiated HIV testing and counselling in Mulago Hospital started with adult wards in 2004 and expanded to paediatric wards in 2005. By end of February 2008 four paediatric inpatient wards (including three general wards and one nutrition ward) were providing PITC to children and their caretakers. The commonest illnesses on the general paediatric wards include malaria, respiratory tract infections and diarrhoea). PITC was provided by regular hospital personnel, including nurses and doctors. An additional counsellor was hired to support the medical

team especially during very busy times (e.g. post-admission).

Provider initiated HIV testing and counselling for children and their caretakers

Children and their caretakers were routinely offered HIV testing using the opt-out (PITC) model. The providers talked to all caretakers of paediatric patients about HIV and the need for testing for caretakers as well as children. Both caretakers and children were tested concurrently to reduce intervention time and the likelihood of missed opportunities for HIV diagnosis among children (both HIV infected and exposed). PITC was offered to caretakers with unknown HIV status, using the opt-out approach. Caretakers who reported that they had tested HIV negative >3 months prior to the current hospital contact were also offered HCT, as per the national HCT guidelines for testing in the hospital setting (MOH Uganda 2005). All children were offered HIV testing irrespective of their status on admission into the ward because the few infants who had tested never had confirmatory testing with DNA PCR. For children younger than 12 years caretakers consented to the testing. For the children aged 12–18 years consent was provided by caretakers and assent by the children. In both circumstances, children were counselled to assess their level of maturity and determine how the testing, counselling and disclosure should happen.

HIV testing, disclosure of results and linkage to care

HIV testing was performed with rapid tests. The sequential rapid testing algorithm included Determine HIV 1/2 assay (Abbott Laboratories, Abbott Park, IL, USA) for screening, STAT-PAK HIV 1/2 DIPSTICK assay (Chembio Diagnostic Systems Inc.) for confirmatory testing and Uni-Gold (Trinity Biotech, Wicklow, Ireland) as the tie-breaker. Patients were classified as HIV-infected if both the Determine and STAT-PAK were positive, and uninfected if the Determine was negative. Discordant Determine and STAT-PAK samples were tested using Uni-Gold as the 'tie-breaker', and reported as positive if the Uni-Gold test was positive or as negative if both STAT-PAK and Uni-Gold were negative. HIV-seropositive children less than 18 months of age had their HIV status confirmed by DNA PCR. PCR tests were performed at the Makerere University-Johns Hopkins University Core laboratory, a specialized laboratory certified by the College of American Pathologists. DNR PCR results for children below 18 months of age were available within 1 week. The rapid tests were done by

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laboratory technicians in a side laboratory within the wards. Results with appropriate counselling were provided same day for caretakers, and children >18 months. For the majority of the children below 12 years of age, parents/caretakers were counselled and given results. Depending on the level of maturity of the child (usually for children above 6 years) the process of explaining about HIV infection and its diagnosis was initiated. HIV test results were also recorded in the inpatient files for use by the medical team. HIV care for infected children, including cotrimoxazole prophylaxis, was initiated on the wards. Most HIV-infected children were referred to the paediatric outpatient HIV clinic within Mulago hospital, with orientation to the clinic before discharge, to continue with disclosure counselling and treatment, including ART. Some children were referred to other clinics based on the preference of their parents. Children of HIV infected women who tested HIV negative but were still breastfeeding were also referred to the clinics for follow-up and repeat testing to ensure early diagnosis. HIV infected caretakers were also given cotrimoxazole for prophylaxis and were referred to outpatient HIV clinics for follow-up care and treatment.

Measurements and statistical analysis

Data including the age, gender, HIV status of children and their caretakers, HIV test acceptance rates, receipt of results and HIV test results, were routinely collected for program monitoring and evaluation. In addition, the CD4 counts and CD4 percentage were documented for children diagnosed with HIV between January 2007 and December 2007; 35% of the HIV infected children were discharged before CD4 testing. At the beginning of the program, we only documented the type of caretaker for each child but not the detailed demographic information and previous testing history of the caretakers; complete caretaker information was therefore available for 6877 caretakers who were seen after revision of the data collection tools. We analysed data for all the 9687 paediatric patients and their caretakers who were offered HCT in the four paediatric wards from February 2005 to February 2008. We assessed the proportion of children and caretakers with known/unknown HIV status, uptake of HIV testing, HIV sero-prevalence among children and their caretakers and distribution of CD4 percentage. The CD4 percentage for children diagnosed with HIV was categorized as <15%, 15–20% and >20%. We also conducted multivariate analyses to identify factors independently associated with HIV infection among caretakers. All the analysis was done using STATA version 10.

