

ORIGINAL ARTICLE

THE RELATIONSHIP BETWEEN THE UPTAKE OF HUMAN IMMUNODEFICIENCY VIRUS (HIV) TESTING AND STIGMA AMONG UNIVERSITY STUDENTS IN THE KLANG VALLEY

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ABSTRACT

The prevalence of Human Immunodeficiency Virus (HIV) is on the rise among adolescents and young people and these people are frequently subjected to significant levels of stigma, resulting in most of them avoiding HIV testing services. This study aimed to identify the prevalence of HIV testing uptake and its associated factors among students who were willing to undergo HIV testing. A cross-sectional study across five campuses within the Klang Valley was conducted between March to May 2020. Data were collected using an online self-administered questionnaire and the HIV Stigma Scale (HSS) was used to assess perceived stigma towards people with HIV. The results were analyzed using SPSS 26.0 and the prevalence of HIV testing uptake and its associated factors were assessed using multiple logistic regression. A total of 305 students showed a willingness to undergo HIV testing, with only 17% (95% CI; 13.0,21.0)(N=52) of the students ever undergoing an HIV test. The overall stigma associated with HIV was found to be high (93.4%) among the students. Students enrolled in non-health-related courses (AOR=0.33, 95% CI; 0.15,0.73), 5th year students (AOR=0.13, 95%CI; 0.02, 0.78), older aged people (AOR=1.35, 95% CI; 1.03,1.78), and those who had multiple sexual partners (AOR=5.28, 95% CI 1.42,19.60) were significantly associated with HIV testing uptake. Although stigma was associated with HIV testing in simple logistic regression, it was not significant in the multivariate logistic analysis and there was no correlation between HIV uptake and HIV-related stigma. The prevalence of HIV uptake among students was low, and it was discovered that variables acting as facilitators were students who engaged in risky behaviors, and that these variables should be formulated and incorporated into advanced university-based programs to harness the potential of testing and expand it to periodic HIV testing.

Keywords: Uptake, HIV testing, HIV Stigma, University, Students

INTRODUCTION

HIV, which has claimed nearly 36 million lives so far, remains a significant global public health issue¹. An estimated 38.0 million people were living with HIV and 1.5 million people were newly infected with HIV at the end of 2020^{1,2}. The burden of HIV among adolescents is higher in the Asia-Pacific region, accounting for 98% of adolescents aged 10 to 19 years living with HIV³. New HIV infections among 15 to 19-year-olds in the Philippines have increased by 50% over four years, from an estimated 800 in 2010 to 1,210 in 2014³. In Malaysia, the HIV trend among adolescents and young people aged 13 to 29 years has also been increasing, from 34% in 2014 to 48% in 2018, with around 90% of them acquiring HIV infection via sexual routes^{4,5}. Furthermore, the mode of HIV transmission has shifted from drug injections to sexual transmission, with the ratio of people injecting drugs/sexual transmission decreasing from 3.95 in 2000 to 0.03 in 2018⁵.

Malaysia has committed to a sustainable and equitable treatment strategy through its public

health system by sustaining government assistance for a decentralized approach to health care. This was expected to be achieved via the National Strategic Plan to End AIDS 90-90-90 objectives by 2020 and to end AIDS by 2030⁵. New HIV infections have also been reported to have decreased by more than 50% since 2002, with 6,978 cases compared to 3,293 cases in 2018⁵. However, the number of high-risk individuals who have been screened for HIV in the past twelve months or those aware of their current status has remained below 50%⁵. Since 2016, new technologies introduced by the World Health Organization (WHO) have helped people conduct self-screening, with many countries opting to implement self-testing as an additional measure to encourage HIV diagnosis⁶.

HIV self-testing (HIVST) is a method by which a person seeking to know his or her HIV status collects a specimen, performs a test, and interprets the test results in private or with someone they trust⁶. This test is then followed by confirmatory testing administered by a health worker. In South Africa, the findings among health

science students have shown that unsafe sex was regularly practiced, which was why most were comfortable using HIVST to establish their status, and HIVST would also help them to avoid the need for repeated counselling that did not fulfil their needs⁷. A study showed that the use of Voluntary Counselling and Testing (VCT) HIV testing among students was 61.5%, with 81% of the students reporting the use of the new approach of HIVST^{8,9}.

Socio-demographic determinants are potentially the most critical factors that influence the spread of HIV and interventions at the level of public health and society in order to reduce the disease's effect and spread. Demographic backgrounds such as region, residence, jobs, ethnicity, and age were clinically meaningful, while marital status, schooling, and SES (socio-economic status) did not have any significant effect on HIV testing uptake¹⁰. Researchers have discovered that the lifestyles of students on university campuses placed them at an increased risk of HIV infection. The HIV/AIDS pandemic poses major challenges for academic institutions as the virus targets young people who are economically active and these issues require a variety of targeted prevention measures and different approaches to minimize the spread of infection.

This rising trend in HIV infections is due to the vulnerability of young people to HIV exposure and transmission, such as increased drug abuse, low usage of condoms, low HIV test rates, and having more than one sexual partner⁵. More than 70% of new HIV infections among individuals aged 20 to 39 years were reported in 2018, predominantly among young homosexuals and bisexual men⁵. In campus settings, peer pressure contributes to the participation of many female college students and even some men in transactional sex¹¹. There is also a great deal of evidence to suggest that while knowledge of a disease is a prerequisite for desirable outcomes, it may not be a predictor of behavioral changes¹².

A study on knowledge and behavior prediction found that environmental knowledge had minimal effect on energy conservation and alcohol knowledge was also unrelated to drinking behavior¹³. Over time, no changes in smoking habits or substance use were observed among South African students, but the number of participating students who reported consuming alcohol slightly increased from 48% in 2007 to 58% in 2012¹⁴.

