Exploring HIV Self-Testing: Barriers and Facilitators Among Undergraduate Students in Nairobi, Kenya

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VISUAL ABSTRACT

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ABSTRACT

PURPOSE Infection with HIV remains a global health challenge, with >36.9 million individuals living with HIV in 2017. Despite efforts to increase HIV testing and treatment, traditional services have not effectively reached marginalized communities. The use of HIV self-testing (HIVST) offers a discreet and accessible alternative, potentially improving testing rates among at-risk populations including university students in Kenya.

METHODS We performed a cross-sectional analytical study using a multistage cluster sampling technique among undergraduate students at Kenyatta University. Clusters from various academic departments were randomly selected, and individual students were chosen for participation. Ethical approval was obtained from the Kenyatta University Ethics Review Committee and the National Commission for Science, Technology and Innovation. Participants were informed of the study's aims and their right to withdraw at any time. We collected data via questionnaires administered by trained enumerators.

RESULTS Participants' age averaged 21.1 years, with a majority being single, female, and full-time students. Substantial HIV knowledge was observed, and nearly one-half were aware of preexposure prophylaxis. Facility-based testing was prevalent, with significant preference for the OraQuick self-test kit among those who self-tested. Fear of positive results and stigma were primary barriers, whereas motivations for self-testing included routine use and protecting loved ones. Media exposure, especially the "Chukua Selfie" campaign, correlated with greater HIVST usage.

CONCLUSIONS This study highlights the importance of school-based interventions and the critical role of academic institution support in HIV prevention. Participants' substantial knowledge of HIV contrasts with findings from other regions, underscoring the need for targeted education and safe-sex promotion. Addressing fear and stigma via comprehensive interventions is essential for improving HIVST uptake. Integrating HIVST into existing prevention programs can enhance HIV care frameworks in East Africa. Strategies to destigmatize HIV, ensure privacy in testing, and address misconceptions are vital for improving health outcomes among young individuals. Continuous efforts to strengthen self-testing programs are crucial to achieving global HIV targets.

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INTRODUCTION

Global estimates from 2017 indicate that there are more than 36.9 million individuals living with HIV, with approximately 21.7 million receiving antiretroviral therapy.[1] New HIV infections that year were estimated to be 1.4-2.4 million, with a global death toll of approximately 940,000 as a result of AIDS-related illnesses.[1] The United Nations Joint Program UNAIDS has set ambitious 95-95-95 goals to be achieved by 2030, aiming for 95% HIV status awareness, 95% of HIV-positive individuals on antiretroviral therapy (ART), and 95% of those on ART achieving viral suppression. However, traditional HIV testing services have not effectively reached marginalized communities and individuals with limited testing access.[2-7]

A study on HIV risk perceptions among youths aged 15-24 years in East Africa found that lack of disclosure of HIV status and inconsistent condom usage contribute to intentional HIV transmission.[8] Factors such as peer pressure, financial insecurity, and transactional sexual relationships exacerbate this issue. Young women often engage in risky sexual practices, owing to limited influence over their partners' decisions such as those regarding condom use. Older men and competition among

young men for sexual dominance also play roles in transmission, with youths perceiving HIV risk as normal and underestimating its severity.[8]

The Kenya Population-Based HIV Impact Assessment (KENPHIA) and the National AIDS and STI Control Program (NASCOP) identified a statistically significant HIV prevalence rate of 4.9% among those aged 15-64 years in Kenya, with Nairobi at 9.3%, and Kiambu at 4.1%.[9,10] The annual HIV incidence is approximately 35,000 new infections, with 1.44% among those aged 14-25 years. Despite ongoing efforts, challenges such as stigma, limited health care, and insufficient funding persist. Targeted measures are essential to decrease the numbers of new cases and improve outcomes, especially among high-risk populations such as young people.[9,10]

