Predictors of early childhood HIV testing among children of sex workers living with HIV in Cameroon

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Abstract

_ _ · _: Despite recent progress, there exist gaps in the prevention of vertical HIV transmission program access and uptake in Cameroon. Female sex workers (FSW), many of whom are mothers, are disproportionately affected by HIV and have specific barriers to HIV testing and treatment access. Testing for HIV-exposed infants is crucial in monitoring for incident infection and timely intervention. This study explores the level of early childhood testing and also associations between antenatal care (ANC) attendance and other factors and early childhood HIV testing among FSW in Cameroon.

`_ _: FSW were recruited to participate in an integrated biobehavioral survey in Cameroon between December 2015 and October 2016. Women were included in these analyses if they were living with HIV and had at least one living child. Both univariate and multivariable logistic regression were used to look at predictors of a child being tested for HIV before age five.

_ · _: A total of 481/2255 FSW were eligible for these analyses as they were HIV seropositive and had at least one living child at the time of the study. Women included in these analyses had a median age of 35(IQR 30–41). Nearly 70% reported none of their children had been tested for HIV before age five (326/481), and 3.5%(17/481) reported one or

Background

There are an estimated 35,000 incident HIV infections each year in Cameroon [1

demographics, sexual and reproductive health history, human rights abuses, and utilization of HIV prevention and treatment services. Blood draws and HIV testing were conducted according to national procedures. For HIV testing, all women were given a first-line rapid test: Alere Determine™ HIV-1/2 Ag/Ab Combo Rapid Test Kit. If nonreactive, the test result for that participant was recorded as HIV-negative. If reactive, a second rapid test, OraSure OraQuick® HIV- 1/2 was administered. If reactive for the OraQuick HIV- 1/2 test, the test result for that participant was recorded as HIV- positive. If nonreactive test result for the participant was recorded as HIV-negative. Pretest and posttest counseling was provided per national guidelines. Those testing positive for HIV were referred to treatment and care facilities for further management.

The primary outcome examined in these analyses was the proportion of a woman's children tested for HIV before the age of five. The proportion of children tested was calculated by taking the number of children who were tested for HIV before age five ["How many of your children were tested for HIV before they were 5 years old?"] and dividing it by the total number of living children a woman reported having ["How many of your biological children are currently living?"]. Both questions were answered via self-report.

The main independent variable of interest was ANC attendance during a woman's last pregnancy, defined as "yes, attended" or "no, did not attend." Women were asked "The last time that you were pregnant, did you go to the clinic for antenatal care during your pregnancy? This is care that you receive from health care providers during your pregnancy to ensure that you and your baby are well, and to promote a healthy pregnancy." Other covariates of interest included site of recruitment, age, highest level of education completed, income, years selling sex, future pregnancy intentions, parity, network size, and awareness of HIV status, all of which, other than site of recruitment, were collected via self-report. Future pregnancy intentions were dichotomized and women were asked "Do you plan to or hope to have more children in the future?" To get at network size, women were asked "how many female sex workers have you met in the past week?"

Among FSW living with HIV and who had at least one living child, characteristics were compared by recruitment site using Fisher's exact tests. Logistic regression was used to examine the associations between ANC

attendance and other predictors and the odds of a child having been tested for HIV before the age of five. Both crude and adjusted associations were examined. Covariate predictors were selected for inclusion in the final multivariable model based on a consideration of both statistically significant associations with the outcome in univariate models (< 0.10) and a priori hypothesized relationships. As all variables had less than 1% missing data, complete case analysis was utilized.

The association between ANC attendance and the odds of a child having been tested for HIV before the age of five was also examined among a restricted sample of women who had children 5 years old or younger at the time of the study. By restricting to women with children under five, a more proximal measure of risk was assessed given that testing guidelines are rapidly evolving and children born within the past 5 years may reflect current child testing trends.

