CAMBRIDGE
UNIVERSITY PRESS

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Concerns about contracting HIV, knowing partners' HIV sero-status and discussion of HIV/STI with sexual partners as determinants of uptake of HIV testing

Anthony Idowu Ajayi[1]*, Abdulazeez Olumide Abioye[2], Oladele Vincent Adeniyi[3] and Wilson Akpan[1]

[1]Department of Sociology, Faculty of Social Sciences & Humanities, University of Fort Hare, East London, South Africa, [2]Department of Sociology, University of Ilorin, Ilorin, Nigeria and [3]Department of Family Medicine & Rural Health, Faculty of Health Sciences, Walter Sisulu University, Mthatha/East London, South Africa
*Corresponding author. Email: ajayianthony@gmail.com

Abstract

Worldwide, adolescents and young adults (aged 15–25 years) account for the highest proportion of new HIV infections, yet the uptake of HIV testing among this cohort is sub-optimal. Understanding factors that predict the uptake of HIV testing among adolescents and young adults is critical for designing effective and relevant interventions to increase testing. Drawing from the psychosocial constructs of the Health Belief Model, the study examined the effects of HIV risk perception, discussion of HIV with partners and knowing partners' HIV status on HIV testing uptake among adolescents and young adults in two Nigerian universities. The study was conducted in 2018 and was cross-sectional in design, with a final sample of 784 male and female students selected using stratified random sampling. Adjusted and unadjusted logistic regression models were used to examine the effect of HIV risk perception, discussion of HIV with partners and knowing partners' HIV status on HIV testing uptake. Only 50.6% of participants had ever tested for HIV with 30.7% being tested in the last year, with no significant differences by sex. After controlling for other covariates (age, sex and being sexually active), knowing partners' HIV status, having discussed HIV with partners and being very concerned about contracting HIV were found to be significantly associated with ever being tested for HIV and recent HIV testing uptake. Uptake of HIV testing was found to be low in the study setting and fell short of the first '90%' UNAIDS target. Age-appropriate strategies, targeting open communication on HIV/STIs and disclosure of sero-status between sexual partners are required to promote uptake of HIV testing among young adults and adolescents in Nigeria.

Keywords: HIV testing; HIV Sero-status; Adolescents and Young Adults

Introduction

Uptake of HIV testing is central to the diagnosis of HIV infection and early initiation of antiretroviral therapy (ART), which are necessary to halt the spread of the disease and prevent HIV-related mortality (Girardi *et al.*, 2007). Yet many HIV infections remain undiagnosed, especially in sub-Saharan Africa and particularly among adolescents and young adults (White *et al.*, 2009; Deblonde *et al.*, 2010; Staveteig *et al.*, 2017; Wanyenze *et al.*, 2011). There is evidence that most recently diagnosed people present with late-stage disease (Girardi *et al.*, 2007; Burns *et al.*, 2008; Wanyenze *et al.*, 2011; Camoni *et al.*, 2013). Delaying testing for HIV results in late diagnosis, which has deleterious consequences not only for the patient, but also for the population at large (Girardi *et al.*, 2007). In other words, individuals who are diagnosed late are often

ill, have a high risk of mortality, tend to respond poorly to treatment and cost more to treat. Individuals who remain untested aid the furtherance of the pandemic nature of the disease by failing to adopt preventive measures and the behavioural patterns required of them to curtail onward transmission of the disease (Marks *et al.*, 2005).

Despite having the largest burden of HIV, uptake of HIV testing – especially among young adults – in many sub-Saharan African countries remains suboptimal (Kalichman & Simbayi, 2003; Vermeer *et al.*, 2009; Ogaji *et al.*, 2013). Only an estimated 15% and 10% of young men and women, respectively, know their HIV status in sub-Saharan Africa (World Health Organization, 2013). Specifically, the prevalence of HIV is 3.2% in Nigeria, but due to its huge population the country has the second largest number of people living with HIV (PLHIV) worldwide – an estimated 3.2 million (Awofala & Ogundele, 2018). Yet the uptake of HIV testing is relatively low in Nigeria, especially among adolescents and youths (Ogaji *et al.*, 2013; Amu *et al.*, 2014; Olowokere, *et al.*, 2018). Only 34% of people living with HIV in Nigeria know their status compared with 75% globally (UNAIDS, 2014).