In addition to engaging in high-risk behaviors, young people are also often subjected to substantial levels of stigma, prejudice, and abuse, resulting in a high risk of HIV infection⁵. HIV-related stigma is evident in the negative attitudes, actions, and judgments towards people living with HIV, their partners, families, and key populations that are unfounded or fear-driven, whereas discrimination based on their real or

perceived HIV status is unjust and there is unfair treatment of an individual or groups of people with HIV¹⁵. HIV stigma is linked to decreased acceptance, non-disclosure, and delayed access to comprehensive HIV testing services, leading to higher transmission rates as the majority of people are reluctant to undergo HIV testing, fearing discrimination and potential legal implications^{5,16}. As such, most of them avoid services and support networks and are often reluctant to reveal their HIV status to parents and relatives in fear of disclosing their identity or risk behavior, making it difficult to achieve the first ninety goals⁵.

Findings among young black adults from North Carolina showed that close to half (40%) of those having internalized HIV-related stigma never underwent HIV testing, and about 36% reported no intention of HIV testing in the future. This implied that, in the event of a positive test outcome, respondents who did not want to get tested and those who feared losing their social circle might have been discouraged from testing due to internalized stigma¹⁷. In Tanzania and China, youths do not want to go for VCT because they fear being stigmatized, particularly when they are well labelled as HIV-positive^{18,19}. As the 90-90-90 goals have not been achieved in any country with a major HIV epidemic, to what extent will stigma impede HIV testing? A research agenda on stigma-driven adverse social conditions that impede HIV testing is therefore required. Stigma manifests differently across populations, so various types of stigma should be thoroughly studied due to the unequal uptake of HIV testing. Needless to say, one may hold certain beliefs or preconceptions about people living with HIV, regardless of whether or not a person has been tested and is aware of their HIV status²⁰.

HIV testing is the key to a variety of options for HIV prevention and treatment options, such as antiretroviral therapy (ART) for those who tested positive and pre-exposure prophylaxis (PrEP) for those who tested negative. Malaysia supports both voluntary and confidential HIV testing (VCT) and Provider Initiated Testing and Counselling (PITC) including regular HIV screening of all donated blood, blood products, and organs, opt-out antenatal screening, routine prisoner testing in drug rehabilitation centers and prisons, Tuberculosis and sexually transmitted diseases patients screening, harm reduction program clients, contacts of HIV infected persons, and voluntary premarital testing. HIVST offers an alternative to other testing strategies, but this approach is still in the process of developing its HIV self-testing policies and guidelines in Malaysia⁶.

In Malaysia, university students still lack awareness of HIV counselling and testing and the reasons to test for HIV despite all the efforts that have been put in. Few studies have investigated

the uptake of HIV testing among university students who have expressed their willingness to undergo the test, considering the increased vulnerability of young adults to HIV infection due to risky behavior. Addressing HIV among young people requires them to have access to the information and services they need to reduce their risk, make healthier choices, and, if necessary, seek treatment and care.

This study aimed to identify the prevalence of HIV testing uptake and its associated factors among undergraduate university students that were willing to perform HIV testing.

METHODS

A cross-sectional study involving five campuses was conducted in the Klang Valley between March 2020 and May 2020. The inclusion criteria included all undergraduate students who were willing to give written consent and were able to read and write in English, 18 to 29 years of age during the 2019/2020 academic session, and those willing to perform HIV testing. Students who declined to participate in the study made up the exclusion criteria.

A convenience sampling method was used to select study participants, and data collection was performed using an online self-administered questionnaire through Google forms with an attached consent form. The questionnaire was circulated by student leaders and lecturers of each campus via the WhatsApp application. Strict confidentiality and anonymity of data were maintained throughout the study. Reading material by the Malaysian Association of Adolescent Health (MAAH) on high-risk behaviors and other assistance hotlines were attached to the link as part of the health promotion. The Malaysian Adolescent Health Association (MAAH) is a non-governmental organization (NGO) that promotes public and professional interest in the comprehensive development of young people's health and well-being, as well as facilitating collaboration and communication between adolescent health organizations and individuals, including young people themselves. The questionnaire was adapted and prepared in English based on similar previous studies and pre-tested among 20 undergraduate students to revise its clarity, the order of questions, and consistency^{19,21-24}. It consisted of 3 sections; section A: socio-demographic background and risky behaviors, section B: uptake of HIV testing, and section C: HIV-related stigma.

Section B was concerned with the outcome of the study and focused on the uptake of participants who were willing to perform the HIV test. The outcome of the variable was evaluated by asking "Have you ever had an HIV test to determine the status of HIV infection?" There were two groups

of participants: those that had been tested for HIV (yes) and those that never tested for HIV (no).

The HIV-related stigma was examined in section C using a validated HIV Stigma Scale (HSS) questionnaire which consisted of four subscales: personalized stigma (enacted stigma), disclosure concern (enacted stigma), negative self-image (internalized stigma), and public attitude concern (perceived stigma). In total, forty items were scored on a scale of four points (strongly disagree, disagree, agree, and strongly agree), with a score of 1 encoded for 'Strongly disagree', 2 for 'Disagree', 3 for 'Agree', and 4 for 'Strongly agree'. Two items were reverse-scores: items 8 and 21. The lowest overall score was 40, and the highest overall score was 160. Two levels were then ranked for the total score: low (40-120) and high (121-160)²⁵⁻²⁸.

