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ORIGINAL RESEARCH

Factors Associated with Linkage to HIV Care Among Oral Self-Tested HIV Positive Adults in Uganda

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Background: HIV oral self-testing (HIVST) was rolled out in Uganda in 2018. However, data reported by public facilities show that less than 60% of oral self-tested HIV positive adults were linked to HIV care. This study set out to determine the factors associated with linkage to HIV care among adults with positive HIV oral self-test results in Uganda.

Methods: A cross-sectional study was carried out at Nabweru HCIII and Entebbe Hospital in central Uganda. The study reviewed medical records from January 2019 to May 2020 and successfully invited 144 self-tested HIV positive participants for the quantitative interview process. Data on socio-demographics and health-related characteristics were collected. Bivariate and multivariable analysis was used to determine the factors associated with linkage to care.

Results: The proportion of participants linked to HIV care was 69.6% (100/144). The majority of the participants were female (71%), with a mean age of 29 (±8) years. Participants within age groups of 31–35 years and 41–60 years, who used directly assisted HIVST, disclosed their HIV status to their sexual partners, are ready to start ART, do not consume alcohol and having a supportive sexual partner were more likely to be linked to HIV care. Single participants, separated/divorced, female, fear unfair treatment after HIV status disclosure and those who fear ART side effects were less likely to be linked to HIV care.

Conclusion: Our study showed that less than 70% were linked to HIV care. It also shows that HIV status disclosure, readiness to start ART, type of HIVST used, fear of ART side effects, and being divorced/separated negatively associated with linkage to HIV care among self-test HIV positive adults. There is a need for HIV programs to address the above factors to improve linkage to HIV care to realize the national targets towards the UNAIDs 2035 goals.

Keywords: linkage to HIV care, HIV oral self-testing, Uganda

Background

Sub-Saharan Africa (SSA) has seen a general increase in antiretroviral therapy (ART) access despite HIV/AIDS-related mortality remaining high.[1] In SSA, only 57% of the people living with HIV (PLHIV) accessed HIV diagnosis, 66% started ART in 2018, thus increasing their risk of advanced morbidity and mortality associated with HIV/AIDS.[2,3] The mortality is attributed to delayed diagnosis, the barriers to HIV diagnosis and late initiation and presentation of HIV positive patients for HIV treatment.[4,5] In addition, the delay in diagnosis and initiation of ART treatment increases the risk of reduced CD4 counts, increased risk of comorbidities, HIV-related anaemia that increases the risk of advanced morbidity and mortality.[6] Evidence shows that early HIV treatment initiation is reliant on early HIV diagnosis, prompt linkage to HIV care as well as retention in care. The Uganda Ministry of Health (MOH) adopted the HIV self-testing (HIVST) guidelines as an effort towards UNAID's 95-95-95 target by 2030. HIV oral self-test provides an added advantage to the conventional testing approaches because the HIVST can be performed through unassisted approaches in communities without monitoring of a health-care worker. The goal was to identify 95% of people living with HIV within every age and sex strata to supplement the existing HIV testing and counselling approaches.[7] However, despite the

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progress to have all PLHIV sustained on ART (linkage to ART), the country was still below the 90% target by 2020 at 85%. This low rate of linkage to HIV care has been attributed to several factors including fear of being seen at the clinic, fear of disclosing, not feeling sick, transportation costs, distance to the clinic, unkind health workers, drug stock-outs, and persistent HIV stigma.[8–10] Since the rollout of HIVST in Uganda, there has been an increasing acceptability and uptake of HIVST among the population especially the key population (19–22). According to data from the District Health Information Software 2 (DHIS2), approximately 169,031 individuals were tested for HIV using the oral HIVST approach in 2020, among which 53% (90,076/169,031) utilized directly assisted HIVST method. The rate of HIV positivity among those who utilized the HIVST was about 3% (4873/169,031) in 2020 according to DHIS2 (2020). In addition, data from the DHIS2 show that only 60% of individuals who tested positive on oral HIVST were linked to a confirmatory test using the HIV testing national algorithm. We think that approximately this is the similar number that were further linked to HIV care after having the HIV confirmatory test, indicating low linkage to HIV care compared to the UNAIDS target of 2020, and 2035.

