Provision of Services and Care for HIV-Exposed Infants: A comparison of Maternal and Child Health (MCH) Clinic and HIV Comprehensive Care Clinic (CCC) models

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BACKGROUND

- Over 90% of pediatric HIV infections, acquired through mother-to-child transmission, are in sub-Saharan Africa.
- Prevention of Mother-to-Child transmission of HIV programs require follow-up of HIV exposed infants (HEI) for infant feeding support, prophylactic medicines, and HIV diagnosis for at least 18 months.
- Retention in care and receipt of HIV services are challenging in resource limited settings.
- Two different models for offering services and care for HIV exposed infants include:
  - Maternal and Child Health Clinic model: Infants receive immunizations, growth monitoring as well as HIV-related services including early infant diagnosis by polymerase chain reaction (PCR), initiation on cotrimoxazole (CTX), and infant HIV antibody test at one year of age in the MCH.
  - Comprehensive Care Clinic model: HIV-exposed infants receive routine immunizations and growth monitoring in the MCH and are referred to the CCC to receive all HIV-related services.
- This study compared infant follow-up results when HEI services were provided in MCH clinics or in specialized HIV CCC (located within the same facility as the MCH clinic) in Western Kenya.

METHODS

- This observational, prospective cohort study enrolled 363 HIV exposed infants at 6-8 weeks of age in two purposively selected hospitals in Western Province, Kenya in 2009 with similar characteristics but different models of service delivery.
  - MCH model: Vihiga District Hospital (n=179)
  - CCC model: Bungoma District Hospital (n=184)
- Data were collected at the 6-8 week immunization visit and 14-week, 6-month, 9-month, and 12-month follow-up visits.
- Pearson chi-square tests were used to test for significant associations between model of service and each of the socio-demographic characteristics.
- Poisson regression with robust error variance estimation was used to examine the relationship between total number of study follow-up visits per infant and model of service adjusting for significant covariates.
- Generalized estimating equations (GEE) for binary data were used to test for significant differences in attendance at each follow-up visit between the models of service.
- Poisson regression with robust error variance estimation was used to test for significant differences in rates of uptake of services between the models of service adjusting for significant covariates.
- All statistical analyses were generated using SAS/STAT software, Version 9.1 of the SAS System for Windows (SAS Institute Inc., Cary, NC, USA)

RESULTS

TABLE 1. Comparison of Infant and Caregiver Demographic Characteristics and Average Number of Study Visits to a Health Facility in a 12-month Follow-up Period

Characteristics	Model of Service Delivery		P-value[2]	Unadjusted Mean # Visits (95% CI)[3]	P-value[4]
	MCH (N=179) n (%) or median (IQR)	CCC (N=184) n (%) or median (IQR)			
Service					
MCH	179 (100)	-----	-----	3.01 (2.83, 3.21)	
CCC	-----	184 (100)	-----	2.18 (2.00, 2.37)	**<0.0001**
Caregiver age	27 (24, 31)	28 (23, 31)	0.39	-----	0.99
Caregiver level of education[1]					
Less than secondary	113 (63.1)	113 (61.4)		2.69 (2.53, 2.87)	
Secondary +	62 (34.6)	66 (35.9)	0.78	2.44 (2.20, 2.70)	0.10
Caregiver marital status					
Married	138 (77.1)	157 (85.3)		2.54 (2.39, 2.69)	
Not married	41 (22.9)	27 (14.7)	**0.04**	2.81 (2.48, 3.18)	0.15
Maternal parity[1]					
1	55 (30.7)	36 (19.6)		2.56 (2.29, 2.86)	
2-4	112 (62.6)	120 (65.2)		2.58 (2.42, 2.76)	
5+	12 (6.7)	27 (14.7)	**< 0.01**	2.72 (2.33, 3.17)	0.81
Caregiver employment status[1]					
Employed	85 (47.5)	128 (69.6)		2.38 (2.20, 2.56)	
Not employed	94 (52.5)	54 (29.3)	**< 0.01**	2.91 (2.71, 3.12)	**0.0002**
Caregiver counseled and tested for HIV during most recent pregnancy[1]					
Yes	172 (96.1)	177 (96.2)		2.62 (2.48, 2.76)	
No	4 (2.2)	4 (2.2)	0.97	2.25 (1.36, 3.73)	0.56
Infant place of delivery[1]					
In a health facility	95 (53.1)	83 (45.1)		2.66 (2.46, 2.88)	
At home	82 (45.8)	93 (50.5)	0.22	2.54 (2.36, 2.74)	0.40
Mother WHO staging[1]					
I	130 (72.6)	109 (59.2)		2.69 (2.53, 2.86)	
II	32 (17.9)	43 (23.4)		2.40 (2.10, 2.74)	
III	13 (7.3)	28 (15.2)	**0.01**	2.49 (2.11, 2.94)	0.25
Mother currently on CTX[1]					
Yes	145 (81.0)	179 (97.3)		2.58 (2.44, 2.73)	
No	31 (17.3)	5 (2.7)	**< 0.01**	2.69 (2.26, 3.21)	0.65
Mother currently on ARVs[1]					
Yes	42 (23.5)	71 (38.6)		2.68 (2.45, 2.93)	
No	134 (74.9)	110 (59.8)	**< 0.01**	2.56 (2.39, 2.73)	0.41
Infant gender					
Male	89 (49.7)	84 (45.6)		2.65 (2.46, 2.85)	
Female	90 (50.3)	100 (54.4)	0.44	2.54 (2.35, 2.74)	0.43