The emergence of HIV self-testing (HIVST) as a potential solution offers discreet and convenient testing options.[11] The World Health Organization has approved various HIVST kits, including OraQuick (OraSure Technologies Inc), which uses an oral swab, and others that use blood samples obtained with finger pricks.[12] In Kenya, licensed kits include OraQuick and INSTI (bioLytical Laboratories Inc) (Figure 1), all varying in sample type and complexity. The use of HIVST has been shown to improve testing rates among at-risk populations. More than 1 million kits have been distributed and funded across Kenya by the Ministry of Health and the United States Agency for International Development to increase accessibility and reach marginalized communities.[9,10,13]

Challenges in HIVST implementation include concerns about result accuracy, lack of counseling, and ensuring linkage to care for positive diagnoses.[13] Given the increased risk of HIV transmission among university students in Kenya, we aimed to assess the awareness and acceptance of HIVST among undergraduates. Expanding HIVST is crucial to target key populations and address disparities in testing access.[9,10,14]

METHODS

We used a cross-sectional analytical research design with a multistage cluster sampling technique. We selected random clusters of students from various academic departments within the main sampling units and secondary stage units. The process involved selecting individual students from each cluster and repeating the process without replacement until the desired sample size was reached. The completed list was then provided to competent enumerators for questionnaire administration. We adjusted the sample size to address the unequal distribution of students across courses, based on the population size, and the sample was evenly distributed among specific years of study for each course. The Kenyatta University Ethics Review Committee (PKU/2598/11723) and the National Commission for Science, Technology and Innovation (NACOSTI/P/22/21909) granted ethical permission for the study. The study's volunteers were informed about the study's advantages and drawbacks and about their autonomy to withdraw at any point. The Kenyatta University administration also granted permission (KU/DVCR/RCR/VOL.3/352) for the study to be conducted with its students. The participants were reassured that their academic program would not be affected by the study.

Sample Size Determination

We used the Fisher formula for sample size calculation as follows:

$n = [(Z^2 P(1-P)] \div d^2$,

where n = required sample size (where population is >10,000) (N = 70,000 [university population]),

Z = Z value corresponding to the desired confidence level (eg, 1.96 for 95% confidence),

P = estimated proportion of the population with the characteristic of interest (eg, prevalence of HIV in the population), which is 55% (55% of youth living with HIV in 2017 according to Kenya HIV Estimates, Report 2018),[15]

Figure 1. Examples of HIV self-testing kits (INSTI and OraQuick).

d = margin of error (precision; taken to be 5%).
Therefore,
$n = [Z^2 P(1-P)] \div d^2$,
$n = [1.96^2 \times 0.55 \times (1\text{-}0.55)] \div (0.05)^2 = 380.3184$,
$n_1 = 380.3184$
Adjusting for the size of the population, given that the targeted population at Kenyatta University is >10,000,
$n_2 = n_1 \times [N/(N + n_1)]$,
$n_2 = 380.3184 \times [70{,}000/(70{,}000 + 380.3184)] = 378.2632$
$n_2 = 378.2632$
Adjusting for the response rate to determine the final sample size, the estimated response rate (r) is 95%,
$n = n_2/r$
$n = 378.2632/0.95 = 398.1718$
Final n = 398.

Table 1. Sociodemographic Characteristics of Study Participants (N = 398)

Characteristic	No. (%)
Age group, y	
18-21	257 (64.6)
22-25	141 (35.4)
Gender	
Female	202 (50.8)
Male	196 (49.2)
Marital status	
Single	390 (98.0)
Married	8 (2.0)
Religion	
Christian	373 (93.7)
Muslim	25 (6.3)
Mode of study	
Full time	391 (98.2)
Part time	7 (1.8)
Residency status	
In school	137 (34.4)
Out of school	261 (65.6)
School	
Education	122 (30.7)
Business	71 (17.8)
Humanities and Social Sciences	40 (10.1)
Pure and Applied Sciences	32 (8.0)
Economics	29 (7.3)
Public Health and Applied Human Sciences	24 (6.0)
Creative, Film, and Media Studies	17 (4.3)
Hospitality and Tourism	17 (4.3)
Law	8 (2.0)
Environmental Sciences	7 (1.8)
Medicine	7 (1.8)
Agriculture and Enterprise Development	6 (1.5)
Architecture	6 (1.5)
Engineering and Technology	6 (1.5)
Nursing Sciences	6 (1.5)

