



Association between HIV/AIDS Knowledge and Risk Behaviors among African American Undergraduate Students at a Historically Black University

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Authors' contributions

This work was carried out in collaboration between both authors. Author POA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors POA and RNA managed the analyses of the study and managed the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

Objective: This study aimed to assess the association between HIV/AIDS knowledge and risk behaviors relating to HIV infection among African American undergraduate students at a Historically Black University.

Methods: A cross-sectional study method was used. A total of 400 participants were randomly selected from Jackson State University undergraduate students. This study utilized a self-administered questionnaire on HIV/AIDS knowledge and their risk behaviors.

Results: Majority of the students (96.5%) had good knowledge about the disease, some respondents had some misconceptions about HIV infection. This study found no significant difference between male and female participants of this study on HIV/AIDS knowledge ($\chi^2 = 3.05$; $P = 0.08$). About 75.8% of respondents in this study have had at least one HIV risk behavior. HIV risk behaviors of these students were not varied by gender ($\chi^2 = 2.76$; $P = 0.1$). However, some students engaged in various HIV risk behaviors such as having unprotected sexual intercourse, multiple sexual partners, low and inconsistent condom use. There was an association between HIV/AIDS knowledge and risk behaviors relating to the disease ($p = 0.03$, Pearson's $\chi^2 = 5.237$).

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Conclusions: Majority of the students demonstrated good knowledge of the disease and practiced at least one risk behavior predisposing them to HIV infection. There was an association between HIV/AIDS knowledge and risk behaviors relating to the disease infection. This study finding has shown that good knowledge about HIV/AIDS may not translate into positive behavior change. Hence, this study calls for sustained effective youth friendly programs geared toward addressing gaps in HIV/AIDS knowledge, misconceptions of the disease and eliminating various risk behaviors identified in this study.

Keywords: HIV/AIDS; infection; various risk behaviors.

1. INTRODUCTION

Human immunodeficiency virus (HIV) has claimed more than 34 million lives and continues to be a global public health threat [1]. United Nations Program on HIV/AIDS (UNAIDS) estimates that 37.9 million people are living with the disease globally. About 1.7 million new HIV infections and 770, 000 thousand AIDS related deaths were recorded in 2018 [1]. The Centers for Disease Control and Prevention (CDC) estimates that about 1.2 million individuals are living with HIV in the United States (U.S.) [2]. Among people living with HIV/AIDS in the U.S., African Americans continue to be disproportionately affected by the disease. African Americans represent about 13% of U.S. total population, they have the highest rate of HIV diagnoses and accounted for about 43% of HIV new cases diagnosed in 2017 [3]. African American men are not left behind in this skewed HIV infections. In 2017, African American men accounted for 32% of all new HIV diagnosed in the U.S. [3]. Thus, the rate of HIV diagnoses among African American men is eight times more than the rate among white men, and twice that of Latino men [3].

Gay and bisexual African American men continue to drive this high rate of HIV infections among African American men. According to CDC, about 60% of African Americans diagnosed of HIV infection in 2017, were either African American gay or bisexual men [3]. CDC estimates that if this current rate of HIV infections persist in the U.S., one in twenty African American men, and one in two African American gay and bisexual men will be diagnosed of HIV during their lifetimes [3]. African American women accounted for the highest percentage (59%) of new HIV cases diagnosed among women in 2017. The rate of new HIV diagnoses among African American women is fifteen times more than the rate among white women and five times more than the rate among Latino women. It is estimated that approximately one in forty-eight

African American women will receive HIV diagnosis during their lifetimes [4]. HIV infection rate remains more pronounced among African American men than women. In 2017, African American men accounted for about 73% of new HIV diagnosis and women accounted for about 26% of newly diagnosed HIV infections among African Americans in the U.S. [3]. Misinformation and misconception of the disease have been found to undermine and impede HIV/AIDS prevention campaign among African American communities in the U.S. [5,6]. This disproportionate HIV burden among African Americans reiterates the need for more sustained youth friendly HIV prevention programs geared toward addressing gaps in the disease knowledge, misinformation and misconceptions. Also, to curtail and eliminate this current trend of HIV infections among these vulnerable African American communities.