Results

Of the 2255 FSW recruited to participate in the primary study, 1889 (84%), were mothers, and about 24% [95% CI: 23, 26%] were living with HIV (547/2255). Of the 2255 women recruited for the primary study, 1708 were excluded from these analyses as they were not living with HIV. An additional 66 women living with HIV were excluded as they were not mothers. Among the 481 FSW included in these analyses, 84% attended ANC during their last pregnancy (406/481), and 52% had knowledge of their HIV seropositive status (251/481). Women had a median a two children (IQR: 1–3). Nearly 70% of women reported none of their children had been tested for HIV before age five (326/481), and 17 (3.5%) reported at least one of their children were previously diagnosed with HIV.

Characteristics of study participants by site of recruitment are described (Table 1). There was a relatively equal distribution of women across sites, with about one quarter of included women having been recruited from Yaoundé. Women recruited from Douala were significantly less likely to have attended ANC during their

Rao *et al. BMC Public Health* 2019, 19(Suppl 1):602

Page 4 of 8

Table 1 Characteristics of female sex workers living with HIV by site of recruitment in Cameroon, 2015–2016 (n = 481)

	Overall n = 481	Yaoundé n = 120	Douala n = 122	Bertoua n = 61	Bamenda n = 101	Kribi n = 77	p-value
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
ANC attendance at last pregnancy							**< 0.001**
No, did not attend	75 (15.6%)	20 (16.7%)	35 (28.7%)	4 (6.6%)	3 (3.0%)	13 (16.9%)	
Attended	406 (84.4%)	100 (83.3%)	87 (71.3%)	57 (93.4%)	98 (97.0%)	64 (83.1%)	
Age, years							
18–24	43 (8.9%)	6 (5.0%)	6 (4.9%)	15 (24.6%)	6 (5.9%)	10 (13.0%)	**< 0.001**
25–34	182 (37.9%)	46 (38.3%)	39 (32.0%)	28 (45.9%)	29 (28.7%)	40 (52.0%)	
35+	256 (53.2%)	68 (56.7%)	77 (63.1%)	18 (29.5%)	66 (65.4%)	27 (35.0%)	
Education completed[a]							
Primary or less	217 (45.2%)	38 (31.7%)	60 (49.2%)	22 (36.7%)	68 (67.3%)	29 (37.7%)	**< 0.001**
Some secondary	237 (49.4%)	74 (61.7%)	57 (46.7%)	36 (60.0%)	25 (24.8%)	25 (58.4%)	
Secondary or more	26 (5.4%)	8 (6.6%)	5 (4.1%)	2 (3.3%)	8 (7.9%)	3 (3.9%)	
Monthly income							
≤ 100,000 XAF	329 (68.4%)	87 (72.5%)	47 (38.5%)	39 (63.9%)	99 (98.0%)	57 (74.0%)	**< 0.001**
> 100,000 XAF	152 (31.6%)	33 (27.5%)	75 (61.5%)	22 (36.1%)	2 (2.0%)	20 (26.0%)	
Years selling sex							
0–2 years	109 (22.7%)	24 (20.0%)	24 (19.6%)	21 (34.4%)	10 (9.9%)	30 (39.0%)	**< 0.001**
3–9 years	228 (47.4%)	60 (50.0%)	70 (57.4%)	20 (47.5%)	35 (34.7%)	34 (44.1%)	
10+ years	144 (29.9%)	36 (30.0%)	28 (23.0%)	11 (18.0%)	56 (55.4%)	13 (16.9%)	
Awareness of HIV status							
No awareness of status	230 (47.8%)	56 (46.7%)	49 (40.2%)	36 (59.0%)	34 (33.7%)	55 (71.4%)	**< 0.001**
Aware of status	251 (52.2%)	64 (53.3%)	73 (59.8%)	25 (41.0%)	67 (66.3%)	22 (28.6%)	
Number of living children							
One	132 (27.4%)	28 (23.3%)	43 (35.3%)	13 (21.3%)	21 (20.8%)	27 (35.0%)	**0.02**
Two	145 (30.2%)	47 (39.2%)	28 (23.0%)	19 (31.2%)	27 (26.7%)	24 (31.2%)	
More than two	204 (42.4%)	45 (37.5%)	51 (41.7%)	29 (47.5%)	53 (52.5%)	26 (33.8%)	
Future pregnancy intentions							
None	267 (55.5%)	55 (45.8%)	81 (66.4%)	36 (59.0%)	68 (67.3%)	27 (35.1%)	**< 0.001**
Want more children	214 (44.5%)	65 (54.2%)	41 (33.6%)	25 (41.0%)	33 (32.7%)	50 (64.9%)	
Network size[b]							
Mean	13.4	14.4	20.3	13.8	9.7	5.3	**< 0.001**
Standard deviation	22.3	25.5	29.7	19.8	12.5	6.3	