RESULTS

The average age of the participants was 21.1 years, with a majority being single, female, Christian, full-time students majoring in Education, and living off-campus (Table 1). The majority of students had tested for HIV and used facility-based testing (voluntary counseling and testing) (Table 2). Of those who self-tested, the OraQuick kit was preferred by 60.8% of participants.

Barriers to the Use of HIV Self-Testing

Participants exhibited substantial knowledge about HIV, recognizing it as a serious disease primarily transmitted via sexual contact (Table 3). Approximately 80% to 85% of participants were informed about HIV preexposure prophylaxis, the lack of a definitive cure, and the possibility of living a normal life with highly active antiretroviral therapy. Participants had a favorable view of HIVST; most had been tested within the past 3 to 6 months, including with self-test kits. Among the 97 participants who used HIVST, routine use and protecting loved ones were primary motivations. The predominant reason for avoiding self-testing was the fear of a positive result, whereas fear of stigmatization was the main obstacle to facility-based testing.

Facilitators to the Use of HIV Self-Testing

Media exposure, notably the "Chukua Selfie" campaign, correlated with greater usage of HIVST (Table 4). Participants generally favored self-testing and would recommend it to others. Several facilitators, such as knowledge about HIV/AIDS, awareness of preexposure prophylaxis, and considering oneself sexually active, were also identified.

Table 2. HIV Self-Testing Characteristics of Study Participants

Characteristic	No. (%)
Ever tested for HIV (N = 398)	
Yes	260 (65.3)
No	138 (34.7)
Ever used HIV self-test kit (N = 398)	
Yes	97 (24.4)
No	301 (75.6)
HIV self-test used (n = 97)	
INSTI	25 (25.8)
OraQuick	59 (60.8)
Atomo Diagnostics HIV Self-Test	13 (13.4)
Last time tested for HIV (n = 260)	
Within 3 months	69 (26.5)
Within 6 months	75 (28.8)
> 1 year	116 (44.6)
Type of test done at that time (n = 260)	
Facility test (VCT)	185 (71.2)
HIV self-testing	75 (28.8)

VCT = voluntary counseling and testing.

Comparing Barriers With Facilitators in the Uptake of HIV Self-Testing

When comparing barriers and facilitators for HIVST among undergraduates, most participants had not used HIVST, and no significant statistical link was found between demographic factors (age, sex, marital status) and self-testing usage (Table 5). However, a significant association ($P < .001$) was observed between HIVST use and awareness of HIV preexposure prophylaxis, suggesting that knowledge of HIV prevention strategies such as preexposure prophylaxis might play a key role in encouraging self-testing.

Table 3. Barriers to Use of HIV Self-Testing

Barrier	No. (%)
Knowledge about HIV (N = 398)	
HIV/AIDS is a serious disease	
Yes	364 (91.5)
No	18 (4.5)
Unsure	16 (4.0)
How HIV is spread	
Sexually	390 (98.0)
Mother to child	349 (87.7)
Blood transfusion	327 (82.2)
Intravenous drug use	180 (45.2)
Aware of preexposure prophylaxis	
Yes	190 (47.7)
No	160 (40.2)
Unsure	48 (12.1)
HIV has a cure	
Yes	20 (5.0)
No	341 (85.7)
Unsure	37 (9.3)
Live normal life with HAART	
Yes	316 (79.4)
No	28 (7.0)
Unsure	54 (13.6)
HIV testing acceptance	
Ever tested for HIV (N = 398)	
Yes	260 (65.3)
No	138 (34.7)
Ever used HIV self-test kit (N = 398)	
Yes	97 (24.4)
No	301 (75.6)
Last time tested for HIV (n = 260)	
Within 3 months	69 (26.5)
Within 6 months	75 (28.8)
>1 year	116 (44.6)
Type of test done at that time (n = 260)	
Facility test (VCT)	185 (71.2)
HIV self-testing	75 (28.8)
HIV self-test used (n = 97)	
INSTI	25 (25.8)
OraQuick	59 (60.8)
Atomo Diagnostics HIV Self-Test	13 (13.4)

HAART = highly active antiretroviral therapy; VCT = voluntary counseling and testing.