Data from the DHIS2 (2020) resonates well with other studies done in Uganda (23,24) and sub-Saharan Africa (25–27) have shown low linkage to HIV care. Several factors are thought to limit linkage to HIV care after testing positive with oral HIVST. These include: the inconvenience of accessing the clinic (travel, wait, expense, opportunity costs), fear or avoidance of a needle stick needed for confirmatory testing, or privacy concerns among key population groups. Despite the available evidence of low linkage to care, the reasons for this low linkage after testing positive with oral HIVST are not well documented. Therefore, in this study, we sought to determine the factors associated with linkage to HIV care among adults with positive oral HIV self-testing results. We believe that understanding this knowledge gap is critical to the success of the national HIV response in Uganda.

Methods

Study Design

This was a cross-sectional study, with quantitative data collected through structured interviews and a review of medical records captured between January 2019 and May 2020. Data collection was carried out from July to August 2020.

Study Setting

The study was conducted at Entebbe regional referral hospital and Nabweru Health Centre III.

Entebbe Regional Referral Hospital is located in the town of Entebbe, Wakiso district, in the central region of Uganda. Nabweru Health Centre III is located in Nansana Municipal Council, Wakiso district. These health facilities are part of the community distribution centres for HIV oral self-test kits under MOH. The HIVST kit distribution exercise is done through community outreaches where OraQuick HIV oral self-testing kits are distributed to adults.[7]

Sampling Procedure

The study included all adults (aged 18 years) receiving HIVST kits at Entebbe regional referral hospital and Nabweru Health centre III under the MOH distribution exercise as recorded in the HIV self-testing distribution log. Participants with reactive HIV oral self-test results were invited through a phone call to participate in the study. Participants who were linked to HIV care were required to present an ART card which indicated they were registered for ART treatment. Participants were consecutively sampled until the sample size was achieved.

Eligibility Criteria

Inclusion Criteria

Participants who tested HIV positive on oral self-test kits, presenting an ART card among those who linked to care and consented to participate in the study were included.

Exclusion Criteria

Those who had started HIV treatment before January 2019 were excluded from the study.

Data Collection, Variables, and Measurements

Phone numbers, sex, key population, type of HIV self-testing, test kit distribution purpose, HIVST results were extracted from the HIV self-testing distribution log for participants who were positive on HIV oral self-test using a data abstraction form designed for this study as a screening tool. A structured questionnaire with closed-ended questions on patient demographics, socio-economic characteristics and health-related factors was used to collect data from eligible participants (Supplementary material). The demographic and socioeconomic factors included age, sex, religion, education level, income status, employment status, marital status, alcohol consumption, parenting and media exposure. The health-related factors included key population groups, location of HIVST kit distribution point, type of HIV oral self-testing, test kit distribution purpose, time-taken to reach the health facility, quality of health care and means of transport to the health facility, denial of HIVST results, stigma, HIV status disclosure, perceived state of health, knowledge of ART side effects, the likelihood of experiencing side effects, living with HIV positive person in the same household and HIV counselling.

The study tools were pre-tested at a health facility in Kampala. Data was collected by qualified staff with experience in data collection and fluent in the local language of the study setting. The study research assistants were trained on the study procedures and ethical conduct of research before data collection commenced.

The outcome variable was linkage to HIV care, and this was defined as whether the individual who tested positive on HIV oral self-test got an HIV confirmatory test was either registered or not registered for ART treatment as observed using the ART card.

Sample Size

The formula for sample size calculation for a cross-sectional study was used to estimate the number of participants to be sampled using Epi info® software. We assumed a two-sided alpha value of 0.05, power at 90%, the ratio of participants with positive HIV oral self-test linked to HIV care to those positive with HIV self-test not linked to HIV care as 1:2 and a minimum.