It has been documented previously that perceived physical health deterioration or death of a loved one, roll-out of various HIV testing initiatives, availability of treatment, social network and support and guarantee of anonymity and confidentiality are all enabling factors for the uptake of HIV testing (Deblonde *et al.*, 2010; Musheke *et al.*, 2013). In contrast, perceived low risk of contracting HIV, fear of stigmatization, lack of access and the perceived psychological burden of living with HIV are reported barriers to the uptake of HIV testing (Meiberg *et al.*, 2008; Deblonde *et al.*, 2010; MacKellar *et al.*, 2011; Turan *et al.*, 2011; Prestage *et al.*, 2012; Musheke *et al.*, 2013). Although the cost of HIV testing is relatively low in Nigeria, access to the test is limited, especially in rural areas (Federal Ministry of Health, 2013; NACA, 2014). For instance, over 30% of adolescents and young adults do not know where to access HIV testing (Federal Ministry of Health, 2013).

Worldwide, adolescents and youths (aged 15–25 years) account for the highest proportion of new HIV infections (UNAIDS, 2012; World Health Organization, 2013). What is more, this age cohort are more likely not to have tested for HIV, have the lowest level of adherence to ART and viral load suppression and are more likely to die from HIV/AIDS-related causes. To reverse this trend and eliminate the AIDS epidemic by 2030, 90% of PLHIV have to know their HIV status, 90% of those who have received an HIV diagnosis have to receive ART and 90% of those on ART have to be virally suppressed (Joint United Nations Programme on HIV/AIDS, 2014). Understanding factors that predict the uptake of HIV testing among adolescents and young adults is critical to developing relevant interventions for this cohort.

Risk perception is a core construct of the Health Belief Model (HBM), which is widely utilized in health behaviour research (Glanz *et al.*, 2008; Painter *et al.*, 2008; Hayden, 2013). According to the HBM, individuals who have a higher perceived risk of contracting an illness are more predisposed to risk reduction behaviours, including treatment utilization (Glanz *et al.*, 2008; Painter *et al.*, 2008). In other words, perceived susceptibility to an illness, perceived severity of the illness and perceived benefits of treatment all influence risk reduction behaviours and treatment utilization (Glanz *et al.*, 2008; Painter *et al.*, 2008). However, empirical evidence on the association between HIV risk perceptions and the uptake of HIV testing is mixed (Khawcharoenporn *et al.*, 2016). While there are studies that show that low HIV risk perception is associated with not testing for HIV (Marcus *et al.*, 2016; Olowokere *et al.*, 2018), another study did not find this association (Sisay *et al.*, 2014). Thus, there is a gap in our understanding of the association between HIV risk perceptions and the uptake of HIV testing. Many studies have defined HIV risk perception as an individual's perception of his/her likelihood of contracting HIV (Marcus *et al.*, 2016; Olowokere *et al.*, 2018). The shortcoming of this definition is that an individual may have concerns about contracting HIV, despite rating himself/herself as unlikely to contract HIV. Studies have shown that people tend to underestimate their HIV acquisition risk (Khawcharoenporn *et al.*, 2016). While people may underestimate their risk of contracting HIV

(an often stigmatized disease), the chances are that they will accurately report whether they are worried or concerned about contracting HIV. The relationship between concerns about contracting HIV and uptake of HIV testing is less understood.

