



Assessment of Risk Behaviors for HIV Infection among Undergraduate Students at a Historically Black University

Prince Onyekachi Andrew^{1*}, Azad Bhuiyan², Jung Hye Sung³,
Anthony Mawson² and Mohammad Shahbazi⁴

¹Lewisville Medical Pharmacy, 560 W Main St, Lewisville, TX 75057, USA.

²Department of Epidemiology and Biostatistics, School of Public Health, Jackson State University, Jackson, MS 39213, USA.

³Biostatistics Concentration, School of Public Health, Jackson State University, Jackson, MS 39213, USA.

⁴Department of Behavioral Health Promotion and Education, Jackson State University, Jackson, MS 39213, USA.

Authors' contributions

This work was carried out in collaboration among all authors. Author POA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors POA, AB, JHS, AM and MS managed the analyses of the study. Author POA managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJRID/2020/v3i230122

Editor(s):

(1) Dr. Bobby Joseph, Professor, Department of Community Health, St. John's Medical College, Bangalore, India.

Reviewers:

(1) Adelabu Olusesan Adeyemi, University of Fort Hare, South Africa.

(2) Roberta Termini, Italy.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/54674>

Original Research Article

Received 02 December 2019
Accepted 07 February 2020
Published 12 February 2020

ABSTRACT

Aims: This study aimed to assess and compare risk behaviors for HIV Infection among undergraduate students by gender at a historically black university.

Study Design: A cross-sectional survey.

Place and Duration of Study: This study was conducted from January 10, 2016 to September 30, 2016. Participants were selected through convenience sampling among undergraduate students of Jackson State University (JSU).

*Corresponding author: E-mail: princeandrew55@gmail.com;

Methodology: Sample: We included 400 undergraduate students (141 males, 259 females; age range 18-57 years). Data were collected using a validated self-administered standardized questionnaire that was designed to measure their risk behaviors for HIV Infection.

Results: Over seventy five percent of undergraduate students in this study have had at least one risk behavior related to HIV infection transmission. The engagement of these students in HIV sexual risk behaviors were not varied by gender (Chi-square test = 2.76; P = 0.1). However, participants engaged in various risk behaviors related to HIV infection transmission such as multiple sexual partners, unprotected sexual intercourse, low and inconsistent condom use.

Conclusion: We concluded that about 75.8% of the students have had at least one risk behavior related to HIV infection and engaged in various risk behaviors related to HIV infection transmission. The engagement of these students in HIV sexual risk behaviors were not varied by gender. This investigation calls for sustained effective youth appealing interventions tailored toward addressing various risk behaviors identified in this study.

Keywords: HIV; risk behaviors; students; African Americans; Mississippi.

1. INTRODUCTION

Human immunodeficiency virus (HIV) has become a global threat that requires ambitious interventions to reduce new infections and related deaths. The Joint United Nations Program on HIV/AIDS (UNAIDS) estimated 37.9 million people were living with HIV globally, with 1.7 million new HIV infections and 770,000 thousand Acquired Immune Deficiency Syndrome (AIDS) related deaths in 2018 [1]. The Centers for Disease Control and Prevention (CDC) estimates that 1.2 million people are currently living with HIV in the United States (U.S.) [2]. HIV/AIDS continues to disproportionately affect African Americans. Despite representing about 13% of U.S. population, African Americans have the highest rate of HIV diagnoses and accounted for 43% of HIV diagnoses in 2017 [3].

CDC estimates that African American men accounted for almost one-third (32%) of all HIV diagnosed in the U.S. The rate of HIV diagnoses among African American men is eight times as high as the rate among white men, and more than twice that of Latino men [4]. Among African American men, most new diagnoses occur among gay and bisexual men. If current rates persist, CDC estimates that approximately one in 20 African American men and one in two African American gay and bisexual men will receive a diagnosis of HIV during their lifetimes [4]. In 2017, African American women accounted for the largest share of new HIV diagnoses (59%) among women, and the rate of new HIV diagnoses is nearly 15 times the rate among Caucasian women and nearly five times the rate among Latino women. CDC estimates that approximately one in 48 African American

women will receive a diagnosis of HIV during their lifetimes [5]. HIV infection rate is more pronounced among African American men than women. CDC estimates that about 73% of African Americans who received HIV diagnosis were men and 26% were women in 2017 [3]. This high rate of HIV infection among African American men is been driven mainly by gay and bisexual men. It is estimated that 60% of African Americans who received HIV diagnosis in 2017, were gay or bisexual men [3]. It is disturbing that some African American men who have sex with men (MSM) believed that a cure for HIV/AIDS was already available to some individuals and will soon to be made available to general public [6,7]. Many African American communities disproportionately affected by HIV do not understand the physical and mental toll that HIV and AIDS can have on African Americans living with the disease. They often see it as a chronic disease that can be managed with readily available drugs [6,7]. Such misinformation and misconception could undermine HIV/AIDS awareness and prevention campaign among disproportionate HIV burden African Americans. This HIV burden among African Americans underscores the need to curtail the growth of this epidemic and to eliminate its various negative consequences.