DISCUSSION

This study, primarily involving undergraduate students aged 18-21 years, offers insights particularly relevant to this demographic. With nearly equal sex representation, the findings might apply broadly to both men and women, mirroring Hatzold et al's findings on first-time testers among those

Table 4. Facilitators to Use of HIV Self-Testing

Facilitator	No. (%)
Acceptability of HIV self-testing (n = 97)	
Preferred HIV self-test kit	
Blood	72 (74.2)
Oral	22 (22.7)
None	3 (3.1)
Instructions on kit easily understood	
Yes	84 (86.6)
No	13 (13.4)
Know difference between facility testing (VCT) and HIV self-testing services	
Yes	75 (77.3)
No	22 (22.7)
Preference for HIV testing	
Health facility	53 (54.6)
Privately at home	44 (45.4)
Easily accessed HIV self-test kits	
Yes	64 (66.0)
No	33 (34.0)
Sexual behavior factors	
Ever had sex (N = 398)	
Yes	278 (69.8)
No	120 (30.2)
Consider self sexually active (N = 398)	
Yes	228 (57.3)
No	50 (12.6)
Never had sex	120 (30.2)
Recommendation of HIV self-testing and its media campaign	
Know about campaign dubbed "Chukua Selfie" (N = 398)	
Yes	189 (47.5)
No	209 (52.5)
Recommend HIV self-testing (n = 97)	
Yes	97 (100.0)

VCT = voluntary counseling and testing.

aged 16-24 years.[16] The predominance of single, predominantly Christian participants highlights the need for tailored HIV testing and prevention interventions, reflecting similar conclusions by Buldeo and Gilbert.[17] The predominance of full-time students suggests that school-based interventions could effectively promote HIV testing and prevention, supported by evidence from meta-analyses and systematic reviews.[18] The majority of students, particularly those with out-of-school residency status, were more likely to rely on family financial support as opposed to government or employment funding for their financial needs, underscoring the role of family in HIV prevention and aligning with Bassett et al's findings on addressing financial barriers to healthcare access.[19]

Barriers to the Use of HIV Self-Testing

Participants exhibited high knowledge of HIV/AIDS, contrasting with a Malaysian study in which limited understanding of non-HIV sexually transmitted diseases and risky behaviors was reported.[20] This comparison underscores the need for broad-based sexual health education that covers HIV/AIDS and other sexually transmitted diseases comprehensively.[21] A substantial number of participants had undergone HIV testing, indicating a positive attitude toward testing, similar to Marks et al's findings on HIVST preferences among young men.[22] Major barriers identified included fear of positive results and limited access to self-test kits, paralleling Qin et al's findings that HIVST can decrease stigma.[23] The presence of risky sexual behaviors among some participants highlights the ongoing need for enhanced safe sex promotion. Stigma emerged as a barrier, consistent with Clifton et al's study on HIV risk perception and testing behavior in the British population, which revealed a disconnect between perceived risk and testing behavior.[24]

Facilitators to the Use of HIV Self-Testing

Participants generally held positive attitudes regarding individuals living with HIV, although some fears and misconceptions persisted. Media, particularly social media, effectively raised awareness of HIVST, echoing Birdthistle et al's findings on the effect of a multimedia campaign in South Africa.[25] Participants valued the privacy and ease of interpreting self-test results at home. The accessibility and affordability of self-test kits were crucial, aligning with prior research on decreasing stigma via HIVST.[23] A high willingness to repeat usage among past self-test users paralleled the 4 Youth by Youth Nigerian study by Iwelunmor et al, which emphasized youth engagement in HIV prevention.[26] Facilitators, such as HIV prevention education, routine testing, and protecting loved ones, were also statistically significant, supported by a study among African-American youths in the US state of North Carolina that highlighted these factors as enablers for self-testing.[27]