Results

The overall number of children seen in the wards between February 2005 and February 2008 was 10 906 and 9687 (88.8%) of these were offered HCT. Caretakers agreed to test 8990 (92.8%) of the children who were offered HCT. The majority of these children (8663, 96.0%) had never been previously tested for HIV. Overall HIV sero-prevalence among children was 12.4% but was very high (30.8%) on the nutrition ward (Table 1). The majority of the children who were diagnosed with HIV (97.4%) received one month's supply of cotrimoxazole for prophylaxis, before they were discharged from the hospital. The median age of the children tested was 1.5 years (IQR: 0.75–3.75) years.

Stage of HIV infection on diagnosis, among HIV infected children

Of the 323 children who tested HIV positive between January 2007 and December 2007, 208 (64.4%) underwent CD4 counts. All 208 were younger than 5 years; the median age was 2 years (IQR: 1.1–5.0). More than half of the children had %CD4 of <20%; 56.4% of the children had %CD4 < 20%; and 43.6% had %CD4 > 20%. The median CD4 count was 1036 (IQR 553–1581) among infants and 683 (IQR 371–1038) in the 1–5 years age group.

Table 1 Characteristics and HIV sero-prevalence of paediatric patients tested in Mulago Hospital (2005–2008)

Patient characteristics	No. of children tested (%) <i>n</i> = 8990	HIV positive tested <i>n</i> = 1113 (12.4%)
Sex		
Female	4186	526 (12.6%)
Male	4804	587 (12.2%)
Age		
<1 years	2888	443 (15.3%)
1–5 years	4737	548 (11.6%)
6–12 years	1260	117 (9.3%)
>12 years	105	5 (4.8%)
Ward		
General paediatric wards	8078	832 (10.3%)
Nutrition rehabilitation ward	912	281 (30.8%)
Previously tested for HIV		
Yes	327	57 (17.4%)
No	8663	1056 (12.2%)
Previous test results		
Positive	54	44 (81.3%)
Negative	273	13 (4.8%)

HIV status of caretakers on admission

All the 9687 children had a caretaker who was their mother (8263, 85.3%), father (574, 5.9%) or guardian/other caretaker (578, 6.0%). The caretaker category was not specified (missing) for 272 (2.8%) of the children. HIV status before hospitalization and other demographic information was available for 6877 caretakers who were

offered testing after revision of data collection tools. At the time of hospitalization, 2837 (41.3%) of the 6877 caretakers reported that they had previously tested for HIV and 318 (13.8%) reported that they were HIV infected (Table 2). While 43.5% of the mothers had previously tested for HIV, only 30.6% of other caretakers and 23.5% of the fathers had previously tested. Although 313 parents (mothers and fathers) reported that they had previously

Table 2 Characteristics and HIV sero-prevalence among caretakers of paediatric patients tested in Mulago Hospital (2005–2008)