Prevalence rate ratio of 0.3. Considering the prevalence of linkage to HIV care among adults testing positive with HIV oral self-testing to be 50%, and using the Kelsey formulae, the total sample size was estimated to be 143.

Statistical Analysis

Data were analysed using STATA version 14.0. Frequencies and their corresponding percentages were used for categorical variables and mean with standard deviation were used for continuous variables that were normally distributed. Univariate analysis was done using the Mann–Whitney *U*-test for continuous variables and the chi-square test or Fisher's exact for categorical variables. The dependent variable was modelled as a binary outcome. Bivariate and multivariable analysis was done using robust modified Poisson regression using prevalence rate ratios as a measure of association. Robust modified Poisson logistic regression was used because the outcome variable is a common event (>10%), thus using the odds ratio with ordinary logistic regression would overestimate the risk ratio. In addition, Poisson regression with robust variance regression provide correct estimates and are a better alternative for the analysis of cross-sectional studies with binary common outcomes.[11] All variables with $p < 0.02$ at bivariate analysis were included in a correlation model to remain with a correlation coefficient greater than +0.4 and less than < -0.4. Backward elimination was then used to build the final multivariable model, by eliminating variables with a p-value greater than 0.05. Factors specified as important based on previous literature were included in the final model. A two-sided significance p-value of 0.05 and a 95% confidence interval were considered statistically significant for the analysis. Measures of association were reported as unadjusted prevalence rate ratio on bivariate analysis and adjusted prevalence rate ratio on multivariable analysis.

Results

Characteristics of the Study Participants

The study successfully reached out to 81% (196/243) of the patients through phone call invitations, and 59.3% (144/196) agreed to participate in the study. Table 1 shows the sociodemographic characteristics of the study participants. Among the 144 participants, 69% (100/144) had successfully been linked to HIV care. The mean age of the participants was 28 ±8 years, with the majority of the participants in the age group of 18–25 years. The majority (72%) of the participants

were female. Considering the key population, 44% (64/144) of the participants were from the general population, 43% (63/144) were female sex workers, 6% (9/144) were men who have sex with men, and 5% (8/144) were men through prevention of mother to child transmission (PMTCT) program. More than half (56%) of the participants had attained a secondary or vocational level of education, and up to 88% (127/144) of the participants were able to read. Considering income status, over half (54%) earned less than USD 27.0 per month. The mean time to reach a health facility was 41±22 minutes, with the majority (51%) of the participants using a motorcycle and taxis as a means of transport to the health facility.

Table 2 shows the health-related characteristics of the study participants. The majority (78%) of the study participants reported being in good health, 18% (16/144) reported being in poor health, and 4% (5/144) reported being in excellent health. The majority (91%) of the participants received HIVST from the community distribution centres while the rest received them from the health facility. Seventy-eight (54%) of the participants reported using unassisted HIVST, with more than half (51%) of these linked to HIV care. The majority (71%) of the participants reported having disclosed their HIV status to a family member or a friend, while 62 (43%) participants reported having been very ready to start ART.