Discussion of HIV and STIs with a sexual partner represents an important step in self-risk assessment, or at least serves as an important indication of the occurrence of risk assessment. In addition, insisting on knowing a sexual partner's HIV status could facilitate couple testing and promote positive behaviour among adolescents. Drawing from the psychosocial constructs of the Health Belief Model, this paper examines the effects HIV risk perceptions, discussion of HIV with partners and knowing partners' status on HIV testing uptake among adolescents and young adults in two Nigerian universities. It also assesses the progress towards achieving the first of the three 90–90–90 UNAIDS targets by focusing on university students in Nigeria, characterized as engaging in risky sexual behaviours including unprotected sex with multiple sexual partners (Imaledo *et al.*, 2012; Noubiap *et al.*, 2015; Ajayi *et al.*, 2016, 2018).

Methods

This cross-sectional study was conducted between February and April 2018 in two universities in North–Central Nigerian: the University of Ilorin, run by the federal government, and Nasarawa State University, run by the state government. These universities were selected purposively. Nasarawa State not only has a high prevalence of HIV (7.5%), but shares boundaries with states that have the highest prevalence of HIV in Nigeria (Federal Ministry of Health, 2013). Most students in Nasarawa State University are from Nasarawa and neighbouring states. In contrast, the University of Ilorin has a highly diverse group of students. The two universities combined have an approximate total number of 45,000 students.

A self-designed validated questionnaire was administered to 800 male and female students using a face-to-face interview method. A pilot study was conducted among 20 students at the University of Ibadan, Nigeria, prior to commencement of the study. Each student completed the questionnaire independently and was debriefed in order to get their feedback on the clarity of the instrument. Four graduate students were recruited as research assistants and trained to administer the questionnaire at the two study universities. The University of Fort Hare and Ondo State Ministry of Health Ethical Review Committees approved the study protocol. The participants voluntarily granted their consent after being convinced of confidentiality and anonymity.

Study participants and sampling design

All students currently enrolled at the two universities were eligible for the study. The study sample size was based on an estimated 50% prevalence of HIV testing uptake, as previously reported by Ogaji *et al.* (2013). The sample size was determined using the sample size calculator at a confidence level of 95%, with a confidence interval of ±5. The appropriate sample size needed to detect 5% error at each of the universities after adjusting for possible missing responses was 400 participants. A stratified random sampling technique was employed for sample selection. To ensure representativeness, students were stratified by sex, year of study and faculty of study. Probability proportion to the size of each stratum was used to determine the number of samples required from each stratum. Overall, 800 students took part in the study, but sixteen questionnaires were discarded due to incomplete responses, giving a final sample of 784 (402 males and 381 females).

Measures
Dependent variables
HIV testing uptake was measured using two variables based on the answers to two questions: (1) '*ever tested for HIV*', with a dichotomized yes/no response to the question 'Have you ever tested for HIV?'; and (2) '*recently tested for HIV*', based on the question 'What month and year was

your most recent HIV test done?' Recent HIV test was defined as an HIV test done within one year of the survey.

Independent variables

The main independent variables were 'HIV risk perception', 'perceived severity of HIV', 'knowing partners' HIV status' and 'discussed HIV/STIs with partners'.

'HIV risk perception' was based on the HBM assumption that illness perception influences risk reduction behaviour. The study thus hypothesized that HIV risk perception is significantly related to HIV testing – which is a risk reduction behaviour. It was measured using three questions derived from previous studies (Corneli *et al.*, 2014; Sisay *et al.*, 2014; Marcus *et al.*, 2016): (1) 'Do you think you are at risk of contracting HIV?', with a dichotomized yes/no response; (2) How would you rate your chances of contracting HIV?', on a scale of 'highly likely' to 'highly unlikely', re-coded into 'unlikely' (merging of unlikely and highly unlikely) and 'likely' (merging of likely, highly likely and neutral) for the bivariate and multivariate analyses; (3) 'Do you have concerns about contracting HIV from your sexual partners?', with the three mutually exclusive responses 'concerned', 'somewhat concerned' and 'not concerned', re-coded into 'concerned' and 'somewhat/unconcerned' for the bivariate and multivariate analyses. It was assumed that some of the participants currently had more than one sexual partner.