Caretaker characteristics	Offered HIV test <i>n</i> = 6877	Accepted and tested <i>n</i> = 6178 (89.8%)	HIV positive <i>n</i> = 1027 (16.6%)
Category of caretaker			
Mother	5647 (82.1%)	5055 (89.5%)	914 (18.1%)
Father	651 (9.5%)	605 (92.9%)	68 (11.2%)
Guardian/other caretaker	579 (8.4%)	518 (89.5%)	45 (8.7%)
Sex			
Female	6134 (89.2%)	5488 (89.5%)	955 (17.4%)
Male	743 (10.8%)	690 (92.9%)	72 (10.4%)
Age**			
15–17	148 (2.2%)	141 (95.3%)	10 (7.1%)
18–20	1158 (16.8%)	1069 (92.3%)	144 (13.5%)
21–30	3847 (55.9%)	3436 (89.3%)	617 (18.0%)
31–40	1272 (18.5%)	1113 (87.5%)	216 (19.4)
41+	376 (5.5%)	343 (91.2%)	32 (9.3%)
Religion			
Christian	5200 (75.6%)	4611 (89.6%)	788 (16.9%)
Moslem	1669 (24.3%)	1509 (90.4%)	241 (15.9%)
Seventh Day Adventists	08 (0.1%)	07 (87.5%)	0 (0%)
Marital status			
Never married	583 (8.5%)	531 (91.1%)	88 (16.6%)
Married/cohabiting	5602 (81.5%)	5040 (90.0%)	758 (15.0%)
Separated/divorced	548 (7.9%)	494 (90.2%)	148 (30.0%)
Widowed	144 (2.1%)	113 (78.5%)	33 (29.2%)
Education			
None	715 (10.4%)	657 (91.9%)	116 (17.7%)
Primary	3462 (50.3%)	3106 (89.7%)	562 (18.1%)
Secondary	2428 (35.3%)	2181 (89.8%)	317 (14.5%)
Tertiary	272 (4.0%)	234 (86.0%)	32 (13.7%)
Previously tested for HIV			
Yes	2837 (41.3%)	2309 (81.4%)	318 (13.8%)
No	4040 (58.7%)	3869 (95.8%)	709 (18.3%)
Result of last test			
Negative	2425 (85.5%)	2129 (87.8%)	147 (6.9%)
Positive†	411 (14.5%)	179 (43.5%)	170 (95.0%)
Partner HIV status‡			
Positive	222 (3.7%)	132 (59.5%)	102 (77.3%)
Negative	1120 (18.7%)	988 (88.2%)	67 (6.8%)
Unknown	4636 (77.6%)	4264 (91.9%)	675 (15.8%)
Most recent partner type			
Spouse	5449 (91.2%)	4882 (89.6%)	736 (15.1%)
Steady	309 (5.2%)	296 (95.8%)	57 (19.3%)
Casual	220 (3.5%)	206 (93.6%)	51 (24.8%)

**Missing data (72).

†Some HIV infected caretakers only declared that they had previously tested HIV positive during the post-test counselling.

‡Some caretakers had no sexual partners.

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tested HIV positive, only 113 (36.3%) of these had tested their children prior to hospitalization.

HIV testing for caregivers during hospitalization

Out of 6877 caretakers who were offered testing, 6178 (89.8%) accepted and they were tested. While 5985 (87.0%) agreed to HIV testing for both the children and themselves, 403 (5.9%), declined to be tested but agreed that the children be tested, and 193 (2.8%) wanted to be tested but not to have their children tested. Only 296 (4.3%) declined testing for both the children and themselves.

The majority of children (99.1%) and caretakers (99.2%) tested received their results; results for children were disclosed to the caretakers, and for a few to the children depending on the level of understanding and preparedness. Overall HIV sero-prevalence among caretakers was 16.6%, highest among the mothers (Table 2). About half of the HIV-infected mothers (53.2%) also had HIV-infected children. 23 children were HIV infected while their fathers were uninfected. Similarly, 39 children were HIV infected while their guardians/other caretakers were uninfected.

Predictors of HIV positive status among caretakers

In bivariate analysis, women were more likely to be infected than men, OR 1.7 (1.3–2.3) while caretakers in the 21–30 age group had the highest risk of infection, OR 2.1 (1.1–4.3). Caretakers who were divorced or widowed were twice as likely to be HIV infected compared with those who had never married; OR 2.0 (1.5–2.8) and OR 2.1 (1.3–3.2), respectively. Caretakers who reported that their sexual partners were known HIV positive had a very high risk, OR 46 (25–85). Those who did not know the HIV status of their sexual partners also had a higher risk of infection than those with negative partners, OR 2.7 (2.1–3.5). There was no significant association between HIV sero-prevalence and type of caretaker, education level and religion. In multivariate analysis high risk of HIV infection was associated with age group (21–30 and 31–40), being a mother, widowed, never testing for HIV, having a partner who is HIV infected or of unknown HIV status (Table 3).

