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Index case testing uptake and determinants among HIV clients attending Shashemene town public health facilities, Southern Ethiopia

Mohammed Feyisso Shaka[1]✉, Furi Megerso[2], Bonso Ami[1] & Hamid Abdulhakim Daud[3]

Ethiopia adopted the 95-95-95 strategy as part of the National Strategic Plan to end HIV/AIDS by 2030. The HIV seronegative partners of people living with HIV, children whose parents with HIV, and families of index clients are at higher risk of contracting HIV infection. Hence, partner and family-based index testing of these groups is a key public health intervention for HIV prevention, care, and treatment. This study aims to determine the magnitude of partner and family-based index case testing of HIV and its associated factors. A facility-based cross-sectional study was conducted among randomly selected 336 HIV patients currently attending antiretroviral therapy in Shashemene Town, from February 12 to March 20, 2022. Data was collected using pre-tested interviewer-administered questionnaires. The collected data was entered into Epi-Data 3.1 and exported to SPSS version 24 for analysis. Logistic regression analyses was used to identify factors associated with family-based index case HIV testing after controlling for possible confounders. The strength of association was assessed by using an adjusted odds ratio with their corresponding confidence interval, and statistical significance was declared at a *p*-value < 0.05. Out of 336 respondents included in the study, the proportion of HIV-positive clients who have tested at least one family member through index case testing was 63.7% (95% CI: 58.5-69%). The odds of family-based HIV index case testing was lower among those who stayed on antiretroviral therapy for less than 1 year (AOR: 0.05, 95%CI: (0.02–0.15)], index cases who didn't disclose their HIV status to any family members [AOR: 0.06, 95%CI: (0.02–0.14)] and those having no child [AOR: 0.10, 95%CI: (0.03–0.30)]. On the other hand, for those who didn't report an incident of stigma, the odds of testing at least one family member through the index case testing strategy is about 13 times higher when compared to those who reported an incident of stigma [AOR: 13.11, 95%CI: (2.58–66.74)]. The findings revealed that the index case testing practice was relatively lower when compared to the reports from other areas and when seen through the lens of the three 95 targets. The practice of index case testing is significantly associated with HIV disclosure status, months on antiretroviral therapy, having children, and incidents of stigma. It is essential to sustain the platform of family-based index case testing service through strengthening assisted disclosure counseling, and still further work is needed to combat the stigma related to HIV status. Due focus also needs to be given to those who are newly enrolled in antiretroviral therapy.

Keywords Index case, HIV testing, Partner and Family-based HIV index case testing

Abbreviations

AOR	Adjusted odds ratio
ART	Anti-retroviral therapy
CI	Confidence interval
COR	Crude odds ratio
Epi	Epidemiological info
ICT	Index Case Testing
SPSS	Statistical Package for Social Science
WHO	World Health Organization

[1]School of Public Health, Shashamene Campus, Madda Walabu University, Shashemene, Ethiopia. [2]Arsi Nagele Health Office, Arsi Nagele, Oromia Region, Ethiopia. [3]Radiology Department, Guoyaodongfeng Hospital, Hubei University of Medicine, Shiyan City, Hubei Province, China. ✉email: mohammedshaka2@gmail.com

HIV/AIDS	Human Immuno-Virus/Acquired Immuno-Deficiency Syndrome
PEPFAR	US President's Emergency Plan for AIDS Relief
PLHIV	People living with HIV
UNAIDS	The Joint United Nations Program on HIV/AIDS

HIV continues to be a major global public health issue, having claimed 42.3 million lives so far and 630 000 people died from AIDS-related illnesses in 2023 only. An estimated 39.9 million people were living with HIV at the end of 2023, over two-thirds of whom (25.4 million) are in the WHO African Region[1,2]. According to estimates from the Ethiopian Public Health Institute (EPHI) for 2022 and 2023, approximately 610,350 people are living with HIV, with 8,257 new infections and 11,322 AIDS-related deaths annually[3].

In 2020 UNAIDS set the global ambitious 95-95-95 goals to be achieved by 2030. The target aims for 95% of people living with HIV to know their status, 95% of those diagnosed to initiate antiretroviral therapy (ART), and 95% of those on ART to achieve viral suppression[4,5]. Besides the proposed targets and ongoing commitments, about 5.4 million people did not know that they were living with HIV and there were 1.3 million new HIV cases in 2023. Particularly, progress in reducing new HIV cases among children has stalled in recent years. The first 95% target—ensuring HIV diagnosis among children aged 0–14 years—remains at 66% (47–87%). Among adults, it stands at 83% (65–97%) for men and 86% (69%–>98%) for women in 2023[1,6]. Reaching the remaining undiagnosed people living with HIV (PLHIV) necessitates the implementation of targeted and evidence-based testing strategies, such as index case testing. This approach has proven effective in identifying undiagnosed cases by focusing on contacts of known PLHIV. The available data underscore the critical importance of strategic policy decisions, including the expansion and integration of index case testing into national HIV programs. Such efforts will play a decisive role in identifying hidden cases, linking individuals to care, and ultimately altering the trajectory of the HIV epidemic[7–9].