Factors Associated with Linkage to HIV Care

Results in Table 3 show the factors associated with linkage to HIV care. Linkage to HIV care was 39% and 46% more likely among age groups of 31–35 years (APRR = 1.39, 95% CI = 1.061-84, $P < 0.05$) and that of 41–60 years (APRR = 1.46, 95% CI = 1.06–2.00, $P < 0.05$), respectively. Table 3 shows that participants who used directly assisted HIVST were 93% more likely to be linked to care compared to those who utilized unassisted HIVST (PRR = 1.93, 95% CI = 1.522-44, $P < 0.001$). Participants who do not consume alcohol were 26% more likely compared to those who do not consume alcohol (APRR = 1.26, 95% CI = 1.04–1.53, $P < 0.05$). In addition, Table 3 shows that those with sexual partner support (PRR = 1.46, 95% CI = 1.30–1.65, $P < 0.001$), participants who spend less than 61–120 minutes to reach the health facility (PRR = 2.0, 95% CI = 1.34–2.99, $P < 0.01$), those who can disclose their HIV status to their sexual partners (PRR = 1.32, 95% CI = 1.03–1.69, $P < 0.05$) and participants' readiness to start ART (PRR = 1.85, 95% CI = 1.25–2.74, $P < 0.01$) were 46%, 2 times, 32%, and 85% more likely to be linked to care compared with their counterparts. Participants who were female were 18% less likely to be linked to care compared to males (APRR = 0.82, 95% CI = 0.68–0.99, $P < 0.05$). Also, single participants/never married (PRR = 0.64, 95% CI = 0.53–0.78, $P < 0.001$) or separated/divorced (PRR = 0.59, 95% CI = 0.41–0.86, $P < 0.01$) were 36% and 41% less likely to be linked to care compared to the married ones. Participants who fear unfair treatment after HIV status disclosure were 33% less likely to be linked to care compared to those who did not fear unfair treatment following HIV disclosure (APRR = 0.67, 95% CI = 0.46–0.97, $P < 0.05$).

Furthermore, participants with fear of likely getting ART side effects (APRR = 0.71, 95% CI = 0.54–0.95, $P < 0.05$) were 29% less likely to be linked to HIV care compared to those without any fear.

Discussion

The results from this study show that linkage to HIV care was positively associated with age, the type of HIV self-testing, HIV status disclosure, the readiness to start ART, non-alcohol consumption, having a supportive sexual partner and was negatively associated with marital status, sex, stigma associated factors and fear of ART side effects. These findings suggest that several factors are limiting linkage to HIV care after self-testing HIV positive. This would increase the risk of advanced morbidity due to delayed ART initiation and subsequent burden to the public healthcare system.

This study showed that linkage to HIV care among adults with positive HIV oral self-testing results was 69%, which is below the UNAIDS target of 90% by 2020 and 95% by 2030 for individuals who know their HIV status started and sustained on ART treatment. This proportion is higher than that of a study done in 20 health facilities in Uganda that showed linkage of HIV care to be 53%.[12] This may be attributed to the lower sample size in this study.

The study demonstrated that age has a positive association with linkage to HIV care with participants within the age of 31–35 years and 41–60 years more 39% and 46% more likely to be linked to HIV care compared to other age brackets. These results are similar to those of studies done in Uganda[13] and South Africa[14] that showed that PLHIV in the age

Table 1 Socio-Demographic Characteristics of the Study Participants

Characteristics and their Categories	All Participants n=144 n (%) or Mean (SD)	Linked to ART n=100 n (%) or Mean (SD)	Not-Linked to ART n=44 n (%) or Mean (SD)	p-value
Age (years)				**0.021**
18–25	64 (45)	39 (61)	25 (39)	
26–30	34 (24)	23 (68)	11 (32)	
31–35	22 (15)	16 (73)	6 (27)	
36–40	10 (7)	9 (90)	1 (10)	
41–60	13 (9)	12 (92)	1(8)	
Sex				0.088
Female	104 (72)	68 (68)	36 (82)	
Male	40 (28)	32 (32)	8 (18)	
Key population groups				**<0.001**
FSW	63 (43)	27 (43)	36 (57)	
GP	64 (44)	63 (98) 2	1 (2)	
MSM	9 (6)	2 (22)	7 (78)	
MTA	8 (5)	8 (100)	0	
Education level				0.207
No formal education	11 (8)	5 (45)	6 (55)	
Primary	48 (33)	35 (73)	13 (27)	
Secondary/vocational	81 (56)	58 (72)	23 (28)	
Higher education	4 (3)	2 (50)	2 (50)	
Able to read				0.311
Yes	127 (88)	90 (81)	37 (84)	
No	17 (12)	10 (10)	7 (16)	
Religion				0.934
Anglican	29 (20)	20 (69)	9 (31)	
Catholic	52 (36)	36 (69)	16 (31)	
Seventh-day	3 (2)	3 (100)	0	
Saved/Pentecostal	16 (12)	12 (71)	5 (29)	
Moslem	42 (29)	28 (67)	14 (33)	
Marital status				**<0.001**
Married	39 (27)	37 (95)	2 (5)	
Single (never married)	77 (54)	47 (61)	30 (39)	
Separated/divorced	23 (16)	13 (57)	10 (43)	
Widowed	5 (3)	3 (60)	2 (40)	
Have children				0.209
Yes	105 (73)	76 (72)	29 (28)	
No	39 (27)	24 (62)	15 (38)	
Income status (UGX)				0.180
<50,000	39 (27)	31 (79)	8 (21)	
50–100,000	38 (26)	23 (61)	15 (39)	
100–350,000	51 (36)	37 (73)	14 (27)	
350–500,000	10 (7)	6 (60)	4 (40)	
>500,000/=	5 (4)	2 (40)	3 (60)	
Consume alcohol				0.053
Yes	55 (38)	33 (60)	22 (40)	
No	89 (62)	67 (75)	22 (25)	