Although HIV and other sexually transmitted diseases (STDs) affect individuals of all ages, HIV and other STDs have taken a heavy toll on young people in the U.S. It is estimated that 51% of young people aged 13-24 who were living with HIV, do not know their status. The same age group represents the highest rate of undiagnosed HIV in any age group in the U.S. [8]. Impact of HIV/AIDS among African Americans is more pronounced when examining its presence among

younger African Americans under the age of 25 years. In 2017, African American young adults, ages 13-24, represented more than half (52%) of new HIV diagnoses in that age group [5]. African American university undergraduates fall within the age range of people mostly affected by HIV infection in the U.S. Any investment in this age group, without protecting them from HIV infection may be a waste of investment among this vulnerable population [9]. Undergraduate students are constantly exposed to sexual risk behaviors, whether it is during the transition period from high school to university as freshmen, or as returning students in colleges across the U.S. [10]. Repeated exposures to sexual risk behaviors also make undergraduate students more vulnerable to HIV infections.

Youth aged 13 to 24 accounted for 21% of new HIV diagnoses in the United States in 2017 [11]. More young males than young females were infected with HIV in 2017 [CDC 2019 below]. CDC estimated that 87% of youth who received HIV diagnosis in 2017, were young men and 13% were young women [11]. Despite this high rate of HIV infection among youth aged 13 to 24, it is estimated that young people were the least likely to be aware of their infection status compared to any other age group [11]. CDC estimates that youth ages 15-24 make up just over one quarter of the sexually active population, but they accounted for half of the 20 million new sexually transmitted infections that occur in the U.S. each year [12]. HIV infection rate among this age group will continue to rise unabated, if no effective and youth friendly interventions were implemented [12].

A study conducted by Zhang and colleague showed that exposure of young people to age appropriate HIV awareness programs, resulted in an increase perceived susceptibility to HIV infections. It also facilitated positive behavior changes toward condom use among their study participants [13]. These findings demonstrate the need for effective age appropriate HIV prevention programs. However, the percentage of U.S. schools in which students were required to receive instruction on HIV prevention, decreased from 64% in 2000 to 41% in 2014 [11]. Undergraduate students are very mobile group, and if not protected and preserved from the scourge of HIV and AIDS, they can become dispersal agents for the spread of HIV in any society [14]. They may also be at higher risk of engaging in risky sexual behavior, especially if they are under the influence of alcohol, illicit

drugs, misconception of the knowledge and severity of HIV and AIDS or lack the necessary maturity in handling negative peer pressure [11]. Against these backdrops, it is critical that effective HIV/AIDS intervention strategies among undergraduate university students are well implemented, effectively promoted and evaluated.

Most undergraduate students are within the age range of high rates of new HIV infections [15]. The relative lack of parental supervision, offers greater opportunity for young students at various universities to test limits of their new freedom through risk sexual experimentations [15,16]. Such risky sexual experimentations involve multiple partnerships, inconsistent use of condoms, sex under the influence of alcohol and illicit drugs [17]. HIV risk behavior prevention Interventions currently been used for general population may not be appropriate for undergraduate students. In order to develop more youth friendly and effective HIV prevention programs, it is an immense important to study HIV risk behaviors among undergraduate students. Studies have shown that undergraduate students are at the risk of HIV infection behaviors because they tend to be sexually adventurous, often with multiple partners, engage in unprotected anal and vaginal sex, inconsistent condom use, sharing of unsterilized sharps, having sex under influence of alcohol and illicit drugs [15,18]. These findings underscore the need to study the sexual risk behaviors among these students and few epidemiological studies have examined risk behaviors for HIV infection among African-American undergraduate students in Historically Black Universities. Hence, assessing risk behaviors for HIV infection among undergraduate students will provide much needed empirical data for higher education and health policy makers to design and implement effective youth appropriate programs on HIV risk sexual behaviors prevention among this vulnerable age group.