Though more than half of all people living with HIV are in eastern and southern Africa, the global HIV prevention response is proceeding at an encouraging pace in the region and other sub-Saharan African countries. In sub-Saharan Africa, the progress towards achieving the cascaded targets of HIV testing, treatment, and viral load suppression among people living with HIV is substantially promising with shorter gaps to reach the three 95s[10]. Reports also show that the 39% decline in the number of new HIV infections globally in 2023 is due primarily to progress achieved in sub-Saharan Africa[6]. These achievements were largely driven by the implementation of effective strategies, including index case testing, which has demonstrated a significant impact in improving HIV case identification across the African region[11–13].

The partner and family-based index case testing service is one of the new initiatives of HTS and a critical public health intervention designed to counsel and link sexual partners, children, and siblings of infected individuals to testing, prevention, care, and treatment. Index testing takes advantage of shared risk networks, thereby accessing people who might not otherwise be considered at risk of HIV by health programs. It reaches those at high risk of undiagnosed or untreated HIV; with a high HIV positivity rate; active testing tends to identify people early in the disease; and reaches people that might be challenging for programs to identify as high-risk[9]. The HIV positivity rate from index case testing is much greater than that achieved by other entry points[14–16].

Currently, Ethiopia has adopted the 95-95-95 strategy as part of its National Strategic Plan to end HIV/AIDS by 2030, and progress toward achieving this goal has been encouraging[5]. In line with this, targeted approaches such as index case testing and social networking strategies are being implemented as promising methods to enhance HIV case finding, with the aim of ensuring that 95% of people living with HIV (PLHIV) know their status and are linked to appropriate care[17].

Besides the promising impact of the index case testing strategy, there is significant variation in family-based index case testing uptake and implementation status in Ethiopia. Contextual barriers are hindering the full potential of the index case testing strategy in improving HIV care. This study was planned to assess the uptake of family-based HIV index case testing and to address factors associated with its acceptance among HIV-positive patients on ART. Testing uptake refers to the proportion of individuals who accept an HIV test when offered, serving as a key indicator of the acceptability of the testing approach or the effectiveness of demand generation efforts[9,18]. In this study, the uptake of index case testing (ICT) among clients was assessed using the indicator of "at least one family member tested" after the testing was offered to the eligible clients. This approach was selected due to its practicality and the relative ease of verification compared to attempting to measure testing among all eligible family members. Existing reports and literature indicate that many clients do not disclose or register all eligible family members for testing, largely due to persistent stigma, which remains a significant barrier in the study area[19,20]. Consequently, measuring complete household testing is often unreliable and operationally challenging. Using the "at least one tested" metric offers a meaningful way to assess the extent to which people on ART have engaged with ICT and provides a minimum threshold of program reach within households. It also serves as a proxy for evaluating the initial success of family-based testing interventions. Given that ICT and related strategies such as partner and family-based testing are relatively new and face implementation challenges, further evaluation is essential to understand their effectiveness and contextual feasibility. This study also incorporates key variables that have been underexplored in previous research, offering a more comprehensive understanding of the factors influencing ICT acceptance.

Methods and materials

Study setting and design

A facility-based cross-sectional study was conducted in public health facilities of ART sites in Shashemene town, Southern Ethiopia. Shashemene town is the capital city of West Arsi Zonal Administration in Oromia Regional National State and is located 240km from Addis Ababa, Ethiopia. Geographically it is located at the Latitude: 7°12′0.00″N and Longitude: 38°36′0.00″E (Find GPS coordinates for any address or location. (latitude.to)).

There were four PEPFAR-supported ART centers of Shashemene town public health facilities, namely Shashemene Comprehensive Specialized Hospital, Melka Oda General Hospital, Abosto Health Center, and Bulchana Health Center having total clients currently on ART of 2363, 841, 1440 and 146, out of 1653, 401, 714 and 75 clients eligible for ICT respectively from 2nd quarter report of 2021. The study period was from February 12 to March 20, 2022, and the participants were recruited and interviewed during the specified time.