Operational Definitions

This study was conducted among participants who were willing to perform HIV testing if the test was offered and the variable was evaluated by asking "Will you do HIV testing if offered for the test?"^{19,23}. Participants were divided into two categories: those who expressed willingness to perform the test (yes) and those who expressed unwillingness to perform the test (no). Only participants who demonstrated a willingness to test for HIV were included. People living with HIV (PLHIV) are identified as infected people who have continued to live well and productively for many years²⁹. HIV stigma is defined as negative attitudes and beliefs about people living with HIV and the classification of a person as part of a group that is deemed socially unacceptable is the prejudice that comes with it³⁰. Personalized stigma is the negative consequence of learning one's HIV status. Disclosure concern is related to controlling information, keeping one's HIV status a secret, or worrying that others who were aware of the respondent's HIV status would reveal³¹. A negative self-image is defined as PLHIV who often internalize the stigma they face and start developing a negative self-image. Internalized HIV stigma can lead to feelings of guilt, fear of exposure, loneliness, and desperation, and these emotions can discourage HIV testing and treatment^{30,31}. Finally, public attitude concerns what others think of a person with HIV or what people with HIV should expect when others learn that they have HIV³¹.

The sample size was determined by the prevalence of HIV testing among students at 77.9%, based on a study by Fu et al. (2018) which was carried out among 407 students at a university in China¹⁹, and calculated using a single proportion³². After the consideration of 20% attrition, the minimum sample required in this study was 316 participants.

Ethics Approval

This study was approved by University Teknologi Mara (UiTM) Research Ethics Committee. The approval code for the study is REC/02/2020 (FB/27).

Statistical Analysis

SPSS 26.0 was used to compile and analyze raw data, and descriptive statistics were performed using frequencies, means, and standard deviations for socio-demographic, uptake of HIV testing, and HIV-related stigma. Simple logistic regression was performed in the statistical analysis to identify potential factors for variables of HIV testing uptake, demographic background including sexual history, and HIV-related stigma. In the multiple logistic regression, factors with P-values ≤ 0.20 were included in determining factors associated with the uptake of HIV testing among students willing to take the test^{8,33}. The backward method was selected to adjust for the confounding factors. The Odds Ratios (OR) and 95% confidence interval were measured and all P-values below 0.05 were considered statistically significant.

RESULTS

Socio-demographic

The questionnaire was completed by 305 students out of all university students who were willing to perform HIV testing and the response rate was favorable. Only 17% (95%CI; 13.0, 21.0) (N=52) of the students performed the HIV test among those who were willing to undergo the test. Table 1 displays the characteristics of the participants in the study.

Risky Sexual Behavior

High-risk activities among the participants, including sexual history, smoking, alcohol consumption, and drug history, are shown in Table 2. Only a small proportion of the study participants reported their risky behaviors.

HIV Stigma

Table 3 presents the level of HIV-related stigma and its components among the participants. The majority of respondents perceived stigma at a high level and the stigma component among the respondents was dominated by personal stigma, followed by public attitudes, disclosure concern, and negative self-image.

Factors Associated With the Uptake of HIV Testing Among Those Willing To Undergo the Test

The results of the simple logistic regression of factors associated with the acceptance of HIV testing among the participants willing to undergo the test are shown in Table 4. The multiple logistic regression model contained nine variables with P-values of less than 0.20, including faculty, year of study, age, ethnicity, place of residence, ever had sexual intercourse, the number of sexual partners, use of condoms, and HIV stigma, in the simple logistic regression. As shown in Table 5, four variables were statistically significantly related to students who performed the HIV test, including older students (AOR=1.35, 95% CI; 1.03, 1.78) and those having two or more sexual partners (AOR=5.28, 95% CI 1.42, 19.60). Non-health-related students (AOR=0.33, 95% CI; 0.15, 0.73) and fifth-year students (AOR= 0.13, 95% CI; 0.02, 0.78) were less likely to undergo the HIV test.

Table 1a: Socio-demographic characteristics among university students in the Klang Valley who were willing to undergo HIV testing (N=305)

Variables	Frequency, (%)	Mean (SD)
Faculty		
Health-related	181 (59.3)	
Non-health-related	124 (40.7)	
Year		
Year 1 to 2	215 (70.5)	
Year 3 to 5	90 (29.5)	
Age		21.21 (1.94)
Gender		
Male	51 (16.7)	
Female	254 (83.3)	
Ethnicity		
Malay	294 (96.4)	
Bumiputra Sabah/Sarawak	11 (3.6)	

Table 1b: Socio-demographic characteristics among university students in the Klang Valley who were willing to undergo HIV testing (N=305)

Variables	Frequency, (%)	Mean (SD)
Religious		
Islam	300 (98.4)	
Others	5 (1.6)	
Marital Status		
Single	304 (99.7)	
Married /Divorced/Widow	1 (0.3)	
Hometown		
Northern	55 (18.0)	
East coast	58 (19.0)	
Central	117 (38.4)	
Southern	53 (17.4)	
East	22 (7.2)	
Place of Resident		
In Campus	232 (76.1)	
Out Campus	73 (23.9)	

Table 2a: Risky sexual behavior among university students in the Klang Valley who were willing to undergo HIV testing (N=305)

Variables	Frequency, (%)
Have You Ever Had Sexual Intercourse	
Yes	27 (8.9)
No	278 (91.1)
Number of Sexual Partner/s	
I have never had sexual intercourse	281 (92.1)
1 person	10 (3.3)
≥ 2 person	14 (4.6)
Use of Condom During Sexual Intercourse	
I have never had sexual intercourse	280 (91.8)
Yes	14 (4.6)
No	11 (3.6)
Sexual Partner/s	
I have never had sexual contact	271 (88.9)
Females or males	2 (0.7)
Males and females	32 (10.5)
Best Describes You	
Heterosexual (straight)	274 (89.8)
Gay or lesbian	5 (1.6)
Bisexual	13 (4.3)
Not sure	13 (4.3)
Ever Tried Cigarette Smoking	
Yes	44 (14.4)
No	261 (85.6)
Ever Used an Electronic Product	
Yes	36 (11.8)
No	269 (88.2)