'Perceived severity of HIV' was assessed by asking participants whether they considered HIV to be a dangerous disease, with a dichotomized yes/no response. 'Knowing partners' HIV status' was assessed by asking participants whether they knew the HIV sero-status of their partners, with a dichotomized yes/no response. 'Discussed HIV/STIs with partners' was assessed by asking participants whether they had discussed HIV/STIs with their sexual partners, with a dichotomized yes/no response.

Other independent variables included in the study were age, sex, ever engaged in sex and being sexually active in the past year.

Data analysis

The obtained data were coded and captured into SPSS version 24 for Windows (Chicago, IL, USA). Data were cleaned to remove possible errors during capturing. This was done by running a frequency count for all variables and re-visiting all errors and discrepancies observed in the results. Three levels of analysis were employed: univariate, bivariate and multivariate. Frequency and mean distributions were run for all variables of interest at the univariate level of analysis. The relationship between each independent variable and the dependent variable was examined using cross-tabulation, chi-square and unadjusted logistic regression models. To examine the net effects of knowing partners' HIV status, having discussed HIV testing with sexual partners, perceived susceptibility to HIV and perceived severity of HIV on recent and ever uptake of HIV testing, a multivariate logistic regression model was computed at 95% confidence interval. Alpha values less than 0.05 were considered statistically significant. Possible confounders were adjusted for in the model.

Results

The demographic characteristics of the study participants by sex are presented in Table 1. Most participants were Christian, resided off campus and shared their rooms with at least one person. Their median age was 22 years.

Table 2 shows the distribution of participants by their perceptions of HIV risk and awareness of partners' sero-status by sex. The majority of students did not think they could contract HIV (87.5%), but more males (15.2%) than females (9.5%) considered themselves to be at risk of contracting the disease (Table 2). Likewise, most participants (81.2%) rated their chances of

Table 1. Demographic characteristics of participants by sex, Nigerian university students, 2018

Variable	All participants (N = 784)	Male (N = 402)	Female (N = 382)
Age			
16–19 years	219 (27.9)	76 (18.9)	143 (37.4)
20–24 years	384 (49.0)	207 (51.5)	177 (46.3)
>24 years	181 (23.1)	119 (29.6)	62 (16.2)
Level of university study			
First year	244 (31.1)	120 (29.9)	124 (32.5)
Second year	188 (24.0)	82 (20.4)	106 (27.7)
Third year	139 (17.7)	75 (18.7)	64 (16.8)
Fourth year	168 (21.4)	94 (23.4)	74 (19.4)
Fifth year	31 (4.0)	22 (5.5)	9 (2.4)
Masters	14 (1.8)	9 (2.2)	5 (1.3)
Residence			
On campus	156 (19.9)	61 (15.2)	95 (24.9)
Off campus	627 (80.1)	340 (84.8)	287 (75.1)
Living arrangement			
Alone	237 (30.7)	116 (29.4)	121 (31.9)
One room mate	315 (40.8)	161 (40.9)	154 (40.6)
More than one room mate	221 (28.6)	117 (29.7)	104 (27.4)
Religious background			
Christian Orthodox	304 (38.9)	166 (41.3)	138 (36.3)
Christian Pentecostal	270 (34.5)	131 (32.6)	139 (36.6)
Muslim	200 (25.6)	99 (24.6)	101 (26.6)
Other	8 (1.0)	6 (1.5)	2 (0.5)
Ever engaged in sex	629 (80.6)	329 (82.0)	300 (47.7)
Sexually active in past year	488 (62.2)	253 (62.9)	235 (61.5)

contracting HIV as either highly unlikely or unlikely, again with significant differences between the sexes. The vast majority (92.1%) considered HIV a dangerous disease, with significant sex variations. When asked whether they were concerned about contracting HIV from their sexual partners, most (63.9%) responded affirmatively, with no significant sex differences. Nonetheless, the majority of participants (79.1%) reported that they were currently doing something to mitigate their risk of contracting HIV, with correct and consistent condom use (29.6%), faithfulness (25.0%) and abstinence commonly being reported (37.4%). Only a few (8%) reported that they did nothing to protect themselves from contracting HIV. However, most participants (61.2%) were unaware of their partners' HIV sero-status and only 37.6% had ever discussed HIV with their sexual partners, with no significant sex differences.