Population

The study involved people living with HIV (PLHIV) who had been currently receiving antiretroviral therapy (ART) in Shashemene town public health facilities ART sites. People living with HIV (PLHIV) and who have been currently receiving antiretroviral therapy and eligible for Family-Based Index Case HIV testing service (those ART clients who have a partner or have children and adolescents < 19 years of age or other close family members, or index child (minor mature) having family were included. Eligible people living with HIV, those currently on ART who were seriously ill during the data collection period, brief psychotic (clients having bizarre behavior or abnormal behavior), children who are minor immature for an interview, and orphans not having any representative to respond to questions were excluded.

Sample size calculation

The sample size of the first objective for people living with HIV who had been currently on ART and eligible for Family-Based Index Case HIV Testing service was determined using Epi Info StatCalc sample size calculator for cross-sectional studies based on the following assumptions; expected frequency/p = 85.2%[21], expected odds ratio 3.137 margin of error = 5%, confidence level = 95%) and the calculated sample became 308. By adding a 10% non-response rate, the sample size becomes 339.

From the same study, the sample size for the second objective was calculated using Epi Info Stat Calculator as expressed in the following table using disclosure status and months on ART as key exposure variables. A larger sample size was taken among the sample sizes calculated using the two exposure variables (Table 1).

The sample size calculated for the first objective from the proportion was larger than the sample size calculated for the second objective based on the factors. Hence, the first sample size calculated for the proportion was used and the final sample size is 339.

Sampling techniques and procedures

The simple random sampling technique was used to draw sample/study participants from people living with HIV who are currently receiving antiretroviral therapy and eligible for index case HIV testing service in Shashemene town public health facilities of all four ART centers (Shashemene Comprehensive Specialized Hospital, Melka Oda General Hospital, Abosto Health center, and Bulchana Health center) having eligible clients registered on the ART registration registry. Currently, the number of patients on ART at each site is 653 at Shashemene Comprehensive Hospital, 401 at Melka Oda General Hospital, 714 at Abosto Health Center, and 75 at Bulchana Health Center from the second quarter report of 2021.

The sample size for each ART Center was proportionally allocated based on the size of ART clients on ICT registers in each site and the total sample size of this study (n = 339). Proportionally allocated samples were 197 for Shashemene Comprehensive Specialized Hospital, 85 for Abosto Health Center, 48 for Melka Oda General Hospital, and 9 for Bulchana Health Center. Samples were selected randomly from all registered ART clients on ICT registers from each ART center using a table of random numbers.

Measurements

The primary outcome variable of this study which is uptake of partner and family-based index case testing is defined as HIV testing for family, sexual partner, and biological children of the HIV-positive cases[16]. For the purpose of this study, the response to family-based index case testing was recorded as "yes" if at least one of the family members (sexual partner, biological children, and/or any other family member) of the index case was tested. Otherwise, it will be recorded as "no if no one from the family member was tested.

Data collection procedure

Data was collected using questionnaires adapted from the literature, and record reviews. An interviewer-administered questionnaire was used to collect information from the participants and the ICT register of ART clients was also used to complement the data. ART clients registered on randomly selected numbers using a table of random numbers from ICT registers were interviewed at the time of their ART follow-up appointment or otherwise contacted and those on the appointment spacing model, a phone interview was done and their record at the ART was also reviewed.

Factors	Power of study	Confidence level	Unexposed to exposed ratio	AOR	%Outcome in exposed	%Outcome in unexposed	Sample size (Fleiss)
Disclosure status	80%	95%	0.185	13.68	92.3%(21)	46.7%	44
Months on ART	80%	95%	0.185	3.8	88.6%(21)	66.7%	189

Table 1. Calculated sample size for second objective using Epi info stat calc function. ART = Anti-Retroviral Therapy, AOR = Adjusted Odds Ratio.

Data analysis procedures

Data were entered into Epi data version 3.1 and then exported to SPSS version 24. Descriptive statistics, including percentages, frequencies, and means, were computed. The strength of the association between the uptake of index case testing and independent variables was assessed using odds ratios (ORs) with their corresponding 95% confidence intervals (CI). After conducting bivariable binary logistic regression analysis, variables with p-value ≤ 0.25 were included in the multivariable binary logistic regression model. Potential confounding effects were controlled through multivariable logistic regression analysis. The association between the explanatory and dependent variables was assessed at a significance level of 0.05. Variables that show a p-value < 0.05 in the multilevel model were considered statistically significant. Assumptions for binary logistic regression were verified, including the binary nature of the outcome variable and the independence of observations. Multicollinearity among independent variables was assessed using the Variance Inflation Factor (VIF), with values below 10 indicating no significant multicollinearity. Model fit was evaluated using the Hosmer–Lemeshow goodness-of-fit test, with a p-value > 0.05 indicating adequate model fit.