(*Continued*)

Table 1 (Continued).

Characteristics and their Categories	All Participants n=144 n (%) or Mean (SD)	Linked to ART n=100 n (%) or Mean (SD)	Not-Linked to ART n=44 n (%) or Mean (SD)	p-value
Time on takes to hospital (minutes)				**<0.001**
1–20	24 (17)	12 (50)	12 (50)	
21–40	63 (44)	40 (63)	23 (37)	
41–60	49 (35)	40 (82)	9 (18)	
Above 60	6 (4)	6 (100)	0	
Means of transport				**0.024**
Walking	35 (24)	18 (51)	17 (49)	
Boda-Boda,	73 (51)	52 (71)	21 (29)	
Taxi (Matatu)	35 (24)	29 (83)	6 (17)	
Public bus	1 (1)	1 (100)	0	
Cost of transport (UGX)				**0.019**
<5000	97 (67)	61 (63)	36 (37)	
6000 to 15,000	38 (26)	30 (79)	8 (21)	
More than 15,000	9 (6)	9 (100)	0	
Quality of health care received				**<0.001**
Very good	52 (36)	49 (94)	3 (6)	
Good	82 (57)	47 (57)	35 (43)	
Not good	9 (7)	4 (44)	5 (56)	

Note: The bold font was used to show statistically significant p-values ($p < 0.05$).
Abbreviations: FSW, female sex worker; GP, general population; MSM, men who have sex with men; MTA, men through Antenatal care; UGX, Ugandan Shilling; ART, antiretroviral therapy.

bracket of 30–39 years were more likely to be linked to HIV care compared to other age groups. A likely explanation for this association may be that individuals in these age groups have a sense of responsibility for their lives and families, as well as being familiar with the health-care system.

The study showed that females were 18% less likely to be linked to HIV care compared with males. These results are surprising in that several studies in Uganda[15,16] and elsewhere[16,17] have shown the contrary, with one study on HIVST having shown that testing HIV positive among men did not increase the likelihood of linkage to HIV care in Uganda.[18] Our results could not be explained by this study; however, this could be attributed to stigma and discrimination most commonly faced by women while seeking HIV health care.[19]

Furthermore, social norms suggest that women require to seek permission from men to seek health care[20] which may limit their freedom to linkage to HIV care.

The readiness to start ART treatment has been shown to enable linkage to HIV care and ART treatment uptake in Uganda.[21] Adding to this evidence, the study results show that participants who were ready to start ART treatment were 89% more likely to be linked to HIV care compared to those who were not ready. However, study findings also suggest that participants with fears regarding ART side effects are 0.58 times less likely to be linked to care. These study findings are similar to evidence from elsewhere that show having thoughts of drug side-effects is associated with poor uptake of treatment.[22,23] These concerns continue to impact individuals' decisions, especially if accompanied with wrong information about the side effects HIV positive people get when on ART.