Table 5. Comparing Barriers and Facilitators to Uptake of HIV Self-Testing Services

	Ever Used (n = 97), No. (%)	Never Used (n = 301), No. (%)	Odds Ratio (95% CI)	*P* Value
Barriers to use of HIV self-testing				
Age, y				
18-21	60 (61.9)	197 (65.4)	ref	
22-25	37 (38.1)	104 (34.6)	1.2 (0.7-1.9)	.520
Gender				
Male	40 (41.2)	156 (51.8)	ref	
Female	57 (58.8)	145 (48.2)	1.5 (1.0-2.4)	.071
Marital status				
Single	94 (96.9)	296 (98.3)	ref	
Married	3 (3.1)	5 (1.7)	1.9 (0.4-8.1)	.390
Facilitators to use of HIV self-testing				
Knowledge about HIV				
HIV/AIDS is a serious disease				
Yes	93 (95.9)	271 (90.0)	1.2 (0.4-3.7)	.752
No	4 (4.1)	14 (4.7)	ref	
Unsure	0 (0)	16 (5.3)	na	
Aware of HIV preexposure prophylaxis				
Yes	64 (66.0)	126 (41.9)	3.4 (1.9-5.8)	< .001
No	21 (21.6)	139 (46.2)	ref	
Unsure	12 (12.4)	36 (12.0)	2.2 (1.0-4.9)	.052
HIV has a cure				
Yes	3 (3.1)	17 (5.6)	0.5 (0.1-1.7)	.288
No	88 (90.7)	253 (84.1)	ref	
Unsure	6 (6.2)	31 (10.3)	0.6 (0.2-1.4)	.205

na = not applicable; ref = reference.

Barriers Compared With Facilitators in the Uptake of HIV Self-Testing Services

The finding that 24% of participants had used HIV self-test kits, a moderate uptake, was similar to findings in Malawi and Zimbabwe among young people.[28] Female students reported greater though not statistically significant usage of self-testing, contrasting with the Kenya AIDS Indicator Survey's report of greater testing in adolescent girls and young women.[29] Sexually active individuals were more inclined to use self-test kits, paralleling Izizag et al's findings on high acceptability among university students.[30] Individuals with negative attitudes regarding HIV-positive people were less likely to self-test. This diverged from Kumwenda et al's study, which highlighted fears of relationship strain due to HIV-discordant results among couples.[31]

Strategies to Mitigate HIV Stigma and Promote Health-Care–Seeking Behaviors

Given the findings that fear and stigma remain barriers to both HIVST and voluntary counseling and testing, it is crucial to situate these results within the larger discourse on mitigating HIV stigma and promoting health-care–seeking behaviors. Interventions should focus on destigmatizing HIV via education and community engagement, ensuring privacy and confidentiality in testing, and addressing misconceptions about HIV transmission and living with HIV. Increasing the availability and affordability of self-test kits, coupled with comprehensive sexual health education, can also empower individuals to seek testing and adopt safer sexual practices. These strategies align with global health goals of decreasing HIV-related stigma and improving access to HIV prevention and treatment services.

CONCLUSION

In East Africa, the stigma surrounding HIV is a substantial issue that needs to be addressed via comprehensive HIV prevention programs. By integrating self-testing into these programs, the current HIV framework can be improved, and a comprehensive strategy for HIV care can be established. Understanding the interaction between self-testing and prior HIV prevention initiatives is crucial for maximizing its effectiveness. Addressing stigma, improving testing services availability, and executing comprehensive interventions can significantly improve the health outcomes of young individuals in East Africa.

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Key words: HIV self-testing; sexually transmitted infections (STDs/STIs), university students; HIV prevention; East Africa; global health

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