2. MATERIALS AND METHODS

2.1 Study Area and Design

A cross-sectional study was conducted from January 10, 2016 to September 30, 2016. Participants were selected through convenience sampling among undergraduate students of Jackson State University (JSU). The inclusion criteria for the participants were as follows: (1) must be freshman, sophomore, junior or senior

undergraduate students of JSU; (2) being at least 18 years of age; (3) giving consent to participate in the research; and (4) must be an African American undergraduate student at JSU. Jackson State University is in the City of Jackson, and the school has a population of about 9,000 undergraduate students. Jackson State University is the fourth largest institution of higher learning in Mississippi State and fourth largest Historically Black Colleges and Universities (HBCUs) in the nation [19]. Jackson is the capital of Mississippi.

A minimum sample size of 369 was calculated using the formulas of Michel and Talbot [20,21]. The sample size was increased to 400 students to allow for non-response. Students were selected through convenience sampling from JSU undergraduate students. Students were informed and encouraged to participate in the study after obtaining permission and approval of their lecturers before their class sessions. Those who agreed to participate were informed that this study was completely voluntary, that they may refuse to answer any specific question, and may withdraw at any time without penalty or prejudice. Those undergraduate students who agreed to participate in the study were given informed consent letters to sign before the distribution of the questionnaires. The questionnaires were only distributed to those students who have signed the informed consent letters at the end of their scheduled class session with cooperation and approval of the lecturer in charge. The questionnaires were completed in class, and it took an average of ten minutes to complete. Completed questionnaires were retrieved after the session.

2.2 Data Collection

The study instrument was a self-administered questionnaire composed of two parts.

1. Related to student's demographic background.
2. On risk behaviors relating to HIV infection transmission.

Risk behaviors relating to HIV infection transmission questionnaire items were adopted and modified for this study from the World Health Organization HIV/AIDS study [22] and literature review. To validate the study questionnaire; a draft was given to a group of JSU students for feedback, and those students were not included in this final study. The questionnaire validation test showed that the Cronbach's alpha was 0.76

for risk behaviors. Cronbach's alpha coefficient ranges from 0–1, with values closer to 1.0 indicating higher internal consistency [23]. The questions on HIV risk behaviors included questions related to multiple sexual partners, unprotected vaginal or anal sex, inconsistent condom use, intravenous injection (I.V.) drugs use, sex under the influence of illicit drugs or alcohol and sharing of unsterilized sharps such as needles.

2.3 Scoring

High risk behaviors were assessed using an 8-item questionnaire, where a report of one negative behavior related to HIV infection was considered as having high risk behavior.

2.4 Data Analysis

All analyses were conducted using SAS® 9.3 statistical software (SAS Institute Inc., Cary, NC, 2012). Descriptive statistics gave a clear picture of background variables like age, sex and other variables in the questionnaire. The frequency distribution of both dependent and independent variables were worked out. In this study, a significance level of $\alpha=0.05$ was taken for analysis. The chi-square test was applied to finding an association between risk behaviors and gender.

3. RESULTS

3.1 Students' Profile

Four hundred undergraduate students participated and completed the questionnaire after recruitment through convenience sampling from JSU undergraduate students. The mean age of the 400 respondents was 21.9 years, standard deviation ± 5.7 years and ranged from 18 to 57 years (Table 1). A total of 141 (35.2%) were male undergraduate students and 259 (64.8%) were female undergraduate students. The respondents for this study were all African American undergraduate students. Regarding religion demography of the respondents of the study, 88.3% were Christians and 11.7% indicated Non-Christians as shown in Table 1.

3.2 Risk Behaviors toward HIV Infection

Responses to the behavior questions showed that about 16.5% of participants of the survey study currently have multiple sexual partners; about 58.5% have had sex without condom in the last 3 months; about 64.2% of the participants did not use condom during their last sexual

intercourse; 34.8% reported having sex under influence of Alcohol in last 3 months. The result further showed that 13.5% reported having sex under the influence of illicit drugs within the last 3 months; about 1.5% were intravenous injection (I.V.) drug users during the period of the study; about 13.5% of the students have had unprotected anal sexual intercourse in the past and about 1.8% of this study participants regularly share unsterilized sharps such as needles and razor blades (Table 2).