[a]Data missing on education (n = 1). Bolded results represent results that are statistically significant at least at the p < 0.05 level
[b]Significant differences calculated using Bartlett's test for equal variances. To get at network size, women were asked "how many female sex workers have you met in the past week?"

from Bamenda (< 0.001). Women reported having sold sex for a median of 5 years (IQR: 3–10). About 20% of women did not report any form of contraception other than condoms (84/481), with those attending ANC being more likely to be using long-acting reversible contraceptives than those not attending (< 0.01). The median age of a woman's youngest child was 8 years (IQR: 4–13).

Antenatal care attendance was associated with an increased odds of a child being tested for HIV before age 5 compared to not having attended (OR: 4.40, 95% CI 2.01, 9.61) (Table 2). Having been recruited from Douala (OR: 0.18, 95% CI 0.09, 0.34) or Kribi (OR: 0.45, 95% CI 0.24, 0.84) was associated with a decreased odds of HIV child testing before the age of five, while having been

Rao *et al. BMC Public Health* 2019, 19(Suppl 1):602

Page 5 of 8

Table 2 Crude and adjusted odds ratios of living children being tested for HIV before the age of five among female sex workers living with HIV in Cameroon, 2015–2016 (n = 477)[a]

	Odds Ratio [95% CI]	Adjusted Odds Ratio [95% CI]
Site of recruitment		
Yaoundé	REF	REF
Douala	**0.18 0.09, 0.34 ***	**0.20 0.10, 0.41 ***
Bertoua	1.17 [0.66, 2.05]	1.02 [0.50, 2.06]
Bamenda	**4.20 2.69, 6.53 ***	**2.34 1.30, 4.22 **
Kribi	**0.45 0.24, 0.84 ***	**0.46 0.22, 0.98 ***
Antenatal care attendance		
Did not attend	REF	REF
Attended during last pregnancy	**4.40 2.01, 9.61 ***	**2.12 1.02, 4.55 ***
Age		
18–24	REF	REF
25–34	1.13 [0.76, 1.67]	0.71 [0.31, 1.61]
35+	0.79 [0.54, 1.16]	0.56 [0.24, 1.30]
Education		
Primary or less	REF	REF
Some secondary	0.75 [0.51, 1.10]	0.92 [0.57, 1.49]
Secondary or more	**2.98 1.42, 6.25 ***	**2.17 1.01. 4.71 ***
Years selling sex		
0–2 years	REF	
3–9 years	0.90 [0.61, 1.33]	
10+ years	1.34 [0.89, 2.03]	
Pregnancy Intentions		
No future intentions	REF	REF
Has future intentions	**1.52 1.03, 2.24 ***	**1.89 1.16, 3.08 ***
Number of living children		
One	REF	
Two	0.84 [0.55, 1.29]	
More than two	1.09 [0.74, 1.60]	
Awareness of HIV status		
No awareness	REF	REF
Aware of HIV status	**3.20 2.91, 4.90 ***	**3.70 2.30, 5.93 ***
Network size	0.99 [0.97, 1.01]	

