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ORIGINAL PAPER

HIV Risk Perception Among College Students at a University in the Midwest

Zelalem Haile[1] · Caroline Kingori[2] · Kay-Anne Darlington[3] · Tania Basta[4] · Bhakti Chavan[5]

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Abstract Despite the high prevalence of risky sexual behavior among college students, HIV risk perception in this population remains low. Overall, there is a dearth of studies examining HIV risk perception among college students. We examined HIV risk perception among college students at a University in the Midwest. Students enrolled in undergraduate and graduate courses were recruited for this pilot study (n = 200). The outcome of interest was perceived HIV risk perception. Descriptive and inferential statistical analyses were utilized to examine the association between HIV risk perception and four measures namely: perceived

✉ Zelalem Haile
haile@ohio.edu

Caroline Kingori
kingori@ohio.edu

Kay-Anne Darlington
kdarlington@rio.edu

Tania Basta
basta@ohio.edu

Bhakti Chavan
chavan@ohio.edu

[1] Department of Social Medicine, Ohio University Heritage College of Osteopathic Medicine, 6775 Bobcat Way, Room 450, Dublin, OH 43016, USA

[2] Department of Social and Public Health, College of Health Sciences and Professions, Ohio University, Grover Center W347, Athens, OH 45701, USA

[3] College of Arts and Sciences, University of Rio Grande, Wood Hall 217, Rio Grande, OH 45674, USA

[4] Department of Social and Public Health, College of Health Sciences and Professions, Ohio University, Grover Center W359, Athens, OH 45701, USA

[5] Department of Social Medicine, Ohio University Heritage College of Osteopathic Medicine, 6775 Bobcat Way, Room 454, Dublin, OH 43016, USA

severity of/susceptibility to HIV, perceived benefits of safe sex, perceived barriers to safe sex and self-efficacy, measured using validated instruments. Overall, greater proportion of students perceived that they are not at risk of HIV infection (81.5 %). Participants had high scores for all measures, except for perceived barriers to safe sex [mean score (standard deviation) 24.5 (15.3)]. The multivariable model showed a statistically significant negative association between composite severity of/susceptibility to HIV/AIDS score and moderate perceived HIV risk (OR, 95 % confidence interval) (0.96, 0.93–0.99, $p = 0.04$). In addition, the odds of having moderate perceived HIV risk were higher among students who currently have a dating partner compared to students who currently do not have a dating partner (3.19, 1.24–8.18, $p = 0.01$). College level HIV prevention efforts should continue to address HIV risk. Additional research examining risk perception in a much larger, and more diverse, student population is needed.

Keywords HIV · Risk perception · College students

Introduction

As of 2010, an estimated 1.1 million individuals in the US aged 13 years and above were living with HIV infection (Centers for Disease Control and Prevention [CDC] 2015a). Approximately 47,500 new HIV infections were diagnosed in 2010 (CDC 2015b). Despite the fact that the overall HIV incidence is declining in the US, the rates among young adults continue to remain a key challenge (CDC 2015a). In 2010 young people aged 13 to 24 accounted for approximately 26 % (12, 200) of all new HIV infection cases (CDC 2015b). Estimates for 2013 indicate that young adults represent 21 % of new HIV diagnoses and 81 % of the incidence occurring among those aged 20–24 years. Furthermore, of the 62,400 young people aged 13 to 24 living with HIV in 2012, 32,000 were living with undiagnosed HIV infection (CDC 2015a).

With regard to college students, it is estimated that 1 in every 500 college students is infected with HIV in the US (Adefuye et al. 2009; Gayle et al. 1990). Approximately 75–90 % of all students are sexually active (LaBrie et al. 2005; Ratliff-Crain et al. 1999) and on average have more than 2 partners per year (Dilorio et al. 1998; LaBrie et al. 2005). A national survey of 34 colleges and universities that included 24,000 students found that in the prior 30 days 43 % students engaged in oral sex, over 46 % had vaginal intercourse, and approximately 4 % had anal sex (The American College Health Association 2007). Of those who had oral sex, fewer than 4 % used a condom during the last episode, for vaginal intercourse 54 % used a condom during the last act, and for anal sex over 26 % used a condom during the last incident (The American College Health Association 2007). These statistics challenge the effectiveness of ongoing HIV related awareness programs, and justify the need for further research to guide the development of diverse HIV related programs targeting this priority group.