Table 2b: Risky sexual behavior among university students in the Klang Valley who were willing to undergo HIV testing (N=305)

Variables	Frequency, (%)
Ever Chewed Tobacco, Snuff, Dip, Snus, or Dissolvable Tobacco Product	
Yes	5 (1.6)
No	300 (98.4)
Ever Smoke Cigars, Cigarillos, or Little Cigars	
Yes	4 (1.3)
No	301 (98.7)
Ever Drank Alcohol Other Than a Few Sips	
No	296 (97.0)
9 - 12 years old	1 (0.3)
>13 years old	8 (2.6)
Ever Used Marijuana	
Yes	12 (3.9)
No	293 (96.1)
Ever Used Any Form of Cocaine, Including Powder, Crack, or Freebase	
Yes	1 (0.3)
No	304 (99.7)
Ever Used Sniffed Glue, Breathed Contents of Aerosol Spray Cans or Inhaled Any Paints or Sprays To Get High	
Yes	3 (1.0)
No	302 (99.0)
Ever Used Heroin	
Yes	0 (0.0)
No	305 (100)
Ever Used Methamphetamines	
Yes	1 (0.3)
No	304 (99.7)
Ever Used Ecstasy	
Yes	1 (0.3)
No	304 (99.7)
Ever Injected Any Illegal Drugs Into The Body	
Yes	0 (0.0)
No	305 (0.0)

Table 3: HIV-related stigma among university students in the Klang Valley who were willing to undergo HIV testing (N=305)

Variables	Frequency (%)
Personalized Stigma (Enacted Stigma)	
Low	21 (6.9)
High	284 (93.1)
Disclosure Concern (Enacted Stigma)	
Low	23 (7.5)
High	282 (92.5)
Negative Self-image (Internalized Stigma)	
Low	27 (8.9)
High	278 (91.1)
Public Attitudes (Perceived Stigma)	
Low	22 (7.2)
High	283 (92.8)
Total Stigma	
Low	20 (6.6)
High	285 (93.4)

Table 4a: Factors associated with uptake of HIV testing among university students in the Klang Valley who were willing to undergo HIV testing (N=305)

Variables	B(SE)	Wald (df) ^a	OR (95% CI)	p-value ^a
Faculty				
Health-related			1	Ref.
Non-health-related	-0.97 (0.35)	7.62 (1)	0.34 (0.12, 0.75)	0.01*
Year				
Year 1			1	Ref.
Year 2	0.20 (0.38)	0.28 (1) ^b	1.22 (0.58, 2.60)	0.60 ^b
Year 3	1.03 (0.46)	5.05 (1) ^b	2.78 (1.14, 6.81)	0.03* ^b
Year 4	0.32 (0.57)	0.32 (1) ^b	1.38 (0.45, 4.18)	0.57 ^b
Year 5	0.14 (0.61)	0.05 (1) ^b	1.15 (0.35, 3.81)	0.82 ^b
Age	0.21 (0.08)	8.07 (1) ^b	1.24 (1.07,1.44)	0.01*
Gender				
Male			1	Ref.
Female	-0.21 (0.39)	0.28 (1)	0.81 (0.38,1.75)	0.60
Hometown				
Northern			1	Ref.
East cost	-0.81 (0.51)	2.51 (1) ^b	0.44 (0.16,1.21)	0.11 ^b
Central	-0.29 (0.40)	0.54 (1) ^b	0.75 (0.34,1.63)	0.46 ^b
Southern	-0.56 (0.50)	1.24 (1) ^b	0.57 (0.22,1.52)	0.27 ^b
East	-1.13 (0.81)	1.96 (1) ^b	0.32 (0.07,1.57)	0.16 ^b
Place of Resident				
In campus			1	Ref.
Out campus	-0.64 (0.41)	2.45 (1)	0.53 (0.24,1.18)	0.11
Ever Had Sexual Intercourse				
No			1	Ref.
Yes	-1.20 (0.43)	7.65 (1)	0.30 (0.13,0.71)	0.01*
Number of Sexual Partners				
I have never had sexual intercourse			1	Ref.
1 person	0.86 (0.71)	1.48 (1) ^b	2.37 (0.59,9.53)	0.22 ^b
≥ 2 persons	1.42 (0.57)	6.35 (1) ^b	4.15 (1.37,12.56)	0.01* ^b
The Last Time You Had Sexual Intercourse, Did You or Your Partner Use a Condom				
I have never had sexual intercourse			1	Ref.
Yes	1.12 (0.58)	3.70 (1) ^b	3.06 (0.98,9.58)	0.05 ^b
No	1.15 (0.65)	3.13 (1) ^b	3.15 (0.88,11.22)	0.08 ^b
Best Describes You				
Heterosexual			1	Ref.
Gay/lesbian	0.21 (1.13)	0.04 (1) ^b	1.24 (0.14,11.34)	0.85 ^b
Bisexual	0.40 (0.68)	0.34 (1) ^b	1.49 (0.39,5.81)	0.56 ^b
Not sure	-0.10 (0.79)	0.02 (1) ^b	0.90 (0.19,4.20)	0.90 ^b
Personalized Stigma (Enacted Stigma)				
Low			1	Ref.
High	-0.15 (0.58)	0.06 (1)	0.86 (0.28,2.68)	0.80

B: unstandardized coefficient; SE: Standard Error; df: degree of freedom; OR: Odds Ratio; CI: Confidence Intervals; Ref.: Reference, *Statistical significance at $\alpha=0.05$, a Likelihood Ratio (LR) test; b Wald test