Data quality management

The questionnaire was initially prepared in English and then translated into the local language, Afaan Oromo, and subsequently back-translated to English to ensure conceptual clarity and consistency. One week before the actual data collection, a pre-test was conducted involving on 5% of the total sample size at Negelle Arsi Health Center. Feedback from both pre-test participants and data collectors was used to improve and refine the questionnaire. The principal investigator provided training to data collectors and supervisors on the data collection procedure. Collected data were carefully reviewed for completeness and internal consistency.

Results

Socio-demographic characteristics of index ART clients

The response rate of this study was 99.1%, with 336 out of 339 individuals participating. The mean age of the participants was 33.28 years (± 9.97 SD), with the majority falling within the 25–39 age range. Among the respondents, 211 (62.8%) were female, and 180 (53.6%) were married. Most participants, 266 (79.2%), resided in urban areas, while 70 (20.8%) were from rural settings. Regarding educational status, the largest proportion, 115(34.2%), had completed primary education. Additionally, 242(72%) of the participants reported having access to mass media (Table 2).

HIV testing and treatment related information

Among the participants, 270(80.4%) were aware of the index case HIV testing service and its importance. Regarding the uptake of index case testing, 214 participants (63.7% with 95% CI: 58.5-69%) reported that at least one family member had been tested for HIV through index case testing.

Among all participants, 225 (67%) had disclosed their HIV status, primarily to family members. Provider referral was the preferred referral method of HIV testing for 173 (51.5%) of the respondents, while facility-based testing was favored by 224(66.7%). Notably, 76.2% of participants reported experiencing HIV-related stigma following their test results (Table 3).

Factors associated with family-based HIV index case testing

The results of the multivariable binary logistic regression analysis indicated that individuals who had been on ART for less than one year were 95% less likely to conduct partner and family-based HIV index case testing compared to those on ART for four years or more (AOR: 0.05; 95% CI: 0.02–0.15). Similarly, participants who had not disclosed their HIV status to any family member had a 94% reduced likelihood of engaging in index case testing (AOR: 0.06; 95% CI: 0.02–0.14) compared to those who had disclosed. Having children significantly influenced testing uptake; individuals without children were 90% less likely to participate in index case testing than those with children (AOR: 0.10; 95% CI: 0.03–0.30). Conversely, participants who did not report experiencing stigma were approximately 13 times more likely to have at least one family member tested through index case testing than those who experienced stigma (AOR: 13.11; 95% CI: 2.58–66.74) (Table 4).

Discussions

The study findings revealed that 63.7% (95% CI: 58.5–69%) of patients had at least one family member tested for HIV through family-based index case testing. Although this figure falls short of the anticipated uptake for index case testing (ICT), it represents a promising trend that could be further improved with targeted interventions. Comparable results were reported in a study from Southern Ethiopia, where 60.6% of HIV patients on ART had tested at least one family member[22]. However, the ICT uptake in this study is relatively higher than reports from other parts of Ethiopia, where uptake ranged from 38.7 to 49.5%[23,24], yet significantly lower than in regions where uptake exceeded 80%[25–27]. This discrepancy may be partly due to the heightened levels of stigma in the study setting, which likely hinder disclosure and testing. Stigma, discrimination, social inequality, and gender-based violence remain major barriers to HIV testing and broader prevention strategies[28]. The considerable regional variation in ICT uptake suggests uneven progress in achieving national HIV elimination goals. Furthermore, while this study only assessed whether at least one family member was tested, it raises concern that the proportion of individuals testing all eligible family members may be substantially lower. These findings highlight critical gaps and emphasize the need for intensified efforts to strengthen index case testing as a key strategy in HIV prevention and control.