Low risk perception, declining health education, low rates of condom use, and multiple sexual partners are some of the most often cited factors hindering

interventions targeted towards this group (CDC 2015a). In addition, there is a reported consistent gap in knowledge among college students with regard to HIV transmission and overall sexual health knowledge (Sutton et al. 2011; Murray et al. 2014). Brown et al. (2012) found that despite having HIV prevention knowledge, almost 70 % of students in the study did not necessarily practice safe sex, while El Bcheraoui et al. (2013) found that students did not utilize safer sex practices despite perceiving themselves at average to high-risk for HIV infection. Such findings enhance the challenges in promoting HIV prevention among college students and call for developing effective strategies with nuance.

The behavioral correlates of aforementioned low-risk perception among college students are similar to the general population and emphasize the importance of targeting high-risk individuals (Khawcharoenporn et al. 2012; Baidoobonso et al. 2013). Khawcharoenporn et al. (2012) found that inconsistent rates of condom use were high in both males and females during oral and anal sex. Furthermore, 84 % of the participants perceived themselves as low-risk for contracting HIV infection despite engaging in high-risk behaviors such as unprotected sex and alcohol/drug use. Such findings present a dire situation across all age groups and genders.

Overall, low-risk perception in the college and general population is alarming. Beltzer et al. (2013), speculated that low-risk perception could be exacerbated by: (1) inadequate knowledge about HIV and other STI transmission routes; (2) reduced severity of HIV morbidity and AIDS related mortality due to anti-retroviral medication and; (3) distrust of the efficacy of condoms to provide complete protection. Given those concerns, novel HIV prevention strategies need to be developed and implemented in order to enhance HIV risk perception among college students and the general population.

The development and implementation of effective HIV prevention strategies that address risk-perception requires a sound understanding of key factors associated with risky sexual behavior. This paper examines HIV risk perception among a convenience sample of 200 students at a university in the Midwest region. Findings from this exploratory study will be utilized to develop an intervention in partnership with the student health care center as well as develop a larger comparative study with other colleges in the west-coast, southern and mid-west regions of the US.

Methods

Sample and Research Design

A sample of 200 students was recruited from a pool of college students at a university in the Midwest. Additionally, participants were sought at high-traffic areas of the university campus such as the entrance of the main student center. Eligible participants had to be: (a) 18 years of age or older and (b) registered at the university at the time of the study. Because of small sample size, participants who were graduate students ($n = 4$), married ($n = 1$) or transgender ($n = 1$) were excluded from the analysis. In addition, participants with missing data ($n = 10$) on

covariates included in the multivariate model were excluded from the study. The final sample consisted of 184 participants (77.7 % female).

Approval was sought from the Institutional Review Board (IRB) of the institution where data was collected. Permission was requested from faculty members to administer the survey during the class sessions. No course credit was provided for participation. Instead, participants received a $5 gift card as a token of appreciation for their participation. Research assistants explained the study to eligible participants and ensured that they filled out a consent form. Each participant was informed of the voluntary nature of the study and the option to discontinue if they felt uncomfortable responding to the questions. Participants recruited at high traffic areas were administered the survey in a private area while those recruited in the classroom completed the survey in the last 15 min of the class after signing the consent form.

Previously tested survey instruments were adapted and used for the current study (Carey and Schroder 2002; Fisher et al. 1994; Herek et al. 2002; White 2009). Items relevant for the current study were selected from the following instruments: HIV-KQ 18 (Carey and Schroder 2002); HIV information seeking among university students (Fisher et al. 1994; White 2009); HIV stigma (Herek et al. 2002); severity of and susceptibility to HIV/AIDS, benefits of safe sex, barriers to safe sex and self-efficacy (Mattson 1999).