Odds ratios were estimated using logistic regression. [a]Five women were excluded from analysis due to missing data on proportion of children tested before age five (*n* = 4) or highest level of education (*n* = 1). *Statistically significant at *p* < 0.05; **p* < 0.01; ***p* < 0.001. Bolded results represent results that are statistically significant at least at the *p* < 0.05 level

recruited from Bamenda (OR: 4.20, 95% CI 2.69, 6.53) was associated with an increased odds of HIV child testing all when compared with those recruited from Yaoundé. Completion of secondary or higher education compared to primary or less (OR: 2.98, 95% CI 1.42, 6.25), future pregnancy intentions compared to no future intentions (OR: 1.52, 95% CI 1.03, 2.24, and awareness of HIV status compared to no awareness (OR: 3.20, 95% CI 2.91, 4.90) were all significantly associated with increased odds of having a child tested for HIV before the age of five in univariate models. In the multivariable model including site of recruitment, ANC attendance at last pregnancy, age, education level, pregnancy intentions, and awareness of HIV status, variables remaining statistically significantly associated with a higher odds of early childhood testing included site of recruitment, ANC attendance, future pregnancy intentions, awareness of HIV status, and higher education.

Having been recruited from Bamenda remained significantly associated with higher odds, while having been recruited from Douala and Kribi remained significantly associated with lower odds compared to having been recruited from Yaoundé.

In the planned sensitivity analyses restricted to the sub-sample of women with at least one child ≤

were interrupted and connections needed to understand network ties and apply adjustments were not made. Women were asked about ANC attendance during their last pregnancy and little can be said about whether or not a woman attended ANC at each of her other pregnancies and how this relates to the health outcomes of any specific child. Despite this limitation, ANC attendance during the most recent pregnancy speaks to a woman's engagement in care during pregnancy, a critical period for prevention of vertical transmission. Additionally, the primary analyses do not consider era-effects of changing testing guidelines. We did, however, attempt to understand these era-effects by restricting the sample to women who had children in the last 5 years in sensitivity analyses, and no appreciable differences were seen when looking at the primary relationships of interest. Furthermore, given the structure of the questions, we were not able to ascertain the testing status of deceased children and to what extent mortality may have been related to HIV.

Conclusions

The high overall prevalence of maternal HIV and low awareness of HIV status in this group of FSW highlight the need to consider different strategies to strengthen current PMTCT intervention strategies. Taking into consideration that many FSW are mothers and promoting the health of the mother through early engagement in testing and care for herself and her children may improve maternal and child health outcomes. It will be important to integrate child-specific services, including HIV testing during early childhood, into existing FSW services, and site-specific differences should be considered in choosing appropriate interventions for the given context. Given the barriers to care, accommodating hard-to-reach women in national PMTCT programs, including sensitization and stigma mitigation of health care workers to sex work, promotion of both ANC attendance and HIV testing among FSW, and active referrals from community-based organizations working with FSW to ANC, may help reduce gaps in PMTCT access and uptake. Leveraging existing outreach workers and case managers from community-based organizations may help facilitate better linkage to care at community health centers. ANC services for at-risk women can be bolstered with intensified HIV testing services and information on prevention of vertical transmission to improve health outcomes for both mother and child.

A French translation of this article has been included as Additional file 1.

A Portuguese translation of the abstract has been included as Additional file 2.

Additional files

interpretation of the results. SB provided valuable feedback on the content and structure of the manuscript and guidance in the development of the statistical models and in the framing of the main research question. All authors read and approved the final manuscript.

All study participants completed written informed consent in either English or French prior to enrolling in the study. Ethical approval for the study was obtained from the National Research Ethics Committee in Cameroon, along with the Johns Hopkins School of Public Health Institutional Review Board.

Not applicable.

The authors declare that they have no competing interests.

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