When compared to the magnitude of index case testing (ICT) reported in other African countries, the uptake observed in this study is notably lower. Several countries across the continent have demonstrated more

Variables	Categories of variables	Frequency	Percentage
Age	Less than 25 years	58	17.3
	25–39 years	185	55.1
	40 and above	93	27.7
Sex	Male	125	37.2
	Female	211	62.8
Religion	Orthodox	130	38.7
	Protestant	79	23.5
	Muslim	77	22.9
	Catholic	24	7.1
	Others	26	7.7
Educational status	No formal education	130	38.7
	Primary education	115	34.2
	Secondary and above	91	27.1
Marital status	Single	78	23.2
	Married	180	53.6
	Divorced/ Widowed	78	23.2
Residence	Urban	266	79.2
	Rural	70	20.8
Occupational category	Employed/students	59	17.6
	Merchant	57	17.0
	Farmer/housewife	102	30.4
	*Others	118	35.1
Monthly income (Eth. Birr)	Less than 2000	161	47.9
	2000–3999	108	32.1
	4000 and above	67	19.9
Possession of mass-medias	Yes	242	72
	No	94	28
Have children less than 19 years	Yes	210	62.5
	No	126	37.5

Table 2. Socio-demographic characteristics of index ART patients eligible for ICT among ART clients in Shashemene town, March 2022 (n = 336). *Commercial daily laborers, sex workers, and drivers.

promising levels of ICT implementation, with reports indicating uptake rates of 70% in Nigeria[29], 75% in Lesotho[12], and as high as 95% in Zimbabwe[14]. These figures underscore the relative underperformance in the study setting. Moreover, when assessed against the global 95-95-95 targets, which aim for 95% of people living with HIV to know their status, the current level of ICT in this study falls significantly short of expectations. This gap highlights the urgent need for strengthened strategies to enhance the reach and effectiveness of index case testing within the local context.

This study also examined the factors associated with the practice of index case testing. In this regard, a range of variables were considered in the analysis using a binary logistic regression model. The analysis identified several factors that were significantly associated with ICT uptake, including having children or adolescents under 19 years of age, duration of antiretroviral therapy (ART), HIV status disclosure, and experiences of stigma.

The result revealed that HIV-positive patients not having children or adolescents less than 19 years old had 90% lower odds of practicing ICT. This might be explained by the fact that the prioritization of ICT by families might be to ensure the safety of their children which encourages families to test the household members. Furthermore, individuals having children often have better family ties than those not having children which may encourage open discussion and disclosure which is a key step for ICT initiation.

Duration of ART was one of the variables significantly affecting the practice of ICT. In this regard, the odds of having at least one family member tested among those who stayed one year or less on ART was 95% less when compared to those who stayed four years or more. Comparable findings were reported from studies in Western Ethiopia[21] and elsewhere in other regions in Ethiopia, as well as from other African countries[22,23,26,27,30]. This is because as the patients stay on ART, there will be frequent exposure to counseling about the importance of HIV testing particularly about index case testing. Through time there will also be improved trust of the health system and the providers. Furthermore, those in the early duration of ART treatment are more prone to stigma and discrimination making them frustrated to disclose their status and initiation of ICT.

From the findings, the odds of index case-based HIV testing were found to be about 94% lower among index cases who didn't disclose their HIV status to their partner and/or family when compared to those who have disclosed their HIV status. This finding is well supported by a study from Western Ethiopia where individuals who disclosed their status were nearly ten times more likely to engage in ICT[21]. This finding is also supported by

Variables	Categories of variables	Frequency	Percentage
Awareness about index case HTS*	Yes	270	80.4
	No	66	19.6
Index case testing	Yes	214	63.7
	No	122	36.3
Preferred referral means for HTS	Client referral	41	12.2
	Provider referral	173	51.5
	Dual referral	106	31.5
	Contractual referral	16	4.8
Preferred place for HTS	Home-based	76	22.6
	Community-based	36	10.7
	Facility-based	224	67.7
Preferred time for HTS	Regular work time	90	26.8
	Evening	87	25.9
	Weekend/holiday	159	47.3
Disclosure status	Yes	225	67.0
	No	111	33.0
To whom disclosed the status	Family members	109	32.4
	Spouse/sexual partner	93	27.7
	Other	23	6.9
Length of stay on ART	One year or less	88	26.2
	Two to three years	91	27.1
	Four years and above	157	46.7
Experienced intimate partner violence	Yes	112	33.3
	No	224	66.7
Incident of stigma due to HIV-positive test result	Yes	256	76.2
	No	80	23.8

Table 3. HIV testing and treatment related information among ART clients, Shashemene town, May 2022 (n = 336). *HTS = HIV Testing Service.

a study conducted in Southern Ethiopia[22], Kule Refugee Camp, Gambella region[23], and Woliso town in central Ethiopia[27]. The findings reaffirm that disclosure of HIV-positive status plays an important role for both HIV-positive clients and the family at large. It adequately addresses the emotional, social, and practical consequences of the disease among the families. ART services require that patients should have to disclose their HIV status to their treatment supporters. This implies that HIV status disclosure inspires families to seek HIV testing and counseling and is a key issue for the further step of telling a spouse to get tested for HIV and creates a favorable environment by reducing stigma and encouraging trust among families.