Table 1. Demographic characteristics of the 400 undergraduate students enrolled in the study

Characteristics	n (%) or Mean \pm S.D.
Age	21.94 \pm 5.74
Gender:	
Male	141 (35.2)
Female	259 (64.8)
Religion:	
Christian	353 (88.3)
Non-Christians	47 (11.7)

n = Number of students in each group; S.D =Standard Deviation; % =Percentage

High risk behavior was assessed using an 8-item questionnaire, a report of one negative behavior related to HIV infection transmission was considered as having high risk behavior. Overall behavior data analysis results on Table 3 revealed that most students (75.8%) in this survey had at least 1 high risk behavior related to HIV infection transmission.

As shown in Table 4, among the male students in this study; about 70.9% of them have had at least 1 risk behavior related to HIV infection. While among the female students; about 78.4% of them have also had at least 1 risk behavior related to HIV infection. There was no significant difference between high risk behaviors of male and female JSU undergraduate students toward HIV infection transmission as shown in Table 4 ($\chi^2 = 2.76$; $P = 0.1$).

4. DISCUSSION

4.1 Risk Behaviors toward HIV Infection

This study has provided important information regarding high risk behaviors of these undergraduate students and has suggested possible protective measures that should be implemented to prevent the spread of HIV among this vulnerable age group. Studies have shown that young people, including university

undergraduate students are constantly engaging in HIV risk behaviors such as having multiple sexual partners, unprotected anal or vaginal sex activities, inconsistency condom use, sharing of unsterilized sharps, having sex under the influence of alcohol and illicit drugs [11,24-26]. Good knowledge of HIV/AIDS and positive attitudes toward people living the disease are not enough to bring a positive behavioral change [24-26]. Rather, some other deep seated social and cultural factors such as religion, level of education, poverty, peer pressure and attitude towards ill-health also affect behaviors [24-26]. It is alarming that 75.8% of respondents in this study reported having at least one HIV risk behavior. At the time of this study, 16.5% of participants of the study survey had multiple sexual partners. Having multiple sexual partners have been linked to HIV and other STDs common mode of transmission among youths [11]. This figure was higher than that reported by CDC study, who documented that 14.8% of high school African American students have had sex with multiple partners [12]. Although this study figure was higher than CDC study result, it was not surprising because university students are more sexually experienced than high-school youth. This study figure of 16.5% was however lower in comparison to similar study that found 40.6% of sexually active undergraduate students in their study had multiple partnerships [26]. Having multiple sexual partners increase the risk of getting or transmitting HIV and other STDs. This attest to the study by Wilson and Sathiyasuman, who reported that having unprotected sex with multiple sexual partners was the greatest risk factor for HIV and other STDs infections in their study. The same study also showed that youths with multiple sexual partners are less likely to use condom and at greater risk of HIV and STDs infections [27]. Therefore, more research should be conducted on the role of multiple sexual partners in HIV infection transmission. More youth friendly preventive programs that address risky sexual behaviors such as multiple sexual relationships among young people should be explored and implemented.

It is worth noting that 13% of students in this survey have had unprotected anal sex in the past. Being a receptive partner during unprotected anal sex is the highest-risk sexual activity for getting HIV [28]. The risk of getting HIV through anal sex is very high because the lining of the rectum is thin and may allow HIV to enter the body during unprotected anal sex [28].

The insertive partner is also at risk of acquiring HIV infection during unprotected anal sex [28]. It has been observed that young people often engage in various sexual risk behaviors that can result in HIV infection. A study by Spiltanick and colleagues suggested that adolescent seeking for sexual sensation has translated to a higher frequency of unprotected anal sexual intercourse, higher number of sexual partners, and less condom use [29]. According to CDC, unprotected anal sexual intercourse carries the highest risk of transmitting HIV if either partner is HIV-positive. This risk of HIV infection transmission could be avoided or reduced during anal sexual intercourse through consistent condoms use; abstinence or lower risk sexual activities; daily intake of HIV pre-exposure prophylaxis (PrEP) drugs; and antiretroviral therapy (ART) treatment for HIV positive individuals [28].