Table 4b: Factors associated with uptake of HIV testing among university students in the Klang Valley who were willing to undergo HIV testing (N=305)

Variables	B(SE)	Wald (df) ^a	OR (95% CI)	p-value ^a
Disclosure Concern (Enacted Stigma)				
Low			1	Ref.
High	-0.59 (0.03)	0.24 (1)	0.99 (0.94,1.04)	0.62
Negative Self-image (Internalized Stigma)				
Low			1	Ref.
High	-0.07 (0.50)	1.40 (1)	0.55 (0.21,1.48)	0.24
Public Attitudes (Perceived Stigma)				
Low			1	Ref.
High	-0.60 (0.47)	1.61 (1)	0.55 (0.22,1.38)	0.20
Total Stigma				
Low			1	Ref.
High	-2.11 (0.58)	6.15 (1)	0.81 (0.26,2.53)	0.71

B: unstandardized coefficient; SE: Standard Error; df: degree of freedom; OR: Odds Ratio; CI: Confidence Intervals; Ref.: Reference, ^aStatistical significance at $\alpha=0.05$, a Likelihood Ratio (LR) test; b Wald test

Table 5: Factors associated with uptake of HIV testing university students in the Klang Valley who were willing to undergo HIV testing (N=305)

Variables	Adjusted OR (95% CI)	Wald (df) ^a	p-value ^a
Faculty			
Health-related		1	Ref.
Non-health-related	0.33 (0.14, 0.73)	7.56 (1)	0.01*
Year			
Year 1		1	Ref.
Year 2	0.65 (0.27,1.57)	0.92 (1) ^b	0.34 ^b
Year 3	0.89 (0.27,2.92)	0.03 (1) ^b	0.85 ^b
Year 4	0.46 (0.11,1.99)	1.09 (1) ^b	0.30 ^b
Year 5	0.13 (0.02,0.78)	4.98 (1) ^b	0.03* ^b
Age	1.35 (1.03,1.76)	4.82 (1)	0.03*
Number of Sexual Partners			
I have never had sexual intercourse		1	Ref.
1 person	2.10 (0.48,9.31)	0.96 (1) ^b	0.33 ^b
≥ 2 person	5.28 (1.42,19.60)	0.67 (1) ^b	0.01* ^b

OR: Odds Ratio; df: degree of freedom; CI: Confidence Intervals; Ref.: Reference, ^aStatistical significance at $\alpha=0.05$, a Likelihood Ratio (LR) test; b Wald test, The sensitivity and specificity of the model were 9.6% and 99.6% respectively, and the overall performance was 84.3%. , Hosmer and Lemeshow test not significant., Area under Receiver Operating Characteristics (ROC) was 71.4% (95%CI: 63.5,79.3)., The final model equation is $Z = -7.384 - 1.12 (\text{Faculty}) + 0 (\text{Year 1}) - 0.430 (\text{Year 2}) - 0.112 (\text{Year 3}) - 0.783 (\text{Year 4}) - 2.081 (\text{Year 5}) + 0.299 (\text{Age}) + 0 (\text{No sexual intercourse}) + 0.744 (1 \text{ sexual partner}) + 1.663 (\geq 2 \text{ sexual partners})$.

DISCUSSION

The current study investigated the variables associated with the uptake of HIV testing among university students who were willing to test for HIV. The demographic profile of students, risky behavior, and HIV-related stigma were investigated in the quest for HIV screening and

testing behavior among students. Overall, the outcome supported the hypothesis that demographic background and risky behavior among students willing to undergo the test were significantly associated with the uptake of HIV testing. However, the uptake of HIV testing, which will be further discussed, was not associated with HIV-related stigma.

Firstly, the findings in this study showed that 17% (95%CI; 13.0, 21.0) of students who were willing to undergo HIV testing had a very low prevalence of the test. These results were consistent with the studies that were conducted in Thailand and Hong Kong, where only 27% and 18.4% of students, respectively, had HIV testing done^{34,35}. The utilization of HIV testing was relatively low compared to college and university students in other countries, where more than 70% of students underwent HIV testing to find out their status³⁶. Furthermore, the actual rate of HIV testing uptake was very low compared to the willingness to undergo HIV testing, which may be attributed to the fact that students in the study did not consider themselves to be at risk because less than 10% admitted that they had risky sexual behavior^{34,37}. Although the students were willing to undergo the test, other problems may arise, such as not knowing where HIV testing takes place, the cost of HIV testing, and even fearing the confidentiality of the HIV test results. This indicated that students who were willing to test for HIV might not necessarily have an HIV test administered during their lifetime, which is an important obstacle to HIV prevention.

The overall HIV stigma score was found to be high in the current study (93.4%), which was similar to a previous study conducted in Gombak, Malaysia among HIV patients aged 18 years and above that discovered a high level of HIV stigma with an overall mean score of 104.69 ± 19.47 ³⁸. Compared to the Midwest research among college students, the overall stigma level was generally low³⁹. The majority of the participants in this study were Malays and Muslims, where getting infected by HIV is considered to be irresponsible behavior and practice, which likely contributed to a higher degree of stigma. Research has also been conducted in other parts of Asia, where sexually transmitted infections continue to be taboo⁴⁰⁻⁴². The results indicated that race and culture play an important role in deciding the understanding of stigmatization within the community.