[1] Percentages do not add to 100 due to missing values.
[2] Generated from Pearson chi-square and Fisher's exact tests.
[3] Estimated from unadjusted Poisson regression models with robust variance estimation.
[4] Generated from unadjusted Poisson regression models with robust variance estimation.

TABLE 1:

- Model of service delivery and employment status were significant predictors in adjusted model.
- Average number of study follow-up visits for infants in MCH model was 1.30 (95% CI: 1.16, 1.46) times number of study follow-up visits for infants in CCC model after adjusting for employment status.
- Average number of follow-up visits for infants with unemployed caregivers was 1.16 (95% CI: 1.04, 1.30) times number of follow-up visits for infants with employed caregivers after adjusting for model of service.

FIGURE 1:

- Compared to infants receiving HIV-related services in the CCC model, the infants enrolled in the MCH model of care are:
  - 1.14 (95% CI; 1.04, 1.26) times more likely to attend 14-week immunization visit
  - 1.42 (95% CI; 1.23, 1.65) times more likely to attend 6-month postnatal follow-up visit
  - 1.95 (95% CI; 1.57, 2.42) times more likely to attend the 9-month postnatal follow-up
  - 1.29 (95% CI; 1.07, 1.56) times more likely to attend 12-month postnatal follow-up visit

FIGURE 2:

- Infants in the MCH are 2.24 (95% CI; 1.57, 3.18) times more likely to attend all four follow-up visits than those in CCC, after controlling for covariates in Table 1.

TABLE 2:

- Infants in the MCH model were significantly more likely than infants in the CCC model to receive:
  - oral polio vaccine at 14 weeks
  - CTX at 6 months
  - measles vaccine at 9 months
  - an HIV antibody test at 12 months

FIGURE 1. Frequency distribution—n (%)—of HIV-exposed infants at enrollment and at each of the study follow-up visits.

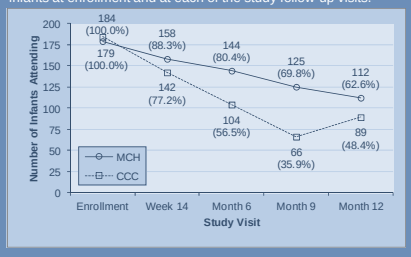

FIGURE 2. Frequency distribution—n (%)—of the total number of study follow-up visits attended by HIV-exposed infants.

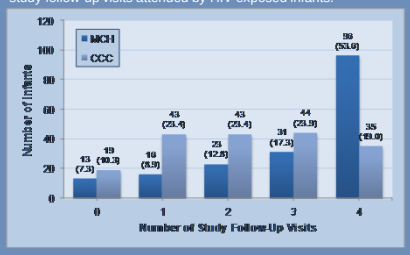

TABLE 2. Comparison of Unadjusted Rates of Service Uptake by Infants in the MCH and CCC Models of Service

	MCH N (%)		CCC N (%)			
Outcome Variable	Yes	No	Yes	No	Ratio (95% CI)[1]	P-value[2]
PCR at 6-8 weeks	177 (98.9)	1 (0.56)	182 (98.9)	0 (0)	0.99 (0.98, 1.01)	0.49
CTX initiation at 6-8 weeks	179 (100)	0 (0)	180 (97.8)	2 (1.09)	1.01 (0.99, 1.03)	0.50
DPT vaccine at 14 weeks	62 (34.6)	117 (65.4)	73 (39.7)	111 (60.3)	0.87 (0.67, 1.14)	0.32
Oral polio vaccine at 14 weeks	147 (82.1)	32 (17.9)	121 (65.8)	63 (34.2)	1.25 (1.10, 1.41)	**0.0004**
CTX at 6 months	135 (75.4)	44 (24.6)	103 (56.0)	81 (44.0)	1.35 (1.16, 1.57)	**<0.0001**
Measles vaccine at 9 months	123 (68.7)	56 (31.3)	63 (34.2)	121 (65.8)	2.01 (1.61, 2.51)	**<0.0001**
HIV antibody test at 12 months	109 (60.9)	70 (39.1)	84 (45.7)	100 (54.3)	1.33 (1.10, 1.62)	**0.0036**

[1] Estimated from Poisson regression models with robust variance estimation, these probability ratios (95% CI) are calculated as the probability that infants in the MCH model receive the service divided by the probability that the infants in the CCC model receive the service.
[2] Generated from unadjusted Poisson regression models with robust variance estimation.

CONCLUSIONS

- HIV services integrated in the MCH model yield better follow-up of HIV-exposed infants than the CCC model

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