Table 2. Distribution of participants by HIV risk perception, knowing partners' HIV sero-status and discussing HIV testing with sexual partners, by sex

Variable	All (N = 784)	Male (N = 402)	Female (N = 382)	p-value
Do you think you can contract HIV?				
Yes	96 (12.5)	60 (15.2)	36 (9.5)	0.022
No	675 (87.5)	334 (84.8)	341 (90.5)	
How do you rate your chances of contracting HIV?				
Highly likely	12 (1.5)	9 (2.2)	3 (0.8)	0.015
Likely	55 (7.1)	35 (8.7)	20 (5.3)	
Neutral	79 (10.1)	46 (11.5)	33 (8.7)	
Unlikely	279 (35.8)	149 (37.2)	130 (34.4)	
Highly unlikely	354 (45.4)	162 (40.4)	192 (50.8)	
Do you think HIV is a dangerous disease?				
Yes	716 (92.1)	375 (94.5)	341 (89.7)	0.016
No	61 (7.9)	22 (5.5)	39 (10.3)	
Are you concerned about contracting HIV from your sexual partners?				
Very concerned	292 (38.5)	154 (39.5)	138 (37.4)	0.082
Somewhat concerned	193 (25.4)	109 (27.9)	84 (22.8)	
Not concerned	274 (36.1)	127 (32.6)	147 (39.8)	
Do you do something to prevent contracting HIV?				
Yes	561 (79.1)	296 (79.4)	256 (78.9)	0.746
No	148 (20.9)	77 (20.6)	71 (21.1)	
What do you do?				
Abstain from sex	286 (37.4)	125 (32.1)	161 (43.0)	0.000
Stay faithful to one partner	191 (25.0)	83 (21.3)	108 (28.9)	
Use condoms correctly and consistently	226 (29.6)	151 (38.7)	75 (20.1)	
Nothing	61 (8.0)	31 (7.9)	30 (8.0)	
Do you know your partners' HIV sero-status				
Yes	293 (38.8)	143 (37.0)	150 (40.7)	0.173
No	462 (61.2)	243 (63.0)	219 (59.3)	
Have you discussed HIV/STIs with your partners?				
Yes	282 (37.6)	141 (36.6)	141 (38.6)	0.311
No	468 (62.4)	244 (63.4)	224 (61.4)	

Tables 3 and 4 show the logistic regression analyses of the effects of HIV risk perception, knowing partners' HIV sero-status and discussing HIV testing with sexual partners on 'ever tested for HIV' and 'recently tested for HIV', respectively. Only 50.6% and 30.6%, respectively, of participants had ever tested, or recently tested, for HIV, with no significant differences between

Table 3. Adjusted and unadjusted logistic regression model showing the effects of HIV risk perception, knowing partners' HIV sero-status and discussing HIV testing with sexual partner on 'ever tested for HIV'