Sexually active participants, who self-identified themselves as either single or separated (divorced) were 36% and 41% less likely to be linked to HIV care compared to married participants. The findings align with evidence from another study in South Africa among newly diagnosed patients.[22] There is thus increasing evidence of the importance of targeted HIV counselling among these HIV positive individuals as a form of HIV control and prevention to increase awareness of the benefits of early initiation on ART.

Table 2 Health-Related Characteristics of the Study Participants

Characteristics and their Categories	All Participants n=144 n (%)	Linked to ART n=100 n (%)	Not-Linked to ART n=44 n (%)	p-value
Health status				0.873
Poor health	26 (18)	18 (69)	8 (31)	
Good health	113 (78)	79 (70)	34 (30)	
Excellent health	5 (4)	3 (60)	2 (40)	
HIVST kits distribution point				0.986
Community	131 (91)	91 (69)	40 (31)	
Health facility	13 (9)	9 (69)	4 (31)	
Type of HIVST				**<0.001**
Directly assisted	66 (46)	62 (94)	4 (6)	
Unassisted	78 (54)	38 (49)	40 (51)	
Denial of HIVST results				0.490
Yes	90 (65)	63 (70)	27 (30)	
No	49 (35)	37 (76)	12 (24)	
Knowledge of anyone taking ART at home				0.196
Yes	61 (42)	44 (72)	17 (28)	
No	72 (50)	51 (71)	21 (29)	
I do not know	11 (8)	5 (45)	6 (55)	
Know of ART side effects				**0.020**
Yes	78 (54)	59 (76)	19 (24)	
No	49 (34)	34 (69)	15 (31)	
I do not know	17 (12)	7 (41)	10 (59)	
Likely to get ART side effects				**<0.001**
Not likely	55 (38)	52 (95)	3 (5)	
Somewhat likely	22 (15)	15 (68)	7 (32)	
Very likely	34 (24)	23 (68)	11 (32)	
I do not know	33 (23)	10 (30)	23 (70)	
Received HIV counselling				**<0.001**
Yes	135 (94)	99 (73)	36 (27)	
No	9 (6)	1 (11)	8 (89)	
Disclosed to the sexual partner				**0.011**
Yes	84 (59)	65 (77)	19 (23)	
No	58 (40)	34 (59)	24 (41)	
I do not want to	1 (1)	0	1 (100)	
Disclosed to family/friend				**0.001**
Yes	102 (71)	75 (74)	27 (26)	
No	36 (25)	25 (69)	11 (31)	
I do not want to	6 (4)	0	6 (100)	
Thought of being treated unfairly if disclosed to partner / family				**<0.001**
Not likely	68 (47)	57 (84)	11 (16)	
Somehow likely	30 (21)	23 (77)	7 (23)	
Very likely	30 (21)	15 (50)	15 (50)	
I do not know	16 (11)	5 (31)	11 (69)	
Ready to start ART				**<0.001**
Very ready	62 (43)	50 (81)	12 (19)	
Ready	42 (29)	33 (79)	9 (21)	
Not ready	40 (28)	17 (42)	23 (58)	

Note: The bold font was used to show statistically significant p-values ($p < 0.05$).
Abbreviations: STD, sexually transmitted diseases; ART, antiretroviral therapy.