Stigma plays a well-documented role in HIV prevention and treatment, and greater understanding is crucial to achieving global epidemic targets. A high score was obtained for each subscale, which was comparable to another Malaysian study and high public attitude stigma, for example, can be attributed to local activities⁴³. During the Muslim burial rite for people suspected of being infected with HIV, bleaching is carried out, which reinforces social and individual fear, and stigma against HIV. The majority of the students were female, as evident from the study, and it is believed that the reasons for blaming women were intricately connected to socially accepted norms on gender-specific roles, obligations, and sexuality. This was consistent with the results of a study conducted among Malay patients in Kelantan, Malaysia, where women are accused and stigmatized more than their

counterparts⁴³. Other studies, however, showed that more women had low stigma levels and the gender gap in empathy was higher among women³⁹.

Next, it was discovered that divisions within a university were associated with the uptake of HIV testing, with the results consistent with studies by Thai university students where non-health-related students were not ready to accept HIV testing⁴⁴. This factor is important among non-health-related students who were less knowledgeable and unexposed to HIV/AIDS, which may hinder them from undergoing the testing. Health-related students participated in more activities and programs that provided them with opportunities to learn about sexually transmitted diseases, including HIV prevention. However, a study carried out among students in China did not show any connections between the academic major of the student and the willingness to utilize HIV testing¹⁹.

Findings from this study also showed that fifth-year students from all campuses were less likely to do the test, suggesting that the senior students feel more at risk and terrified of being labelled as prostitutes or homosexuals compared to junior students who preferred to undergo HIV screening and testing. Students should be exposed to HIV education during their years at a university where, despite low uptake, they are willing to do HIV testing. Caution must be taken from the results; however, this may be an alarm that risky behavior is occurring among university students which puts them at greater risk. Therefore, in order to produce a better outcome, it is important to improve education on the association of risky behaviors with sexually transmitted diseases. University policymakers and providers of education should work collaboratively to ensure that students receive meaningful sex education. The findings were consistent with the results of male students in China; HIV preventive services were less likely to be used by university seniors⁴⁵.

It was also discovered that among those students who displayed a willingness to do the test, the older students were significantly associated with the uptake of HIV testing. Similar results were observed among students in the younger age group in Thailand and Tanzania who did not screen for HIV compared to the older age group^{18,34}. A younger age means less HIV experience and knowledge, and ignorance of HIV testing benefits were possible reasons behind the results, even though they were willing to do the test. However, there was a contrast in the results among high school students, where VCT uptake was found to decrease with age^{46,47}. It was mentioned that young people become more sexually active as their age increases, so they are reluctant to undergo HIV testing due to fear of the outcome⁴⁶.

In addition, the findings have shown that university students who were involved in risky behaviors (multiple sexual partners) were more likely to be tested for HIV. The risky behavior associated with HIV testing was consistent with other countries where unprotected sex, alcohol and drug use before sexual activity, and having multiple sexual partners were among the risky behaviors associated with HIV testing^{36,44}. When adolescents and young adults recognize that they are at risk of contracting sexually transmitted diseases, including HIV, they may take action to mitigate the risk. This demonstrated that the involvement of risky behaviors, particularly engaging in sexual activities, is a significant predictor of their health-seeking behavior. However, despite the low HIV uptake among students, they were willing to do the test if offered, meaning that a widespread HIV testing campaign and outreach would help encourage adolescents who are concerned about the risk of HIV.

HIV-related stigma was not found to be a significant factor associated with HIV uptake which was consistent with previous a study. A study conducted among youths in Kenya found that HIV stigma was associated in a simple regression with HIV testing, but lost significance when other variables were taken into account²⁰. In contrast to the results from other studies, it was found that HIV stigma was associated with the decision to undergo the HIV test^{8,48}. This was likely due to multicollinearity among the predictors used in the analysis, when more powerful predictors are taken into account, the importance of HIV-related stigma was lost in explaining the purpose of HIV testing. It can therefore be assumed that HIV-positive people can hold certain beliefs or preconceptions, regardless of whether or not a person has been tested and is aware of their HIV status. If the confidentiality of the result is kept and taking into account the willingness of students to take the HIV test, HIV prevention services for young people would have a high potential for success.

There were several limitations to this study. Firstly, it was also not possible to determine the temporal relationship between the research outcome and the associated factors for the cross-sectional study. Secondly, convenience sampling was used for analysis and the findings cannot be used to generalize the entire population. Thirdly, as only university students were involved in this study, the results cannot be applied to those not studying in higher institutions. Finally, the willingness of students to undergo HIV testing did not necessarily indicate a practical use of HIV testing services, so further analysis is required to determine the circumstances in which university students will be able to use HIV testing services.

Despite the mentioned limitations, there were also several strengths to this study. Firstly, this

was the first study that investigated the uptake of HIV testing among university students who were willing to test for HIV. This provided significant information that can be used to help implement HIV self-testing and also for the preparation and distribution of health resources for future HIV programs. Furthermore, the analysis was relatively quick and easy to conduct, as it utilized a self-administered online questionnaire so only a relatively short amount of time was required to complete the study and was cost-effective. In addition, the analysis included multiple campuses and faculties that reflected the diverse backgrounds of the student populations.

Recommendation

This study can be further improved by several modifications. Firstly, it is recommended that HIV information is disseminated among students, which will help to reduce the HIV-related stigma among them. HIV prevention education at the university level can be achieved via media and text messages, or the implementation of basic health education classes for all new students. Various platforms (website or social media) can be used to disseminate messages to various sites, such as libraries and student union centers. Secondly, universities can provide more counsellors and peer educators to provide comprehensive HIV information and prevention programs. A collaborative partnership must be formed between university care providers and nearby health institutions to provide HIV testing and counselling, and proactive steps have to be taken to ensure periodic screening of university students. Finally, the willingness of students to perform HIV testing requires thorough planning and preparation to increase the acceptance of HIV testing beyond the availability of the existing HIV self-testing method, as suggested by the WHO.