Furthermore, this study found that index cases who did not experience stigma related to their positive HIV status were 13 times more likely to engage in family-based HIV index case testing compared to those who did report stigma. Although studies that have examined stigma as a factor influencing HIV testing were limited, a study from Côte d'Ivoire reported stigma as a major challenge in the implementation of index testing[13]. Similar findings reported from studies in other parts of the world highlighted stigma as a considerable barrier to HIV testing including index case testing[31,32]. This is particularly due to the fact that stigma could discourage open communication about HIV status among families, those reporting incidents of stigma may be less likely to get engaged with the healthcare services. The fear of perceived stigma and self-stigma influences the active concealment of telling one's HIV status from others/family or partner. Continuous concealment of one's HIV status and delayed disclosure limit the opportunities for counseling, testing, and treatment.

The contribution of intimate partner violence to poor HIV testing is also considerable. In this study, the contribution of intimate partner violence has been significant in bivariate analysis and turned out to be on the borderline in multivariable analysis. However, a range of studies show that intimate partner violence is one of the factors negatively affecting HIV testing practices including the index case testing[33–35]. This is because intimate partner violence may lead to fear of violent reactions due to disclosure of HIV status, restricted autonomy that may affect health-seeking behavior, and may enhance other psychosocial barriers.

This study has addressed important areas that a timely issues with regard to HIV care considering its expected significant contribution to the HIV prevention and control goal of 2030. The study identified findings that have public health significance, and which need due consideration in HIV prevention and control programs. This study focused on more practical indicator to measure the uptake of ICT which testing at least one family member. This allows for a more clear and verifiable measure of engagement in ICT—a proxy measure for household-level HIV testing reach. However, the study has considerable limitations. The use of "at least one family member tested" as the main indicator may underestimate the gap in comprehensive ICT uptake. On the other hand, the cross-sectional nature of the study may not show temporal relationships for factors contributing to poor ICT

Variables	Category of variables	HIV tested		COR (95% CI)	AOR (95% CI)
		No	Yes		
Age category	Less than 25	32	26	0.28(0.13–0.54)	4.57(0.82–25.51)
	25–39	67	118	0.58(0.33–1.01)	1.42(0.52–3.84)
	40 and above	23	70	1	1
Sex	Male	40	85	1	1
	Female	82	129	0.74(0.46–1.18)	0.98(0.40–2.39)
Educational status	No formal education	52	78	0.94(0.54–1.62)	-
	Primary education	35	80	1.43(0.80–2.55)	-
	Secondary and above	35	56	1	-
Income	Less than 1999	60	101	1	-
	2000 to 3999	37	71	1.14(0.69–1.90)	-
	4000 and above	25	42	1.00(0.55–1.80)	-
Occupation	Employee/student	23	36	1	1
	Merchant	26	31	0.76(0.36–1.59)	0.50(0.12–2.04)
	Farmer/housewife	24	78	2.08(1.04–4.16)	1.56(0.38–6.36)
	Others	49	69	0.90(0.48–1.70)	1.61(0.47–5.47)
Marital status	Single	46	32	1	1
	Married	45	135	4.31(2.46–7.58)	1.91(0.43–8.48)
	Divorced/widowed	31	47	2.18(1.15–4.13)	0.83(0.17–4.06)
Residence	Urban	98	168	1	-
	Rural	24	46	1.12(0.64–1.94)	-
Have children	Yes	47	163	1	1
	No	75	51	0.20(0.12–0.32)	0.10(0.03–0.30)*
Possession of mass-media	Yes	71	171	1	1
	No	51	43	0.35(0.21–0.57)	0.46(0.18–1.15)
Months on ART	One year or less	74	14	0.02(0.01–0.05)	0.05(0.02–0.15)*
	Two to three years	31	60	0.24(0.12–0.46)	0.59(0.21–1.62)
	Four years and above	17	140	1	1
Disclosure status	Disclosed	33	192	1	1
	Not disclosed	89	22	0.04(0.02–0.08)	0.06(0.02–0.14)*
ICT awareness	Yes	95	175	1	-
	No	27	39	0.39(0.45–1.36)	-
Incident of stigma	Yes	119	143	1	1
	No	3	71	19.69(6.05–64.13)	13.11(2.58–66.74)*
Intimate partner violence	Yes	65	47	1	1
	No	57	167	4.05(2.51–6.55)	2.39(1.00-5.83)