Table 3 Factors Associated with Linkage to HIV Care at Bivariate and Multivariate Analysis

Characteristics and Categories	Unadjusted Prevalence Rate-Ratio (95% CI)	p-value	Adjusted Prevalence Rate-Ratio (95% CI)	p-value
Age (years)				
<25	1.0		1.0	
26–30	1.11 (0.82–1.51)	0.502	1.13 (0.89–1.45)	0.333
31–35	1.19 (0.86–1.65)	0.284	1.39(1.06–1.84)	**0.019**
36–40	1.48(1.11-1.97)	**0.008**	1.36(0.96–1.93)	0.079
41–60	1.52(1.18-1.95)	**0.001**	1.46(1.06-2.00)	**0.022**
Sex				
Male	1.0		1.0	
Female	0.82 (0.66–1.01)	0.059	0.82 (0.68–0.99)	**0.044**
Education level				
No formal education	1.0			
Primary	1.6 (0.82–3.14)	0.168		
Secondary/vocational	1.58 (0.81–3.06)	0.180		
Higher education	1.1 (0.34–3.57)	0.874		
Type of HIV self-testing				
Unassisted HIVST	1.0			
Directly assisted HIVST	1.93 (1.52–2.44)	**<0.001**		
Marital status				
Married	1.0			
Single (never married)	0.64(0.53-0.78)	**<0.001**		
Separated/divorced	0.59(0.41-0.86)	**0.006**		
Widowed	0.63(0.31-1.30)	0.214		
Have children				
No	1.0			
Yes	1.18 (0.89–1.55)	0.249		
Work time				
Throughout the year	1.0		1.0	
Seasonally	1.67 (1.34–2.06)	**<0.001**	1.1 (0.9–1.33)	0.355
Once in a while	1.31 (0.98–1.77)	0.073	1.23 (0.98–1.55)	0.079
Income status (UGX)				
<50,000	1.0			
50,001–100,000	0.76 (0.56–1.03)	0.078		
100,001–350,000	0.91(0.72-1.15)	0.442		
350–500,000	0.75(0.44-1.29)	0.301		
>500,000	0.50(0.17-1.49)	0.217		
Drinking alcohol				
Yes	1.0		1.0	
No	1.25 (0.98–1.61)	0.072	1.26 (1.04–1.53)	**0.019**
Decision about health care				
Myself	1.0			
Partner	1.46(1.30-1.65)	**<0.001**		
Myself and my partner	0.98(0.43-2.19)	0.955		
My parents/guardian	1.13(0.82-1.55)	0.466		

(*Continued*)

Table 3 (Continued).

Characteristics and Categories	Unadjusted Prevalence Rate-Ratio (95% CI)	p-value	Adjusted Prevalence Rate-Ratio (95% CI)	p-value
Travel time to a health facility				
<20 minutes	1.0		1.0	
21–40 minutes	1.27(0.82-1.98)	0.291	1.28(0.88-1.87)	0.202
41–60 minutes	1.63 (1.07–2.49)	**0.023**	1.27(0.88-1.83)	0.210
61–120 minutes	2.0 (1.34–2.99)	**0.001**	1.41(0.98-2.04)	0.065
Time to HIV confirmatory test				
Same day	1.0			
Within a week	1.09(0.91-1.31)	0.369		
>a week	0.88(0.69-1.12)	0.302		
Do not remember	0.25(0.07-0.87)	**0.029**		
Received counselling				
No	1.0		1.0	
Yes	6.6 (1.03–42.28)	**0.046**	5.36 (0.93–30.87)	0.06
Disclosed to partner				
No	1.0			
Yes	1.32 (1.03–1.69)	**0.027**		
Thought of being treated unfairly if disclosed				
Not likely	1.0		1.0	
Somehow likely	0.91 (0.73–1.14)	0.435	1.1 (0.87–1.34)	0.486
Very likely	0.59 (0.41–0.86)	0.007	0.67 (0.46–0.97)	**0.032**
I do not know	0.37 (0.18–0.78)	**0.009**	0.51 (0.28–0.92)	**0.025**
Readiness to start ART				
Not ready	1.0			
Ready	1.85 (1.25–2.74)	**0.002**		
Very ready	1.89 (1.29–2.78)	**0.001**		
Knowledge of ART side effects				
No	1.0			
Yes	1.09 (0.87–1.37)	0.453		
I do not know	0.59 (0.32–1.08)	0.088		
Likely to get ART side effects				
Not likely	1.0		1.0	
Somewhat likely	0.72 (0.54–0.97)	**0.029**	0.71 (0.54–0.95)	**0.018**
Very likely	0.72 (0.56–0.91)	**0.007**	0.80 (0.64–1.01)	0.056
I do not know	0.32 (0.19–0.54)	**<0.001**	0.42 (0.26–0.68	**<0.001**
Means of transport				
Walking	1.0		1.0	
Boda-boda	1.39 (0.97–1.97)	0.072	1.33 (0.95–1.84)	0.093
Taxi (Matatu)	1.61 (1.13–2.30)	**0.009**	1.31 (0.94–1.84)	0.114
Quality of health care services				
Not good	1.0			
Good	1.29 (0.61–2.75)	0.510		
Very good	2.12 (1.02–4.43)	**0.045**		

