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SHORT COMMUNICATION

Recent HIV Type 1 Infection Among Participants in a Same-Day Mobile Testing Pilot Study in Zimbabwe

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Abstract

We estimated HIV-1 incidence and characterized risk factors associated with recent infection among participants of a mobile HIV voluntary counseling and testing (VCT) pilot program in two communities in Zimbabwe ($N = 1096$). HIV-1 infection was diagnosed using a parallel rapid testing algorithm. Recent HIV-1 infections were characterized using the BED immunoglobulin G capture enzyme immunoassay (BED-CEIA). HIV prevalence was 28.9% overall and nearly twice as high in women compared to men (39.5% vs. 21.4%, $p < 0.001$). HIV-1 incidence was 1.91% and was comparable between men and women (1.99% vs.1.88%; $p = 0.626$). Although not significant, the proportion of recent infections among all infections was highest among persons ages 25 to 34 years old (10.5%) for both men (11.9%) and women (9.2%). Persons recently infected compared to those with long-term infections were more likely to report STD symptoms (33% vs. 13%; OR = 3.2; $p = 0.075$) and prior STD treatment (13% vs. 6%; OR = 3.4; $p = 0.187$) in the previous 6 months. There were no associations found between recent versus long-term HIV infection status and perceived risk or expectation of negative test results. Recent HIV-1 infection detection among mobile VCT participants is a valuable measure for tracking the spread of the epidemic among persons who might otherwise not have access to HIV testing due to practical and logistical barriers. Mobile VCT presents opportunities to expand HIV testing services and evaluate at-risk populations within community settings. Given the challenges of longitudinal cohort studies, recent infection may be a practical endpoint for community-based prevention intervention trials employing mobile testing.

Introduction

HIV prevalence at antenatal clinics suggests the epidemic in Zimbabwe has leveled off in recent years.[1] However, community-based incidence measures would be more informative of current trends and impact of aggregate prevention efforts. Community-based mobile voluntary counseling and testing (VCT) presents the opportunity to evaluate the HIV epidemic in populations that might not otherwise have access to testing.[2–4] A free, anonymous, mobile VCT program was piloted in two Zimbabwean communities in preparation for an HIV prevention trial.[5] We estimated HIV-1 incidence and characterized risk factors associated with recent infection.

Materials and Methods

Participants ($N = 1096$) were recruited from 12 marketplaces in two Greater Harare communities (March 2002–August 2003). Epworth is a periurban township on the outskirts of Harare with a high-density population of migrant workers. Seke is a rural community spread out across the Mashonaland East province. Marketplaces were identified as sites where community members could be reached during the day.

Mobile VCT services were offered from a modified caravan. The field staff was comprised of a driver/outreach worker, four HIV nurse-counselors, and a study interviewer. Outreach workers distributed informational materials describing VCT services and the study. Pretest and posttest counseling were provided by trained nurse-counselors and written informed consent was obtained. A parallel HIV rapid testing algorithm was used: Unigold (Trinity Biotech, Bray, Ireland) and Determine (Abbott, Tokyo, Japan). Same day HIV rapid testing was performed in the caravan. The study received approval from the Institutional Review Boards at the University of California, San Francisco and the Medical Research Council of Zimbabwe.

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Table 1. Distribution of HIV-1 Status by Gender and Age Among Persons Using Mobile VCT Services in Epworth and Seke, Zimbabwe

		HIV negative (n = 779)		*HIV positive* (n = 317)		*Recent infection* (n = 21)	
Participants (n = 1096)	*Totals*	n	%	n	%	n	%
Gender							
Men	640	503	78.6	137	21.4	10	47.6
Women	456	276	60.5	180	39.5	11	52.4
Age							
18–24 years	476	403	84.7	73	15.3	2	9.5
25–34 years	379	224	59.1	155	40.9	14	66.7
35–44 years	137	74	54.0	63	46.0	3	14.3
≥45 years	104	78	75.0	26	25.0	2	9.5

Of 317 HIV-seropositive results by the rapid testing algorithm, 282 stored serum specimens were tested subsequently for recent HIV-1 infection by a BED immunoglobulin G capture enzyme immunoassay (BED-CEIA) applying a 0.8 optical density (OD) threshold and 155-day seroconversion window period.[6,7] Specimens characterized as recent infections indicate that HIV seroconversion occurred approximately within the past 155 days from the date of the blood draw. Annualized HIV-1 incidence estimates were adjusted for misclassification of long-term and recent cases and missing data.[7] The adjustment formula corrects for the sensitivity and dual-parameter specificity, which takes into account misclassifications as a result of low antibody levels during very early infection and late-stage disease, persons with long-standing infections who never evolve high antibody levels, and specimens not available for recent infection testing. Specimens that did not undergo recent infection testing were either missing ($n = 13$), of poor quality ($n = 16$), or lacked consent for further testing ($n = 6$). Demographic characteristics of participants whose specimens were tested for recent infection and those not tested were comparable. Six specimens initially classified as HIV seropositive yielded very low OD values (<0.2). Upon EIA and Western blot retesting, two specimens were false positives due to a transcription error between source document and study database and were removed from the analysis. Sexually transmitted disease (STD) history was self-reported. Behavioral questions encompassed activities in the last 6 months. Associations were assessed using Chi-square and Fisher's exact statistical tests.