Table 4. Bivariate and multivariate binary logistic analysis of factors associated with Family-Based index case HIV testing among ART clients in Shashemene town, May 2022. COR = Crude Odds Ratio, AOR = Adjusted Odds Ratio, CI = Confidence Interval, HTS= HIV Testing Service, *= factors significantly associated, COR = Crude Odds Ratio, AOR = Adjusted Odds Ratio, CI = Confidence Interval, Model fitness of good was checked by Hosmer-Lemeshow (p-value = 0.12), and Nagelkerke $R^2 = 0.755$ which show strong fit of the model to the data.

practice. HIV status disclosure is based on self-report, which can be vulnerable to recall and social desirability biases. The interview was conducted based on the client's perspectives, which may not reflect the whole picture of the HIV testing service including the barriers related to the health care structure. Lastly, the small sample size, and focus on setups in the facilities in the town settings, may hinder the generalizability of these findings.

Conclusion

Besides the promising uptake index case testing in this study, the reach is significantly suboptimal particularly when considering the coverage of whole family members eligible for testing. The figure is also lower when compared to other studies conducted in Ethiopia and other setups in other African countries. To improve the ICT uptake to smell its full potential benefit, greater works are needed to be done particularly on enhancing disclosure, combating stigma related to HIV status, and specifically with a main focus on newly enrolled patients. As Ethiopia continues to make significant progress toward achieving HIV epidemic control, the ICT strategy will play an increasingly vital role in reaching high-risk populations and should be further strengthened.

Data availability

The datasets used during the current study are available from the corresponding author upon reasonable request.