CONCLUSION

It was alarming to find such a low prevalence of HIV testing among students who were willing to undergo the test. The outcomes indicated that it is feasible to scale up HIV testing among university students as students were willing to test for HIV and also target the factors associated with the uptake of HIV testing to promote its implementation. This suggested that novel approaches, such as HIV self-testing, need to be introduced to encourage students who have never undergone the HIV test for certain reasons. For early detection, HIV testing can be recommended as routine screening even for those who have tested negative for HIV.

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Conflict of interests

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REFERENCES

1. HIV/AIDS [Internet]. [cited 2022 Jul 13]. Available from: <https://www.who.int/news-room/fact-sheets/detail/hiv-aids>.
2. Global HIV & AIDS statistics – Fact sheet [Internet]. [cited 2022 Jul 13]. Available from: <https://www.unaids.org/en/resources/fact-sheet>.
3. Asia-Pacific region facing a “hidden epidemic” of HIV among adolescents, new report finds [Internet]. [cited 2022 Jul 13]. Available from: <https://www.unicef.cn/en/press-releases/asia-pacific-region-facing-hidden-epidemic-hiv-among-adolescents-new-report-finds>.
4. REPORT MALAYSIA 2015 [Internet]. Available from: https://www.moh.gov.my/index.php/file_manager/dl_item/554756755a584a69615852686269394d59584276636d46754c3031686247463563326c6858306442556c4253587a49774d5455756347526d.
5. Anita S, Chai PT. Country Progress Report on HIV / AIDS Response 2019 Malaysia. HIV/STI/Hepatitis C Sect Minist Heal Malaysia. 2019;(March):42.
6. Innovative WHO HIV testing recommendations aim to expand treatment coverage [Internet]. [cited 2022 Jul 13]. Available from: <https://www.who.int/news/item/27-11-2019-innovative-who-hiv-testing-recommendations-aim-to-expand-treatment-coverage>.
7. Nkuna E, Nyazema NZ. HIV Self-Testing, Self-Stigma and Haart Treatment at the University of Limpopo: Health Sciences Students’ Opinion and Perspectives. *Open AIDS J*. 2016;10(1):78-82.
8. Dagne S, Agedew E, Misikir D, Haftu D. Voluntary Counseling and Testing Utilization and Associated Factors among Arba Minch University Students, South Ethiopia. *J AIDS Clin Res*.2017;08(06):6-11.
9. Izizag BB, Situakibanza H, Mbutiwi T, Ingwe R, Kiazayawoko F, Nkodila A, et al. Factors associated with acceptability of HIV self-testing (HIVST) among university students in a Peri-Urban area of the Democratic Republic of Congo (DRC). *Pan Afr Med J*. 2018;31:1-9.
10. Woke FI. The role of socio-demographic factors in voluntary counselling and testing uptake in South Africa. *Diss Abstr Int Sect B Sci Eng*. 2016;77(6-B(E)):Sefe.
11. Tade O, Adekoya AJ. Transactional sex and the “aristo” phenomenon in Nigerian universities. *Hum Aff*. 2012;22(2):239-55.
12. Hansson M, Stockfelt L, Urazalin M, Ahlm C, Andersson R. HIV/AIDS awareness and risk behavior among students in Semey, Kazakhstan: A cross-sectional survey. *BMC Int Health Hum Rights*. 2008;8:1-10.
13. Ajzen I, Joyce N, Sheikh S, Cote NG. Knowledge and the prediction of behavior: The role of information accuracy in the theory of planned behavior. *Basic Appl Soc Psych*. 2011;33(2):101-17.
14. Rénette J, Jacobs J, Vergnani T. Trends in HIV risk behaviour of incoming first-year students at a south African university: 2007-2012. *Sahara J*. 2015;12(1):39-50.
15. UNAIDS. Global partnership for action to eliminate all forms of HIV-related stigma and discrimination. 2018;20.
16. Golub SA, Gamarel KE. The impact of anticipated HIV stigma on delays in HIV testing behaviors: Findings from a community-based sample of men who have sex with men and transgender women in New York City. *AIDS Patient Care STDS*. 2013;27(11):621-7.
17. Okumu E, Jolly DH, Alston L, Eley NT, Laws M, MacQueen KM. Relationship between human immunodeficiency virus (HIV) knowledge, HIV-related stigma, and HIV testing among young black adults in a southeastern city. *Front Public Heal*. 2017;5(MAR):1-7.
18. Sanga Z, Kapanda G, Msuya S, Mwangi R. Factors influencing the uptake of Voluntary HIV Counseling and Testing among secondary school students in Arusha City, Tanzania: A cross sectional study Health behavior, health promotion and society. *BMC Public Health*. 2015;15(1):1-9.