It is disturbing that 58.5% of the participants of this study have had sex without condom in the last 3 months; more than half [64.2%] of students in this study did not use condom during their last sexual intercourse before participating in this study. CDC conducted study among high school

students in U.S. found that 46.2% of students in their survey who were currently sexually active, did not use condom the last time they had sex [12]. A similar study conducted among students at Historically Black College and Universities (HBCUs) in 2013, showed that 36.2% of their study participants did not use condom during last sexual intercourse [31]. Lack of condom use during vaginal and anal intercourse has been found to be one of the most common HIV infection transmission routes among young people in U.S. [12]. A recent CDC survey report showed a decrease in condom use among sexually active students in U.S. from 62% in 2007 to 54% in 2017 [12]. Studies have also shown that condom use among students at HBCUs is currently at suboptimal level [30-33]. Some of the factors that have contributed to low condom use among young people are due to lack of awareness of condom use as disease preventive measure, lack of perceived HIV infection threat, lack of knowledge and misinformation about condom use, negative attitudes towards condom use and partner trust [34,35]. A similar study conducted among students at HBCUs in 2013, found that spontaneity of sexual encounters, not feeling at

Table 2. Risky sexual behaviors of 400 undergraduate students enrolled in the study

Risky sexual behaviors	Frequency (%)
Do you have multiple sexual partners?	
Yes	66(16.5)
No	334(83.5)
Do you regularly share unsterilized sharps such as needle?	
Yes	7(1.8)
No	393(98.3)
Have you had sex without condom in the last 3months?	
Yes	234(58.5)
No	166(41.5)
Have you had sex under influence of Alcohol in last 3months?	
Yes	139(34.8)
No	261(65.2)
Have you had sex under influence of illicit drug in last 3months?	
Yes	54(13.5)
No	346(86.5)
Are you currently an intravenous injection (I.V.) drugs user?	
Yes	6 (1.5)
No	394(98.5)
Did you use condom during your last sexual intercourse?	
Yes	143(35.8)
No	257(64.2)
Have you had unprotected anal sex before?	
Yes	54(13.5)
No	346(86.5)

% = Percentage

risk of HIV infection, and partner-related perceptions were associated with condom non-use during last sexual intercourse [35]. These findings highlight the need for positive behavior change awareness campaign, strengthening of HIV/AIDS prevention messages and condom use awareness among college students. Youths centered friendly programs are required to deal with some of these barriers in condom use during sexual intercourse. More healthy sexual practices can only be achieved through sustained effective youth appealing health education programs. These health education programs should be tailored to enlighten young people on various benefits of condom use in preventing not only HIV infection, but also, unwanted pregnancy and other STDs. Young people should be encouraged to adopt new positive behaviors and be taught that benefits of positive sexual behaviors outweigh the consequences of negative sexual risk behaviors that can predispose to HIV infections.

Table 3. Characteristics of behaviors towards HIV/AIDS of the 400 undergraduate students enrolled in the study

Characteristics	n	%
Behaviors		
Risk Behaviors	303	75.8
Non-risk Behaviors	97	24.2

*n = Number of students in each group;
% = Percentage*

According to CDC, sexually active minority students are at a greater risk for alcohol abuse, injecting illegal drugs, and misusing prescription opioids [12]. Alcohol and illicit drug abuse can impair judgment and may lead to unprotected sexual intercourse [12]. This study finding revealed that 34.8% of participants reported having sex under the influence of alcohol in last 3 months; about 13.5% reported having sex under the influence of illicit drugs within the last 3 months; and 1.5% of the students admitted being current intravenous injection drug users during this study period. A CDC conducted study among U.S. high school students indicated that 14% of

respondents of their study had used one form of illicit drugs [12]. Alcohol and illicit drugs abuse predispose young people to vulnerability of unsafe sex practice, unsterilized needles sharing common among I.V. drug users and other forms of HIV risk behaviors [12,36]. Sexual activities under the influence of alcohol and illegal drugs increase the likelihood of high-risk behavior due to disinhibition and lower likelihood of condom use [36-38]. Studies have shown that young people may engage in high risk behaviors due to disinhibition related to drugs, alcohol and other psychoactive substances and increase the feeling of invulnerability to HIV infection [36,39,40]. More effective ways of conveying alcohol and illicit drugs abuse awareness and prevention messages must be explored. The use of drama and other forms of social media messaging platforms that are appealing to young adults should be considered in the fight against this disease.