Variable	Ever tested	Never tested	UOR	AOR
Sex				
Male	208 (52.1)	191 (47.9)	1.14 (0.86–1.50)	1.03 (0.74–1.46)
Female (Ref.)	187 (49.0)	195 (51.0)	1	1
Age				
≥20 years	315 (59.4)	215 (40.6)	3.10 (2.22–4.31)***	2.01 (1.34–3.01)***
<20 years (Ref.)	68 (31.1)	151 (68.9)	1	1
Do you know your partners' HIV status?				
Yes	211 (72.0)	82 (28.0)	4.03 (2.94–5.53)***	2.37 (1.59–3.53)***
No (Ref.)	180 (39.0)	282 (61.0)	1	1
Have you discussed HIV with your partners?				
Yes	210 (74.5)	72 (25.5)	4.54 (3.28–6.29)***	2.28 (1.52–3.42)***
No (Ref.)	183 (39.1)	285 (60.9)	1	1
Do you think you can contract HIV?				
Yes	66 (68.8)	30 (31.3)	2.34 (1.48–3.70)***	1.39 (0.82–2.36)
No (Ref.)	327 (48.4)	348 (51.6)	1	1
How do you rate your chances of contracting HIV?				
Highly likely/likely/neutral	97 (66.4)	49 (33.6)	2.20 (1.51–3.20)***	2.12 (1.36–3.31)***
Unlikely/highly likely (Ref.)	300 (47.4)	333 (52.6)	1	1
Are you concerned about contacting HIV from your partners?				
Very concerned	189 (64.7)	103 (35.3)	2.41 (1.78–3.26)***	2.04 (1.44–2.89)***
Somewhat/not concerned (Ref.)	202 (43.3)	265 (56.7)	1	1
Do you think HIV is a dangerous disease?				
Yes	369 (92.9)	347 (91.3)	1.25 (0.7–2.12)	0.85 (0.46–1.57)
No (Ref.)	28 (7.1)	33 (8.7)	1	1
Have you been sexually active in the past year?				
Yes	277 (56.8)	211 (43.2)	1.83 (1.35–2.47)***	1.15 (0.80–1.66)
No (Ref.)	110 (41.8)	153 (58.2)	1	1

UOR: unadjusted odd ratio; AOR: adjusted odd ratio; Ref: reference category.
***$p < 0.005$

Table 4. Adjusted and unadjusted logistic regression model showing the effects of HIV risk perception, knowing partners' HIV sero-status and discussing HIV testing with sexual partner on 'recently tested for HIV'

Variable	Tested in past year	No recent HIV test	UOR	AOR
Sex				
Male	123 (30.6)	279 (69.4)	0.10 (0.74–1.35)	0.94 (0.66–1.34)
Female (Ref.)	117 (30.6)	265 (69.4)	1	1
Age				
≥20 years	315 (59.4)	215 (40.6)	2.27 (1.56–3.32)***	1.43 (0.92–2.24)
<20 years (Ref.)	68 (31.1)	151 (68.9)	1	1
Knows partners' HIV status				
Yes	141 (48.1)	152 (51.9)	3.49 (2.53–4.81)***	2.19 (1.47–3.26)***
No (Ref.)	97 (21.0)	365 (79.0)	1	1
Discussed HIV with partners				
Yes	138 (48.9)	144 (51.1)	3.48 (2.53–4.80)***	1.75 (1.16–2.63)*
No (Ref.)	101 (21.6)	367 (78.4)	1	1
Do you think you can contract HIV?				
Yes	40 (41.7)	56 (58.3)	1.72 (1.11–2.67)*	1.2 (0.73–1.99)
No (Ref.)	198 (29.3)	477 (70.7)	1	1
How do you rate your chances of contracting HIV?				
Neutral/likely	55 (37.7)	91 (62.3)	1.46 (1.01–2.13)*	1.43 (0.93–2.21)
Unlikely (Ref.)	185 (29.2)	448 (70.8)	1	1
Are you concerned about contracting HIV from your partners?				
Very concerned	132 (45.2)	160 (54.8)	2.81 (2.05–3.85)***	2.35 (1.66–3.32)***
Somewhat/not concerned (Ref.)	106 (22.7)	361 (77.3)	1	1
Do you think HIV is a dangerous disease?				
Yes	224 (31.3)	492 (68.7)	1.28 (0.71–2.32)	0.97 (0.50–1.86)
No (Ref.)	16 (26.2)	45 (73.8)	1	1
Have you been sexually active in the past year?				
Yes	170 (34.8)	318 (65.2)	1.63 (1.16–2.28)**	1.14 (0.77–1.67)
No (Ref.)	65 (24.7)	198 (75.3)	1	1

UOR: unadjusted odd ratio; AOR: adjusted odd ratio; Ref: reference category.
***$p < 0.005$; *$p < 0.05$.