Notes: 1=reference category; the bold font was used to show statistically significant p-values ($p < 0.05$).
Abbreviations: CI, confidence interval; ART, antiretroviral therapy.

The study had some strengths. The main strength was that the study was carried out among individuals who received services under the public health facility, thus providing a picture of the utilization of HIV self-testing services in the local setting. However, it also had some limitations. The results of this study cannot be generalised to the general population because of the smaller sample size and low response rate. The low response rate is attributed to the fact that the study was carried out in the middle of the COVID-19 pandemic. The study reviewed medical records for HIV oral self-testing to sample participants as well as answered the key outcome variable. There was a possibility of incomplete matching of study participants to medical records, this could have resulted in an error in the measurement of linkage to care, a measure of ART initiation. Extensive quality control checks to ensure completeness of data to reduce these limitations.

Conclusion

The study results show that linkage to HIV was more likely among participants with advanced age, those using directly assisted HIVST, disclosed their HIV status, received HIV counselling and ready to start ART and less likely among females, single or separated participants, those who consume alcohol, fear of unfair treatment after disclosure, and fear of getting ART side effects. HIV oral self-testing contributes to solutions in the HIV testing gap including the challenges facing efforts to scale up HIV testing mainly in the hard to reach areas and has a great role to play to get all PLHIV linked to HIV care. We recommend that local programs target the above factors affecting linkage to HIV care to greatly benefit from HIV self-testing services. More studies with a larger sample size are needed to add to these results by interrogating deeply the causes of low linkage among individuals utilizing this noble testing approach.

Abbreviations

APRR, adjusted prevalence rate ratio; ART, antiretroviral therapy; HIV/AIDS, human immunodeficiency virus/acquired immune deficiency syndrome; HIVST, HIV self-testing; HTC, HIV testing and counselling; HTS, HIV testing services; PRR, prevalence rate ratio; MOH, Ministry of Health Uganda; PLHIV, people Living with HIV; WHO, World Health Organisation; UNAIDS, Joint United Nations Programme on HIV/AIDS; UPHIA, Uganda Population-Based HIV Impact Assessment survey; MSM, men who have sex with men; FSW, female sex workers; PMTCT, prevention of mother to child transmission.

Data Sharing Statement

Materials and data analyzed during this study can be made available to all interested researchers upon reasonable request directed to the corresponding author, Mr Bbuye Mudarshiru on email; mudarshirubbuye@gmail.com.

Ethical Approval and Consent

Ethics approval for this study was obtained from the Makerere University School of Public Health Higher Degrees and the Ethics review committee. Administrative clearance was obtained from the Ministry of Health Uganda and the health facilities.

Written informed consent was obtained from the participants before attending interviews. Confidentiality of participants' information was ensured through coding unique identifiers for each participant. Interviews were conducted in a private setting identified in consultation with the participants. All participants who had not been linked to HIV care were counselled by the health facility counsellors and encouraged to start HIV treatment. This study complied with the Helsinki declaration.

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Author Contributions

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no conflicts of interest for this work.

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