Results

Participants were offered the options of either receiving their rapid test results the same day or making an appointment to meet with a counselor at a local clinic to receive their results at a later date. Ninety-nine percent of participants chose to receive their HIV test results on the same day. The average wait time for same-day results was approximately 30 min. Participants testing HIV positive were referred for care.

Mobile VCT participants were 58% men and 42% women; 43% were ages 18 to 24 years, 35% were 25–34, 13% were 35–44, and 9% were 45 and older. Most participants (92.6%) were sexually active and had a median of one partner. Condom use with a regular partner/spouse was 41.4% compared to 51.1% with a nonregular partner. The proportion of participants who reported having sex while drunk was 34.4%, 21.4% had sex with a drunken partner, 12.3% exchanged money or material goods for sex, 15.9% had STD symptoms, and 13.3% received STD treatment. This was the first HIV test ever taken by 81.4% of participants; 49.5% perceived themselves to be at risk for infection and 10.2% were expecting to receive a positive test result.

HIV prevalence was 28.9% overall and nearly twice as high in women as in men (39.5% vs. 21.4%, $p < 0.001$), as shown in Table 1. The highest proportion of HIV-positive cases was among persons ages 35 to 44 years (46.0%). HIV prevalence was similar between first-time and previous testers (29.4% vs. 27.6%; $p = 0.737$). A greater proportion of HIV infections were detected in Epworth than in Seke (30.5% vs. 22.8%; $p = 0.022$).

HIV-1 incidence was 1.91% (95% CI: 1.09–2.72), adjusted from an uncorrected estimate of 6.89%. HIV-1 incidence was only slightly higher in women than men [1.99% (0.81–3.16) vs.1.88% (0.71–3.05); $p = 0.626$]; uncorrected estimates were 9.91% and 5.21%, respectively.

Twenty-one recent infection cases were identified. A greater proportion of cases was detected in Epworth than Seke (3.2% vs. 0.6%; $p = 0.049$) and first-time testers than previous testers (2.9% vs. 1.5%; $p = 0.217$). Recent infection cases did not vary significantly by age ($p = 0.243$), although the highest proportion was in persons ages 25 to 34 years (10.4%), followed by 45 years and older (8.7%). The proportion was comparable between men and women ages 25–34 years (11.9% vs. 9.2%; $p = 0.652$).

Persons recently infected compared to long-term infections were somewhat more likely to report STD symptoms (33% vs. 13%; OR = 3.2; $p = 0.075$) and treatment (13% vs. 6%; OR = 3.4; $p = 0.187$). No associations were found between HIV infection status and perception of being at risk for contracting HIV/AIDS ($p = 0.635$) or the expectation of a negative or positive test result ($p = 0.974$).

Discussion

HIV-1 incidence was at a moderately high level of nearly 2% in mobile VCT clients in Zimbabwe. Of note, the highest proportion of recent HIV-1 infection was detected in men and women ages 25 to 34 years. Recent HIV-1 infection was associated with having STD symptoms in the last 6 months but not with participants' HIV risk perceptions. The nearly 30% HIV prevalence was similar to other estimates during this same time period.[1]

The study findings also illustrate potential problems with recent HIV-1 infection testing. We encountered missing, poor-quality, and mislabeled specimens; inclusion of the latter would have overestimated the incidence by 38%. Of particular note, the many-fold higher uncorrected incidence was

similar to the unfeasibly high estimates reported from previous studies in other African populations.[8,9] There have also been reports that BED-CEIA may overestimate HIV-1 incidence with non-B subtype viruses. In Zimbabwe, the predominant circulating strains are subtype C viruses. However, our study results were on par with other HIV-1 incidence estimates from around the same time period, including those from antenatal clinics and the 2001/2002 Young Adult Survey (YAS).[1] Both the antenatal clinics and YAS used prevalence trends among 15–24 year olds as a proxy to reflect underlying trends in incidence based on the assumption that these individuals are more likely to be recently exposed and infected with HIV compared to older individuals.

We believe the corrected estimate is reasonable and consistent with prevalence and incidence trends in Zimbabwe at the time that this study was conducted. Lack of correction could also result in erroneous conclusions on relative risks, e.g., misassumption that HIV-1 incidence and prevalence were 2-fold higher among women. The correction adjusted for misclassifications due to low antibody levels during late-stage disease and persons with long-standing infections who never evolve high antibody levels. The corrections are more substantial in populations such as Zimbabwe where there is high HIV prevalence and low diagnosis and testing levels. Populations with higher testing levels, e.g., men who have sex with men in San Francisco, have less misclassification risk of a person with long-term infection.[10]

Recent HIV-1 infection detection among mobile VCT participants is a valuable measure for tracking the spread of the epidemic among persons who might otherwise not have access to testing due to practical and logistical barriers. Incidence assays can be used for the basic epidemiological purposes of detecting changes in HIV-1 incidence over time and identifying populations at risk for infection. The development of newer laboratory-based incidence assays with greater precision and validity would provide a useful methodological tool to produce recent infection endpoints. Such a tool would greatly facilitate the evaluation of large-scale community-level HIV prevention interventions.

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