the sexes (Figure 1). In the case of 'ever tested for HIV', the unadjusted logistic regression model showed an independent association with being aged 20 or over, knowing partners' HIV status, discussing HIV with sexual partners, perceived susceptibility to HIV, rating of chances of HIV
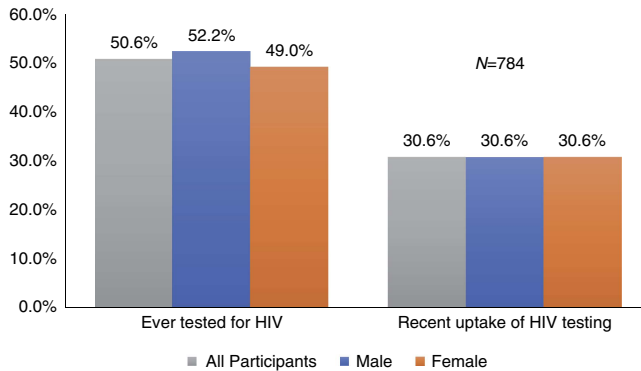
Figure 1. Uptake of HIV testing among Nigerian university students by sex (*N* = 784).

susceptibility, concerns about contracting HIV and being sexually active (Table 3). However, in the adjusted model, after controlling for other covariates (age, sex and being sexually active), knowing partners' HIV status, having discussed HIV with partners, perceived likelihood of contracting HIV and being very concerned about contracting HIV were significantly associated with 'ever tested for HIV'. Individuals who knew their partners' HIV sero-status had increased odds of 'ever tested for HIV' compared with those who did not. Likewise, individuals who had discussed HIV testing with their sexual partners had increased odds of 'ever tested for HIV' compared with those who had not. Those who considered themselves to be likely to be susceptible to contracting HIV were twice as likely to have ever tested for HIV compared with those who considered themselves to be unlikely to be susceptible to contract HIV.

In the case of 'recently tested for HIV', the unadjusted logistic regression model showed an independent association with being aged 20 or over, knowing partners' HIV status, having discussed HIV testing with partner, perceived risk of contracting HIV and being sexually active (Table 4). After controlling for other covariates (age, sex and consistent condom use) in the multivariate analysis, knowing partners' HIV status, having discussed HIV testing with partners, having concerns about contracting HIV and rating oneself as likely to contract HIV were associated with recent HIV testing. Individuals who knew their partners' status were twice as likely to have recently tested for HIV compared with those who had not. Likewise, individuals who had discussed HIV testing with their partners had increased odds of recent uptake of HIV testing compared with those who had not. Similarly, students who believed they were likely to contract HIV had higher odds of recent HIV testing compared with those who rated themselves as unlikely to contract HIV. Individuals who had concerns about contracting HIV from their sexual partners had increased odds of recent HIV testing.

Discussion

This study examined the effect of HIV risk perception, discussion of HIV with sexual partners and knowing partners' HIV sero-status on HIV testing uptake among young adults in two Nigerian universities. It was found that most university students had a low perception of their risk of susceptibility to HIV. This was the case despite the fact that the majority of the students are unaware of their own or their partners' HIV sero-status and had never discussed HIV/STIs with their sexual partners. It is possible that most students underestimated their risk of contracting HIV, perhaps due to perceived HIV stigma, as reported in a previous study by Corneli *et al.* (2014). These findings corroborate those of a recent study which showed that many people at risk of STIs underestimate their level of risk (Clifton *et al.*, 2018). However, most students have concerns about contracting HIV from their sexual partners. This clearly indicates that while most students in the study believed they were unlikely to contract HIV, they

were of course concerned about contracting HIV. Their concerns about contracting HIV may possibly be due to their exposure to the risk of contracting HIV. In other words, they engage in unprotected sex with a partner despite not knowing their partner's HIV status. Risky sexual behaviour has been reported to be common among Nigerian university students (Ajayi *et al.*, 2018).