Measures

The main outcome of interest in the current study was HIV risk perception. Students were asked "*What are the chances that you might get HIV*?" Responses include: no chance, moderate chance, and high chance. However, since none of the respondents reported 'high chance', the variable was dummy coded as 'no risk', and 'moderate risk'.

The main independent variables assessed in the current study included, perceived severity of/susceptibility to HIV/AIDS, perceived benefits of safe sex, perceived barriers to safe sex and self-efficacy. A six (6)-item severity of/susceptibility to HIV/AIDS instrument (Mattson 1999) was used to quantify severity of/susceptibility to HIV/AIDS. The questionnaire includes questions related to the perception of severity of HIV as a disease, and also their perceived susceptibility in acquiring HIV. Responses were measured using a four-point scale: strongly disagree, somewhat disagree, somewhat agree and strongly agree. This questionnaire had a strong internal consistency (Cronbach's $\alpha = 0.64$).

An eight (8)-item perceived benefit of safe sex instrument (Mattson 1999) was used to quantify perceived benefits of safe sex. The questionnaire includes questions to determine if practicing safe sex was an indicator of good, smart, responsible behavior. Responses were measured using a four-point scale: strongly disagree, somewhat disagree, somewhat agree and strongly agree. This questionnaire had a strong internal consistency (Cronbach's $\alpha = 0.73$).

An eight (8)-item perceived barriers to safe sex instrument (Mattson 1999) was used to quantify perceived barriers to safe sex in preventing HIV/AIDS. The questionnaire included questions examining various self-perceived barriers to safe

sex, including social, and religious factors. Responses were measured using a four-point scale: strongly disagree, somewhat disagree, somewhat agree and strongly agree. This questionnaire had a strong internal consistency (Cronbach's $\alpha = 0.63$).

An 8-item HIV self-efficacy instrument (Mattson 1999) was used to quantify self-efficacy in preventing HIV. The questionnaire had items examining the confidence participants had in practicing safe sex, using available condom, condom negotiation, sex talk, and discussing sexual history. Responses were measured using a four-point scale: strongly disagree, somewhat disagree, somewhat agree and strongly agree. This questionnaire had a moderately strong internal consistency (Cronbach's $\alpha = 0.59$).

Composite scores of perceived severity of/susceptibility to HIV, perceived benefits of safe sex, perceived barriers to safe sex, and self-efficacy perceived benefits of safe sex, perceived barriers to safe sex, and self-efficacy were created by summing the responses across the different questions and rescaling the results from 0 to 100 where higher scores indicated higher perceived severity of/susceptibility to HIV, higher level of agreement that safe sex was important for preventing HIV/AIDS, having greater barrier to having safe sex and higher level of self-efficacy, respectively.

Covariates

We chose covariates included in the analysis based on previous knowledge on their influence on HIV risk perception. These included age (Farmer and Meston 2006), gender (Farmer and Meston 2006), race/ethnicity (Farmer and Meston 2006), relationship status, sexual orientation (Halpern et al. 2004; Lewis et al. 2009), academic status (Farmer and Meston 2006), type of residence, had sex in the past 30 days (Lewis et al. 2009), knew someone living with or died of HIV (Opt et al. 2007), access to HIV information in the past 30 days (Opt et al. 2007), HIV knowledge and HIV stigma (Opt et al. 2007). Access to HIV information was measured based on participants response to the frequency of access to HIV related information in the past 30 days from sources that include: (i) poster, signs and billboards, (ii) pamphlets or brochures; (iii) newspaper; (iv) meeting, classes, presentations about HIV; (v) television and/or radio; (vi) healthcare professional; (vii) internet; (viii) social media. Responses were measured using a seven (7)-point scale: never, seldom, sometime, and often, somewhat often, frequently and very often. Access to HIV information index was constructed by assigning each of these responses a factor score generated through principal component analysis. These scores were then standardized in relation to a standard normal distribution with a mean of zero and a standard deviation of one. A sum of these scores were created to rank individuals based on their frequency of access to HIV information, and the scores were rescaled from 0 to 100 where a high score indicated greater access to HIV information.