There was no significant difference between the risk behaviors of male and female undergraduate students toward HIV/AIDS in this study. In contrast, this outcome is different with a similar study, which reported that more sexual risk behaviors were observed in male students compared to female students [26]. Our previous study on HIV/AIDS knowledge, showed no significant difference between male and female respondents [41]. However, our recent study on attitudes toward HIV and AIDS among undergraduate students by gender at a Historically Black University, showed a significant difference between male and female respondents in terms of overall attitudes toward HIV and AIDS patients [42]. The general assumption is that students, who have a high level of education, should be well informed concerning HIV/AIDS and other STDs and should therefore have less risk sexual behaviors. This study has demonstrated that the assumption bears no resemblance to actual reality among undergraduate students. The students were aware of what construes risky sexual behaviors; nonetheless most students (75.8%) in this study have had at least one risk behavior related

Table 4. Differences in distribution of sexual behaviors for all respondents by sex

Variables	Behaviors		Chi-square test	p-value
	Risk n (%)	Non-risk n (%)		
Sex				
Male	100 (70.9)	41 (29.1)	2.76	0.1
Female	203 (78.4)	56 (21.6)		

*P: p-value; p < 0.05 is considered significant; n = Number of students in each group; χ^2 = Chi-square;
% = Percentage*

to HIV infection transmission. Therefore, emphasis should be given on designing different strategy to reduce risky sexual behaviors common in this age group. This study suggests that higher education systems need to implement HIV prevention educational programs that will address HIV risk behaviors revealed in this study. It is important that this vulnerable group understands the dangers of HIV infection, avoid HIV risk behaviors, as well as develop safer sexual practice.

5. CONCLUSION

This study tried to give important information regarding HIV risk behaviors of undergraduate students and possible protective measures that should be implemented to control the spread of HIV infection. Approximately, 75.8% of the students in this study have had at least one risk behavior related to HIV infection transmission. The engagement of students in HIV sexual risk behaviors were not varied by gender. However, participants engaged in various risk behaviors related to HIV infection transmission such as multiple sexual partners, unprotected sexual intercourse, low and inconsistent condom use. This study calls for more robust and age appropriate health educational programs. Newer effective ways of conveying HIV risk behaviors prevention awareness must be explored. The use of drama and other forms of social media messaging platforms that are more appealing to our young adults should be considered in this fight against HIV infections. Furthermore, this study suggests that undergraduate students cannot be considered as homogenous population for which one type of intervention will be effective. School environment remains a good place and time to have peer health education programs that encourage positive behavior change, healthy sexual practices, as well as to be socially active, accepting and caring for others. Taking into consideration the fact that not all students are sexually active, developing youth friendly messages while offering strategies that help students delay sex, refuse sex, or negotiate safer sexual practices should be promoted in various campuses.

6. STRENGTH AND LIMITATIONS OF THE STUDY

This study was conducted among undergraduate students of a university. It would be more appropriate if the students' risk behaviors for HIV infection were evaluated from multiple HBCUs.

Another limitation identified was the use of cross-sectional design in the conduct of this quantitative survey. This study design makes it difficult in differentiating cause and effect from the simple association. Other sensitive socio-cultural and psychological characteristics of the participants which can influence HIV risk behaviors were not collected at this study. Finally, because the questionnaire was self-administered, recall and social desirability bias may have occurred, considering the sensitive nature of HIV and AIDS, as young people may be reluctant to provide information about their sexual activities. However, the anonymity of the questionnaires hopefully encouraged students to be honest in their responses. The strength of this study was 100 percent response rate from study participants, allowing reliable estimation of risk behaviors of these undergraduate students. Despite these limitations, the study has successfully provided useful information on HIV risk behaviors among these students.

7. RECOMMENDATIONS

This study suggests for an increased HIV awareness programs by engaging students to HIV prevention messages through drama and various forms of social media messaging platforms that are more appealing to young adults. Peer health education clubs need to be established to provide education on eliminating risk sexual behaviors. In addition, health education through entertainment programs on HIV/AIDS and other STDs as integral part of the university's curriculum. More recreational centers should be built to allow students to channel their energies toward sports and other forms of entertainments. There is utility in repeating this study in the future to identify any changes in HIV risk behaviors among these students. The findings of this study could further provide vital information for higher education institutions policy makers to design and implement appropriate programs on HIV risk behaviors prevention among undergraduate students, ultimately contributing to national prevention of HIV infection among this important population as they transition to adulthood.