The rate of HIV testing uptake found in this study was very low, and is consistent with that reported in previous similar studies (Babalola, 2007; Golub & Gamarel, 2013; Ogaji *et al.*, 2013). The study's reported rates of ever and recent testing for HIV fell short of the first of the 90–90–90 UNAIDS targets, which is required for the elimination of new HIV infections. This clearly indicates that many cases of HIV infection are undiagnosed in the study population and this could have deleterious consequences. Although the cost of HIV testing is relatively low in Nigeria, access to this is limited (Federal Ministry of Health, 2013), especially on university campuses. Thus, concerted efforts to promote HIV testing on campuses are long overdue and should be a priority strategy for the National Agency for the Control of AIDS (NACA) in Nigeria. Self-testing for HIV has demonstrated impressive results (MacPherson *et al.*, 2014), and thus may be an important strategy for promoting uptake of HIV testing on Nigerian campuses.

This study has shown that high HIV risk perceptions increase the odds of HIV testing uptake after controlling for other covariates. This finding is consistent with the literature (De Paoli *et al.*, 2004) and lays credence to the assumptions in the HBM (Glanz *et al.*, 2008). Consistent with the proposition in the HBM, individuals who are gravely concerned about contracting HIV from their sexual partners are more likely to have ever tested or recently tested for HIV compared with those who are not concerned or neutral about contracting HIV. This finding extends what is already known about HIV risk perceptions and uptake of HIV testing. Individuals who are concerned about contracting HIV, perhaps resulting from their risk exposure, may decide to test for HIV in order to allay their fears and change their risky behaviour. Similarly, individuals who rate their risk of contracting HIV as highly likely/likely have higher odds of uptake of HIV testing compared with those who rate their chances of contracting HIV as highly unlikely or unlikely. It is possible that those who rate themselves as highly unlikely to contract HIV are abstaining from sex or using condoms consistently, and as such feel protected from contracting HIV. Nonetheless, uptake of HIV testing is still important for everyone, irrespective of his or her perceived risk of susceptibility to contracting HIV.

This study also revealed a strong association between knowing partners' HIV sero-status and the uptake of HIV testing. Previous studies have reported that spousal communication and knowledge of male partner's HIV sero-status are determinants of uptake of HIV testing (Gage & Ali, 2005; Turan *et al.*, 2011). The influence of one partner over the other could be leverage in promoting HIV testing uptake. One pathway through which knowing one's partner's status could increase uptake of HIV testing is through contact tracing, which is a widely adopted strategy in identifying new HIV infections (Hsieh *et al.*, 2010). Evidence that offering HIV testing to family members, especially sexual partners of people diagnosed with HIV, doubled the proportion of men in Kenya who took an HIV test lends credence to this assertion (Krakowiak *et al.*, 2016). This finding also largely underscores the importance of the influence of couple testing in promoting uptake of HIV testing. Counselling adolescents and youths who test for HIV about the importance of knowing their partners' HIV status could be an important strategy to promote uptake of HIV testing among this cohort.

Another important finding of this study was that discussion of HIV/STIs with sexual partners increases the odds of uptake of HIV testing. This relationship holds after controlling for other covariates. This finding underscores the importance of open communication between couples in promoting healthy behaviour. Discussion of HIV/STIs could promote safe sex practices among adolescents and youths otherwise characterized as engaging in risky sexual practices. Health

promotional messages designed to influence uptake of HIV testing among this cohort could consider including messages promoting the discussion of HIV/STIs with sexual partners.

The study has its limitations. First, its cross-sectional design means that the association between HIV risk perception, discussion of HIV with sexual partners and knowing partners' status on HIV testing uptake does not infer causation. Also, the study was conducted among adolescents and young adults with higher education levels than those of the general population, so the findings are not generalizable to the overall Nigerian adolescent and young adult population.

In conclusion, the uptake of HIV testing was found to be low in the study setting and fell short of the first 90% UNAIDS target. Encouraging the discussion of HIV/STIs with sexual partners and knowing partners' HIV status could be important in promoting the uptake of HIV testing among young adults and adolescents. Age-appropriate strategies targeting open communication on HIV/STIs and disclosure of sero-status between sexual partners are required to promote the uptake of HIV testing among young adults and adolescents in Nigerian youth.

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