A 17-item HIV knowledge instrument was used to measure knowledge of HIV. This instrument was adapted from the HIV-KQ 18 knowledge instrument (Carey and Schroder 2002). The questionnaire measures HIV infection routes, myths, treatment and prevention of HIV/AIDS. The responses were categorized as True,

False and 'Don't know. Don't know responses were itemized as an incorrect response. A composite HIV knowledge score was created by summing the responses and rescaling the result from 0 to 100 where a higher score indicated higher HIV knowledge.

A 14-item HIV stigma knowledge instrument (Herek et al. 2002) was used to measure HIV stigma, which included feelings towards, attitudes towards and interaction with people living with HIV/AIDS. Responses were measured using a four-point scale: strongly disagree, somewhat disagree, somewhat agree and strongly agree. This questionnaire had a strong internal consistency (Cronbach's $\alpha = 0.85$). A composite HIV stigma score was created by summing the responses across the different questions and rescaling the result from 0 to 100 where a higher score indicated higher level of HIV stigma.

Statistical Analysis

We used descriptive and inferential statistical methods to analyze the data. The distributions of composite perceived severity of/susceptibility to HIV, perceived benefits of safe sex, perceived barriers to safe sex, and self-efficacy perceived benefits of safe sex, perceived barriers to safe sex, self-efficacy, access to HIV information, HIV knowledge and HIV stigma scores were approximately normal.

Proportion of HIV risk perception as 'no risk' and 'moderate risk' was compared between each of the categorical variables, namely age, gender, race, relationship status, type of residence, sexual orientation, academic status, sex in last 30 days, and knowing someone living or died of HIV using the Chi-square (χ^2) tests. Differences in mean composite scores of perceived severity of/susceptibility to HIV, perceived benefits of safe sex, perceived barriers to safe sex, and self-efficacy perceived benefits of safe sex, perceived barriers to safe sex, self-efficacy, access to HIV information, HIV knowledge and HIV stigma between the two HIV risk perception groups namely 'no risk' and 'moderate risk' using independent sample t test. The crude association between HIV risk perception, covariates and HIV self-efficacy, severity of/susceptibility to HIV were obtained using bivariate and multivariable logistic regression analysis. Independent variables with p values of 0.20 or below in the bivariate analysis were entered simultaneously into a multivariable model. To assess for potential collinearity, regression diagnostics were utilized. The variance inflation factor and tolerance values were all within acceptable limits. We evaluated model fit through inspection of Hosmer and Lemeshow test ($p > 0.05$.), implying that the model's estimates fit the data at an acceptable level. All statistical analyses were conducted using SAS® 9.4 (SAS institute Cary, NC).

Results

Table 1 presents characteristics of the study sample. Study participants ranged in age from 19 to 31 years with a mean (standard deviation) of 21 (1.68) years. The majority of the sample was female, non-Hispanic White and identified as

Table 1 Description of sample characteristics by HIV risk perception (N = 184)