Discussion

Program experience in a large national referral hospital in East Africa suggests that PITC for hospitalized children is feasible and acceptable. In our program, 89.8% of caretakers accepted testing and 92.8% of children were

tested. Other studies in Uganda and elsewhere in Africa have reported similarly high uptake rates of HCT when offered within health facilities and homes (Were *et al.* 2006; Nakanjako *et al.* 2007; Helleringer *et al.* 2009). A large proportion of children (91.2%) were nursed by a biological parent with the majority being nursed by mothers, which made it easier to get consent and to disclose results. However children identified using this approach have advanced HIV disease; more than half of the children were eligible for ART according to the Ugandan ART guidelines which recommend treatment of all infants <12 months irrespective of the %CD4 while children 1–5 years should be treated if they have %CD4 < 20 (MOH 2009). PITC for ill children is useful to diagnose and treat HIV infected children even when it is late. However, to reduce mortality among HIV infected children, it is important to institute measures to ensure earlier diagnosis and linkage to HIV care. For example, HIV testing could be integrated into the well-child health services like immunization and growth monitoring so that HIV infected children are diagnosed and linked to care before they become ill. In a study in South Africa infants aged 6, 10 and 14 weeks attending the immunisation clinics were offered opt-out HIV tests by the counsellors

Table 3 Factors associated with HIV infection among caretakers of paediatric patients tested in Mulago Hospital (2005–2008)

Demographic†	Adjusted OR (CI)	P-value‡
Age		
15–20	1.00 (ref)	–
21–30	1.51 (1.21, 1.90)	<0.0001*
31–40	1.76 (1.34, 2.31)	<0.0001*
41+	0.83 (0.50, 1.36)	0.45
Type of care taker		
Other caretaker	1.00 (ref)	
Father	1.63 (0.35, 7.56)	0.53
Mother	1.95 (1.23, 3.08)	0.004*
Marital status		
Never married	1.00 (ref)	–
Married/ cohabiting	1.55 (0.86, 2.80)	0.14
Separated/ divorced	0.85 (0.49, 1.47)	0.57
Widowed	2.67 (1.05, 6.77)	0.04*
Previously tested		
Yes	1.00 (ref)	
No	1.56 (1.30, 1.87)	<0.0001*
Partner status		
HIV–	1.00 (ref)	–
HIV+	43.50 (27.03, 71.43)	<0.0001*
Unknown	19.05 (12.34, 30.30)	<0.0001*

*Statistically significant variables ($P < 0.05$).

†The multivariate model also included education, religion, sex and partner type.

‡Multivariate analysis of maximum likelihood.

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and 90% of the mothers consented to their babies being tested (Rollins *et al.* 2009).

These findings also show that providing HIV testing using the family approach is feasible and acceptable even within the PITC hospital context. PITC was effective in diagnosis of HIV infection among caregivers. This is important in terms of getting the HIV infected caregivers into HIV care early and also in terms of improving support for HIV exposed and infected children. A big proportion of the caretakers who had sexual partners (77.6%) did not know the HIV status of their sexual partners and the findings show an increased risk of HIV infection among those who did not know their partners' HIV status. This highlights the continued need for couples HIV testing strategies.

Gaps in HCT policy guidelines for children have been reported in many countries. A policy review of 20 high-prevalence countries revealed that while 84% identified children as a specific subgroup affected by HIV, only 35% of national policies offered details on HIV testing and counselling and children. The study identified gaps in consent, counselling, discrimination/stigma/child rights, diagnosis/laboratory, access and policy (Wong *et al.* 2006). Other studies have identified gaps in laboratory infrastructure and systems for HIV diagnosis among infants (Cherutich *et al.* 2008). These gaps in policies, systems and infrastructure need to be addressed in order to scale up early diagnosis and linkage to HIV care among infected infants.

This evaluation used program data with a limited number of variables which did not include clinical diagnosis or staging of HIV infection, and maintained access to care and treatment after enrollment into the HIV clinics. However, the findings clearly demonstrate that paediatric PITC is feasible and helps to identify many previously undiagnosed HIV-infected children who are at high risk for mortality.

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