CONSENT AND ETHICAL APPROVAL

Ethical clearance was obtained from the Jackson State University Institutional Review Board. Before data collection, all study participants were given information on the study and assured that all data were confidential and will only be

analyzed as aggregates. All respondents signed the informed consent form before participation. Data obtained during this study were kept private. We protected the privacy of people by withholding their identities and other personal information from all persons not connected to this study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. The Joint United Nations Program on HIV/AIDS. 2018 Global HIV Statistics; 2019. Available: https://www.unaids.org/sites/default/files/media_asset/UNAIDS_FactSheet_en.pdf
2. CDC. HIV in the United States: At a Glance; 2018. Available: <https://www.cdc.gov/hiv/statistics/overview/ataglance.html>
3. CDC. HIV and African Americans; 2019. Available: <https://www.cdc.gov/hiv/group/racialethnic/africanamericans/index.html>
4. CDC. HIV among African Americans; 2019. Available: <https://www.cdc.gov/hiv/group/racialethnic/africanamericans/index.html>
5. CDC. Diagnoses of HIV infection in the United States and Dependent Areas; 2018. Available: <https://www.cdc.gov/hiv/pdf/library/reports/surveillance/cdc-hiv-surveillance-report-2017-vol-29.pdf>
6. Dillon PJ, Basu A. HIV/AIDS and minority men who have sex with men: A meta-ethnographic synthesis of qualitative research. *Health Communication*. 2014;29:182–192.
7. Dodge B, Jeffries WLIV, Sandfort TGM. Beyond the down low: Sexual risk, protection, and disclosure among at-risk Black men who have sex with both men and women (MSMW). *Archives of Sexual Behavior*. 2008;37:683–696.
8. CDC. HIV in the United States and dependent areas; 2019. Available: <https://www.cdc.gov/hiv/statistics/overview/ataglance.html>
9. Bigala P, Adebawale SA, Oladipo SE. Influence of HIV testing on knowledge of HIV/AIDS prevention practices and transmission among undergraduate youths in North-West University, Mafikeng. *Gender & Behavior*. 2014;12(2):6286–6300.
10. Fennie T, Laas A. HIV/AIDS-related knowledge, attitudes and risky sexual behavior among a sample of South African university students. *Gender & Behaviour*. 2014;12(1):6035–6044.
11. CDC. HIV and Youth; 2019. Available: <https://www.cdc.gov/hiv/group/age/youth/index.html>
12. CDC. Youth risk behavior survey: Data summary and trends report 2007–2017; 2018. Available: <https://www.cdc.gov/healthyouth/data/yrbs/pdf/trendsreport.pdf>
13. Zhang JM, Chock TM. Effects of HIV/AIDS public service announcements on attitude and behavior: Interplay of perceived threat and efficacy. *Social Behavior and Personality*. 2014;42(5):799–810.
14. Bigala P, Adebawale SA, Oladipo SE. Influence of HIV testing on knowledge of HIV/AIDS prevention practices and transmission among undergraduate youths in North-West University, Mafikeng. *Gender & Behavior*. 2014;12(2):6286–6300.
15. Lewis JE, Malow RM, Ireland SJ. HIV/AIDS risk in heterosexual college students. A review of a decade of literature. *J. Am. Coll. Health*. 1997;45(4):147–158.
16. Duncan C, Miller DM, Borskey EJ, Fomby B, Dawson P, Davis L. Barriers to safer sex practices among African American college students. *J. Natl. Med. Assoc*. 2002;94:944–951.
17. Nakornkhet N, Crowe JW, Torabi MR, Ding KD. Sexual behaviours and alcohol use among college students. *International Conference on AIDS Abstracts*. 1998;12:2010.
18. Prince A, Bernard AL. Sexual behaviors and safer sex practices of college students at a commuter campus. *J. Am. Coll. Health*. 1998;47(1):11–21.
19. Historically Black Colleges and Universities. Jackson State Becomes the 4th Largest HBCU by Enrollment; 2015. Available: <http://hbculifestyle.com/jackson-state-enrollment-rank/>
20. Mishel MH. Methodological studies: Instrument development. In *Advance*