19. Fu G, Shi Y, Yan Y, Li Y, Han J, Li G, et al. The prevalence of and factors associated with willingness to utilize HTC service among college students in China. *BMC Public Health*. 2018;18(1):1-10.
20. Nall A, Chenneville T, Rodriguez LM, O'Brien JL. Factors affecting hiv testing among youth in kenya. *Int J Environ Res Public Health*. 2019;16(8):1-14.
21. HIV/STI Sector Disease Control Division Ministry of Health Malaysia. Integrated Biological and Behavioural Surveillance Survey (IBSS). Minist Heal Malaysia. 2014;127.
22. Not DO. 2015 State and Local Youth Risk Behavior Survey. 2015;1-20.
23. Yuan L, Li X, Li X, Shi J, Jiang L, Zhang C, et al. Factors associated with willingness to participate in free HIV test among general residents in Heilongjiang, Northeast China. *BMC Infect Dis*. 2012;12:2-9.
24. Mwangi RW, Ngure P, Thiga M, Ngure J. Factors influencing the utilization of Voluntary Counselling and Testing services among university students in Kenya. *Glob J Health Sci*. 2014;6(4):84-93.
25. Ibrahim K, Kombong R, Sriati A. The Difference of Perceived HIV Stigma between People Living with HIV Infection and Their Families. *Nurse Media J Nurs*. 2019;9(2):117-27.
26. Nobre N, Pereira M, Roine RP, Sutinen J, Sintonen H. HIV-Related Self-Stigma and Health-Related Quality of Life of People Living With HIV in Finland. *J Assoc Nurses AIDS Care*. 2018;29(2):254-65.
27. Charles B, Jeyaseelan L, Pandian AK, Sam AE, Thenmozhi M, Jayaseelan V. Association between stigma, depression and quality of life of people living with HIV/AIDS (PLHA) in South India - A community based cross sectional study. *BMC Public Health*. 2012;12(1).
28. Li Z, Sheng Y. Investigation of perceived stigma among people living with human immunodeficiency virus/acquired immune deficiency syndrome in Henan Province, China. *Int J Nurs Sci*. 2014;1(4):385-8.
29. UNAIDS Terminology Guidelines [Internet]. Available from: <http://www.unaids.org/en/media/unaid> s/contentassets/documents/unaidspublication/2011/JC2118_terminology-guidelines_en.pdf.
30. Facts about HIV Stigma | HIV Basics | HIV/AIDS - CDC [Internet]. [cited 2022 Jul 13]. Available from: <https://www.cdc.gov/hiv/basics/hiv-stigma/index.html>.
31. Berger BE, Ferrans CE, Lashley FR. Measuring stigma in people with HIV: Psychometric assessment of the HIV stigma scale. *Res Nurs Heal*. 2001;24(6):518-29.
32. Toolkit Shell for Developing New Applications - OpenEpi [Internet]. [cited 2022 Jul 13]. Available from: <https://www.openepi.com/SampleSize/SPropor.htm>.
33. Tsegay G, Edris M, Meseret S. Assessment of voluntary counseling and testing service utilization and associated factors among Debre Markos University Students, North West Ethiopia: A cross-sectional survey in 2011. *BMC Public Health*. 2013;13(1).
34. Khawcharoenporn T, Chunloy K, Apisarnthanarak A. Uptake of HIV testing and counseling, risk perception and linkage to HIV care among Thai university students. *BMC Public Health*. 2016;16(1):1-12.
35. Choi EPH, Wong JYH, Fong DYT. Disparities Between HIV Testing Levels and the Self-Reported HIV-Negative Status of Sexually Active College Students. Vol. 56, *Journal of Sex Research*. 2019. p. 1023-30.
36. Madiba S, Mokgatle M. Students want HIV testing in schools a formative evaluation of the acceptability of HIV testing and counselling at schools in Gauteng and North West provinces in South Africa. *BMC Public Health*. 2015;15(1).
37. Abiodun O, Sotunsa J, Ani F, Jaiyesimi E. Knowledge of HIV/AIDS and predictors of uptake of HIV counseling and testing among undergraduate students of a privately owned university in Nigeria. *BMC Res Notes*. 2014;7(1):1-8.
38. Abdullah A, Ismail AH, Mooi CS. Stigma Among Patients with HIV/AIDS: A Cross Sectional Study in Malaysia. *Int J Hum Heal Sci*. 2019;4(1):26.
39. Kingori C, Adwoa Nkansah M, Haile Z,

- Darlington K-A, Basta T. Factors Associated with HIV Related Stigma among College Students in the Midwest. *AIMS Public Heal.* 2017;4(4):347-63.
40. Rasel Faruk S, Chowdhury MK, Kamal SB, Ahmed Shamim SM, Mohit I. STD/ AIDS Asia and world perspective. Vol. 3, *Clinical and Medical Investigations.* 2018.
 41. Lieber E, Chin D, Li L, Rotheram-Borus MJ, Detels R, Wu Z, et al. Sociocultural contexts and communication about sex in China: informing HIV/STD prevention programs. *AIDS Educ Prev.* 2009;21(5):415-29.
 42. Svensson, et. al SW. Knowledge of and attitudes to sexually transmitted diseases among Thai university students. *Caring Sci.* 2013;18-21.
 43. Fadzil NA, Othman Z, Mustafa M. Stigma in Malay patients with HIV/AIDS in Malaysia. *Int Med J.* 2016;23(4):324-7.
 44. Kim YK, Small E, Okumu M. School-based HIV/AIDS education, risky sexual behaviors, and HIV testing among high school students in the United States. *Soc Work Health Care.* 2019;58(3):258-73.
 45. Xu H, Xie J, Xiao Z, Xiao H, Li X, Goldsamt L, et al. Sexual attitudes, sexual behaviors, and use of HIV prevention services among male undergraduate students in Hunan, China: A cross-sectional survey. *BMC Public Health.* 2019;19(1):1-9.
 46. Sukari O. Barriers and attitudes towards HIV Voluntary Counselling and Testing (VCT) among Secondary School Pupils of Sengerema in Mwanza. *Off Publ Tanzania Med Students' Assoc [Internet].* 2007; Available from: <https://www.ajol.info/index.php/dmsj/article/view/49596/35924>.
 47. Opong Asante K. HIV/AIDS knowledge and uptake of HIV counselling and testing among undergraduate private university students in Accra, Ghana. *Reprod Health.* 2013;10(1):1-8.
 48. Irmayati N, Yona S, Waluyo A. HIV-related stigma, knowledge about HIV, HIV risk behavior and HIV testing motivation among women in Lampung, Indonesia. *Enferm Clin.* 2019;29(xx):546-50.