	Overall N (%)	No risk N (%)	Moderate risk N (%)	*p*
Age				0.45
19–21 years	134 (72.83)	111 (60.33)	23 (12.50)	
> 21 years	50 (27.17)	39 (21.20)	11 (5.98)	
Gender				0.23
Female	143 (77.72)	114 (61.96)	29 (15.76)	
Male	41 (22.28)	36 (19.57)	5 (2.72)	
Race				0.76
White	163 (88.59)	132 (71.74)	31 (16.85)	
Other	21 (11.41)	18 (9.78)	3 (1.63)	
Relationship status				0.01
Single	117 (63.59)	89 (48.37)	28 (15.22)	
Single with partner	67 (36.41)	61 (33.15)	6 (3.26)	
Type of residence				0.93
Dorms	107 (58.15)	87 (47.28)	20 (10.87)	
Other	77 (41.85)	63 (34.24)	14 (7.61)	
Sexual orientation				0.14†
Heterosexual	170 (92.39)	141 (76.63)	29 (15.76)	
Other	14 (7.61)	9 (4.89)	5 (2.72)	
Academic status				0.40
Freshman	39 (21.20)	30 (16.30)	9 (4.89)	
Sophomore	65 (35.33)	57 (30.98)	8 (4.35)	
Junior	47 (25.54)	38 (20.65)	9 (4.89)	
Senior	33 (17.93)	25 (13.59)	8 (4.35)	
Sex in last 30 days				0.82
No	116 (63.39)	95 (51.91)	21 (11.48)	
Yes	67 (36.61)	54 (29.51)	13 (7.10)	
Know someone living with or died of HIV				0.06†
No	171 (92.93)	142 (77.17)	29 (15.76)	
Yes	13 (7.07)	8 (4.35)	5 (2.72)	
	Mean (SD)	Mean (SD)	Mean (SD)	*p*
Severity/susceptibility	62.77 (12.63)	58.33 (13.20)	63.77 (12.32)	0.03
Benefits of safe sex	75.13 (15.87)	73.65 (18.76)	75.47 (15.19)	0.60
Barriers to safe sex	24.54 (15.33)	24.38 (14.4)	24.58 (15.58)	0.94
Self-efficacy	77.62 (15.81)	72.79 (18.97)	78.72 (14.85)	0.09
HIV knowledge	70.07 (18.69)	70.76 (21.45)	69.92 (18.08)	0.83
Access to HIV information	15.18 (15.05)	17 (12.71)	14.77 (15.54)	0.37
HIV stigma	20.8 (14.45)	21 (14.14)	20.76 (14.57)	0.92

† Indicates *p* values from Fisher's exact test

heterosexual. Greater proportion of the participants were sophomore students followed by junior, freshman and senior respectively. Greater proportion of the participants resided in the dorms. Approximately one-third of the participants had sex in the last 30 days. About 7 % of the participants knew someone living with or died of HIV. Greater proportion of students perceived that they are not at risk for HIV. Overall participants had higher scores for self-efficacy, perceived benefits of safe sex, HIV knowledge and perceived severity of/susceptibility of HIV scores and lower scores for access to HIV information in the past 30 days, HIV stigma and perceived barriers to safe sex, respectively.

Having perceived moderate risk perception differed by relationship status. Compared to participants who reported having a partner, greater proportion of those who were single indicated that they have moderate HIV risk X^2 (1, 184) = 6.3, $p < 0.05$. Students who reported having a moderate risk for HIV had higher perceived severity of/susceptibility to HIV scores (M = 63.8, SD = 12.3) than those who reported that they are not at risk of getting HIV (M = 58.3, SD = 13.2), t (184) = 2.2, $p = 0.03$.

After adjusting for composite self-efficacy score, relationship status, sexual orientation, and knowing someone living or died of HIV, the negative association between composite severity of/susceptibility to HIV score and having moderate perceived HIV risk perception remained significant OR (95 % CI) 0.96 (0.93–0.99; $p = 0.04$). Similarly, after adjusting for composite self-efficacy score, composite severity of/susceptibility score, sexual orientation, and knowing someone living or died of HIV, students without partners were 2.89 times as likely to perceiving moderate HIV risk as students with partners (Table 2).

Table 2 Association between HIV risk perception and self-efficacy and severity/susceptibility

	Unadjusted			Multivariable-adjusted		
	OR	(95 % CI)	*p*	OR	(95 % CI)	*p*
Severity	0.70	(0.51–0.95)	0.02	0.96	(0.93–0.99)	0.04
Self-efficacy	0.80	(0.63–1.00)	0.05	0.80	(0.66–1.08)	0.19
Relationship status						
Single with partner	Reference	1	–	Reference	1	–
Single	3.19	(1.24–8.18)	0.01	2.82	(1.04–7.64)	0.04
Sexual orientation						
Other	Reference	1	–	Reference	1	–
Heterosexual	0.37	(0.11–1.18)	0.09	0.59	(0.16–2.14)	0.42
Know someone living with or died of HIV						
No	Reference	1	–	Reference		
Yes	0.32	(0.10–1.07)	0.06	0.35	(0.09–1.29)	0.11