- Design in Nursing Research; Sage Publications: Thousand Oaks, CA, USA, 1998;235–282.
21. Talbot LA. Principles and Practice of Nursing Research; Mosby Year Book: St. Louis, MO, USA; 1995.
 22. World Health Organization. Interview schedule on knowledge, attitude, beliefs and practices on AIDS/KABP survey. Geneva, World Health. Mishel, M.H. Methodological studies: Instrument Development; 1988.
 23. Mishel MH. Methodological studies: Instrument development, 2nd Edn. In Advance Design in Nursing Research. Sage Publications, Thousand Oaks, CA. 1998;235-282.
 24. Al-Rabeei NA, Dallak AM, Al-Awadi FG. Knowledge, attitude and beliefs towards HIV/AIDS among students of health institutes in Sana'a City. Eastern Mediterranean Health Journal. 2012;18(3): 221-226.
 25. Maimaiti A, Shamsuddin K, Abdurahim A, et al. Knowledge, attitude and practice regarding HIV/AIDS among university students in Xinjiang. Global Journal of Health Science. 2010;2(2):51-60.
 26. Shiferaw Y, Alemu A, Girma A, Getahun A, et al. Assessment of knowledge, attitude and risk behaviors towards HIV/AIDS and other sexual transmitted infection among preparatory students of Gondar town, North West Ethiopia. BMC Research Notes. 2011;4(505):1-8.
 27. Wilson CN, Sathiyasusuman A. Associated risk factors of STIs and multiple sexual relationships among Youths in Malawi. Plos One. 2015;10(8):1-13.
 28. CDC. Anal sex and HIV risk. Available: <https://www.cdc.gov/hiv/risk/anal-sex.html>
 29. Spiltanick JS, DiClemente RJ, Wingood GM, Crosby RA, Milhausen RR, Sales JM, Young SN. Brief report: Sexual sensation seeking and its relationship to risky sexual behaviour among African-American adolescent females. Journal of Adolescence. 2007;30:165–173.
 30. Bcheraouia CE, Suttonb MY, Hardnettb FP, Jones SB. Patterns of condom use among students at historically Black colleges and universities: Implications for HIV prevention efforts among college-age young adults. AIDS Care. 2013;25(2):186-193.
 31. Adefuye AS, Abiona TC, Balogun JA, Lukobo-Durrell M. HIV sexual risk behaviors and perception of risk among college students: Implications for planning interventions. BMC Public Health. 2009;9: 281.
 32. Charnigo R, Crosby RA, Troutman A. Psychosocial constructs associated with condom use among high-risk African American men newly diagnosed with a sexually transmitted disease. Annals of Behavioral Medicine. 2010;39:303310.
 33. Ober AJ, Iguchi MY, Weiss RE, Gorbach PM, Heimer R, Ouell AJ, et al. The relative role of perceived partner risks in promoting condom use in a three-city sample of high-risk, low income women. AIDS and Behavior. 2010;15(7):13471358. DOI:10.1007/s10461-010-9840-7
 34. Lotfi R, Tehrani FR, Yaghmaei F, Hajizadeh E. Barriers to condom use among women at risk of HIV/AIDS: A qualitative study from Iran. Open Access. 2012;12(13):1-10.
 35. El Bcheraoui C, Sutton MY, Hardnett FP, Jones SB. Patterns of condom use among students at Historically Black Colleges and Universities: Implications for HIV prevention efforts among college-age young adults. AIDS Care. 2013;25(2):186-193. DOI: 10.1080/09540121.2012.687864
 36. Orgiles M, Carratala E, Carballo JL, Piqueras JA, Espada JP. Factors associated with sex under the influence of alcohol among adolescents with divorced parents. Journal of Child & Adolescent Substance Abuse. 2013;22:150–162.
 37. Becoña E, Juan M, Calafat A, Ros M. Reasons for not accepting a sexual relationship in young people having fun in nightlife settings in function of gender and drunkenness. Adicciones. 2008;20(4):357–364.
 38. Takakura M, Wake N, Kobayashi M. Relationship of condom use with other sexual risk behaviors among selected Japanese adolescents. Journal of Adolescent Health. 2007;40:85–88.
 39. Raj A, Cheng D, Levison R, Meli S, Samet J. Sex trade, sexual risk, and nondisclosure of HIV serotatus: Findings from HIV infected persons with a history of alcohol problems. AIDS and Behavior. 2006;10(2):149–157.

40. Stueve A, O'Donnell LN. Early alcohol initiation and subsequent sexual and alcohol risk behaviors among urban youths. *American Journal of Public Health*.2005;95:887–893.
41. Andrew PO, Bhuiyan A, Mawson A, Buxbaum SG, Sung JH, Shahbazi M. HIV/AIDS knowledge of undergraduate students at a Historically Black College and University. *Diseases*. 2018;6:98.
42. Andrew PO, Bhuiyan A, Mawson A, Shahbazi M. Assessment of attitudes toward HIV and aids among undergraduate students at a historically black university. *Journal of Aids and HIV Treatment*. 2019;1(2):25–32.

© 2020 Andrew et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<http://www.sdiarticle4.com/review-history/54674>