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References

1. UNAIDS. Fact sheet 2024—Latest global and regional HIV statistics on the status of the AIDS epidemic (2024).
2. UNAIDS. Global AIDS Monitoring 2024 Indicators and questions for monitoring progress on the 2021 Political Declaration on HIV and AIDS UNAIDS 2023 GUIDANCE 2 (2021).
3. Ethiopian Public Health Institute (EPHI). HIV Related Estimates and Projections in Ethiopia for the Year 2022–2023 Addis Ababa. HIV Relat Estim Proj Ethiop Year (2023).
4. Frescura, L. et al. Achieving the 95 95 95 targets for all: A pathway to ending AIDS. *PLoS ONE* **17**(8), e0272405 (2022).
5. UNAIDS. Fast Track: Ending the HIV/AIDS epidemic by 2030 (2020).
6. UNAIDS. 2024 global AIDS report—The Urgency of Now: AIDS at a Crossroads. Available from: http://www.wipo.int/ (2024).
7. Dalal, S. et al. Improving HIV test uptake and case finding with assisted partner notification services. *AIDS*. **31**(13), 186776 (2017).
8. Sundararajan, R., Ponticiello, M., Nansera, D., Jeremiah, K. & Muyindike, W. Interventions to increase HIV testing uptake in global settings. *Curr. HIV/AIDS Rep.* **19**(3), 184-193 (2022).
9. Chamie, G., Napierala, S., Agot, K. & Thirumurthy, H. HIV testing approaches to reach the first UNAIDS 95% target in sub-Saharan Africa. *Lancet HIV* **8**, e225-236 (2021).
10. WHO. HIV statistics, globally and by WHO region (2024).
11. Katbi, M. et al. Effect of clients Strategic Index Case Testing on community-based detection of HIV infections (STRICT study). *Int. J. Infect. Dis.* **1**(74), 54–60 (2018).
12. Jubilee, M. et al. HIV index testing to improve HIV positivity rate and linkage to care and treatment of sexual partners, adolescents and children of PLHIV in Lesotho. *PLoS ONE* **14**(3), e0212762 (2019).
13. Mugisha, N. et al. Implementation process and challenges of index testing in Côte d'Ivoire from healthcare workers' perspectives. *PLoS ONE* **18**(2), e0280623 (2023).
14. Mahachi, N. et al. Sustained high HIV case-finding through index testing and partner notification services: experiences from three provinces in Zimbabwe. Available from: https://doi.org/10.1002/jia2.25321/full (2019).
15. CHASS. Implementation of Community Index Case Testing Approach (2017).
16. Fhi360. Index Testing, Risk Network Referral (RNR), Enhanced Peer Outreach Approach (EPOA): What's the Difference? (2019).
17. FMOH. HIV national strategic plan 2023/24 2026/27 (2023).
18. WHO. Policy brief: Consolidated guidelines on HIV testing services for a changing epidemic, Geneva, Vol. 33, AIDS (Lippincott Williams and Wilkins, 2019).
19. Feyasa, M. B., Gebre, M. N. & Dadi, T. K. Levels of HIV/AIDS stigma and associated factors among sexually active Ethiopians: analysis of 2016 Ethiopian Demographic and Health Survey Data. *BMC Public Health* **22**(1), 1080 (2022).
20. Turi, E. et al. High perceived stigma among people living with HIV/AIDS in a resource limited setting in Western Ethiopia: The effect of depression and low social support. *HIV/AIDS - Res. Palliat. Care* **13**, 389–397 (2021).
21. Edosa, M., Merdassa, E. & Turi, E. Acceptance of index case HIV testing and its associated factors among HIV/AIDS clients on ART follow-up in West Ethiopia: A multi-centered facility-based cross-sectional study. *HIV AIDS Res. Palliat. Care* **14**, 451–460 (2022).
22. Assefa, E. & Figa, Z. Acceptance of the index case HIV testing and associated factors among anti-retroviral therapy patients in public health facilities in Gedeo Zone, Southern Ethiopia. Cross-sectional study design with document review. *Inquiry* **61**, 469580241271185 (2024).
23. Wegu, Y., Sileshi, T. & Melis, T. Assessment of index case family testing among adults attending art clinic at Kule Refugee Camp, Southwest Ethiopia: 2021. *HIV AIDS Res. Palliat. Care* **14**, 13–21 (2022).
24. Asmare, L., Yigzaw, Z. & Alemu, T. Magnitude of HIV index case testing among HIV positive clients attending ART clinic in University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia, 2023. *J. AIDS HIV Treat.* **6**, 37–43 (2023).
25. Seyoum, F., Belachew, G., Beyene, G. B. & Atinafu, W. T. Magnitude and factors associated with partner and family-based index case HIV testing among clients on anti-retroviral therapy follow-ups at Holeta Health Centre, Oromia, Ethiopia. *Afr. J. Nurs. Midwifery* **26**(1), 14 (2024).
26. Hussen, M. A., Kadire, D., Kefeni, B. T., Abdu, Z. & Chilo, E. Index case HIV testing uptake and its associated factors at Oromia, Ethiopia. *J. Int. Assoc. Provid. AIDS Care* **1**, 23 (2024).
27. Uma, T. H. & Bedada, H. G. Assessment of the proportion and the factors associated with partner and family-based index case HIV testing in Woliso Town, Oromia, Ethiopia: A cross-sectional study. *AIDS Care* **35**(9), 1322–1328 (2023).
28. Stangl, A. L. et al. Removing the societal and legal impediments to the HIV response: An evidence-based framework for 2025 and beyond. *PLoS ONE* **17**(2), e0264249 (2022).
29. Shallangwa, M. M. et al. Sociodemographic factors associated with acceptance of index case testing among newly diagnosed human immunodeficiency virus-positive clients in southern borno, Nigeria. *Int. J. STD AIDS* **35**(1), 4–10. https://doi.org/10.1177/09564624231199521 (2024).
30. Yumo, H. A. et al. Parental and child-level predictors of HIV testing uptake, seropositivity and treatment initiation among children and adolescents in Cameroon. *PLoS ONE* **15**(4), e0230988 (2020).
31. Yu, H. Social stigma as a barrier to HIV testing: Evidence from a randomized experiment in Mozambique. *J. Dev. Econ.* **161**, 103035 (2023).
32. Thapa, S. et al. Stigma reduction in relation to HIV test uptake in low- and middle-income countries: A realist review. *BMC Public Health* **18**(1), 1277 (2018).
33. Sullivan, T. P. The intersection of intimate partner violence and HIV: Detection, disclosure, discussion, and implications for treatment adherence. Available from: https://doi.org/10.1177/10249079100 (2019).
34. Sanena, M. et al. Intimate partner violence among HIV index case testing clients in Malawi, a mixed-methods study. *PLOS Glob. Public Health* **5**(2), e0003818 (2025).
35. Kuchukhidze, S. et al. The effects of intimate partner violence on women's risk of HIV acquisition and engagement in the HIV treatment and care cascade: A pooled analysis of nationally representative surveys in sub-Saharan Africa. *Lancet HIV* **10**(2), e107–e117 (2023).

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Author contributions

M.S. and F.M. contributed to the conception of the ideas, designing, methodology, administration, analysis, and write-up, and B.A. and H.D. contributed to designing, methodology, analysis, and write-up. All authors approved the final manuscript.

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Declarations

Competing interests

The authors declare no competing interests.

Additional information

Correspondence and requests for materials should be addressed to M.F.S.

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