For the purpose of analysis, self-efficacy and severity have been modeled to 10 units

Discussion

In a pilot study involving a convenience sample of 184 students, we found a significant association between increased perceived severity of/susceptibility to HIV and having a moderate perceived HIV risk. This association remained significant after adjusting for potential confounders, namely self-efficacy, relationship status, sexual orientation, and knowing someone living or died of HIV. It is plausible that individuals with high perceived severity of/susceptibility to HIV score to have better knowledge and understanding of HIV risk (Kabwama and Berg-Beckhoff 2015).

Our study also found a significant positive association between HIV risk perception and relationship status after adjusting for potential confounders. Compared to singles with partner, students who had no partners perceived a moderate HIV risk. The present finding is supported by previous study that demonstrated low perceived HIV risk among college students who had partners (Lewis et al. 2009). Moderate HIV risk perception among students who reported having no partners may reflect either inadequate HIV knowledge, or involvement in high-risk behavior such as having multiple sexual partners.

Previous studies have found higher HIV risk perception among females compared to males (Opt et al. 2007; Parsons et al. 2000). However, in the current study we were unable to detect this relationship. This could possibly be due to the small sample size of this pilot study. In addition, this might have also been influenced by the fact that greater proportions of the study participants in the current study were females. It would be interesting to evaluate this relationship using a proportionate selection with respect to gender.

HIV risk perception can be a strong motivating factor for behavioral change, especially if an individual perceives control over their risk behavior or attitude. Tendency to systematically underestimate HIV risk, also termed as 'optimistic biases'; and treating HIV infection as a distant possibility has been found among college students (Lewis et al. 2009). Furthermore, HIV risk perception partly explains differences in adolescent sexual behavior and is known to influence the cognitive and social factors affecting adolescent sexual behavior (Lewis et al. 2009). Therefore, the development of effective intervention aiming at reducing HIV infection among college students requires a sound understanding of factors influencing HIV risk perception.

Limitation

The major limitation of the study relates to its small sample size resulting in limited generalizability. In addition, the cross-sectional nature of the study design precludes causal inferences. Our study also used only one item measure to assess HIV risk perception. Recent studies have shown the importance and utility of having multiple items while examining risk perception (Napper et al. 2012). Furthermore, the instrument we utilized did not capture previous history of STI diagnosis, which is associated with perceived risk (Mesenburg et al. 2014). Some studies have shown that there is an association between type of sexual partnership and perceived risk for HIV (Newcomb et al. 2014). In our study we did not measure whether or not the

category "single with partner" refers to a main partner, casual partner, or sex partner. Despite these limitations, the present study has numerous notable strengths. The study has evaluated a wide range of factors that might influence perceived HIV risk. Previous studies have primarily focused on the association between HIV risk perception and condom use, or knowledge, self-efficacy, severity of/susceptibility to HIV and condom use. Findings from this pilot study will be utilized to develop a pilot intervention as well as inform a larger comparative study that will be in collaboration with comparable institutions.

Conclusion

To conclude, the findings of the present study add to the scant literature on HIV risk perception among college students in the US. Understanding HIV risk perception plays a key role in informing public health policy and action. Efforts are needed to develop culturally acceptable strategies to reinforce positive HIV related preventive practices and behavior. Future research should examine factors influencing HIV risk perception in a large, diverse, and representative sample of college students.

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Compliance with Ethical Standards

Conflict of interest All the authors declare that there is no conflict of interest.

Ethical Approval All procedures performed using human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The Ohio University IRB reviewed and approved this research. The Board was able to provide expedited approval under 45 CFR 46.110(b)(1) because the research meets the applicability criteria 7 eligible for expedited review. Project Number 15X25. This approval is issued under the Ohio University OHRP Federal wide Assurance #00000095.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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