HIV and other sexually transmitted diseases (STDs) have taken a much heavier toll on young people in the US. In 2017, CDC estimates that young people aged 13 to 24 accounts for 21% of newly diagnosed HIV cases in the U.S. [7]. About 51% of youths aged 13-24 living with HIV, do not know their HIV status. This age group has highest rate of undiagnosed HIV than any other age group in the U.S. [8]. This huge HIV burden among young people are more pronounced among younger African Americans under the age of 25 years. In 2017, African American youths, ages 13-24, accounted for more than half (52%) of newly diagnosed HIV infection in that age group [4]. University undergraduate students fall within this age range of individuals mostly infected by this dreaded disease in the U.S. If this vulnerable age group is not protected from this HIV scourge, any investment among this age group may be waste of resources [9]. Young adults are constantly exposed to risk behaviors to HIV infection at the various universities, whether as freshmen, or as returning students in universities across the U.S. [10]. These constant exposures to sexual risk behaviors also make

undergraduates more susceptible to HIV infections. Despite heavy toll of HIV infections among youth aged 13 to 24, young people are the least likely to know their HIV status compared to any other age group in the U.S. [7]. It is estimated that young adults ages 15-24 make up over one quarter of the sexually active population, yet, they account for half of the 20 million new sexually transmitted infections that occur in the U.S. each year [11]. In 2017, more young males than young females were infected with HIV in the U.S. According to CDC, about 87% of newly diagnosed HIV infections among young adults were males and 13% were females [7].

Studies have shown that increased HIV/AIDS knowledge may be an initial step towards risk behavior change among youths [9,12,13]. Health education programs targeted toward youths remain an excellent tool for conveying HIV/AIDS knowledge among this vulnerable age group. A similar study found that a well-planned health education about HIV and sexual risk behaviors increased HIV/AIDS knowledge and reduced risk behaviors among participants of their study [14]. Young adults are valuable resources of any society, in the absence of a cure for this disease, arming young people with HIV/AIDS education programs will protect them from falling prey to this dreadful disease. Studies have shown misconceptions relating to HIV/AIDS are common among young adults [15–19]. Some of these common misconceptions among young adults include that HIV infections are being transmitted through insect bites, by shaking hands and sharing toilet with HIV positive patients [15–19]. Thus, these vulnerable young adults should be armed with adequate HIV/AIDS information that will eliminate some of these common misconceptions of the disease and improve positive behavior change.

These common misconceptions about the disease and sexual risk behaviors among young adults underscore the important of continuous HIV awareness education programs that will keep youths well informed and protect them from this dreadful HIV pandemic. A similar study by Zhang and colleague found that age appropriate HIV awareness programs will lead to an increase perceived susceptibility of young adults to HIV infections and facilitate positive behavior changes [20]. Effective age appropriate HIV prevention programs are still lacking in various universities in the U.S. [7]. According to CDC, there are decline in the percentage of U.S. schools receiving instructions on HIV prevention.

U.S. schools recorded a decrease from 64% in 2000 to 41% in 2014 [7]. Undergraduates remain very mobile group, and if they are not educated on HIV prevention steps, they can become active dispersal tools for the spread of the disease [9]. Young people are at much higher risk of indulging in sexual risk behaviors when under the influence of illicit drugs or alcohol [7]. They often lack the maturity of resisting negative peer pressure that encourages sexual risk behaviors [7]. Unfortunately, majority of undergraduate students fell within this age range of high rates of HIV infections [21]. They are further exposed to risk of HIV infection due to lack of parental supervision at the university campuses. Absence of parental guidance at universities offers students greater opportunity to explore the limits of their newly found freedom through sexual risk experiments [21,22]. Some of these sexual risk experiments involve having multiple sexual partnerships, lack or inconsistent use of condoms, sex under the influence of illicit drugs and excessive alcohol consumptions [21-23].

It is obvious that current HIV prevention programs been used at various schools in the U.S. have not achieved the desired positive expectations and not appealing to young African American adults. In order to achieve age appropriate and youth appealing HIV prevention programs, it is of uttermost important to study the association between HIV/AIDS knowledge and various risk behaviors among these vulnerable undergraduate students at a Historical Black University. Studies have also shown that undergraduates are at constant risk of HIV infections because of they often indulged in both unprotected anal and vaginal sex, practiced lack or inconsistent condom use, shared multiple partners and unsterilized sharps, engaged in sexual intercourse under the influence of alcohol and other illicit drugs [21-24]. Despite some of the misconceptions of the disease, the prevailing inadequate HIV/AIDS knowledge and high sexual risk behaviors common among this vulnerable group of young students, fewer epidemiological studies have evaluated the association between the level of HIV/AIDS knowledge and various risk behaviors among African American undergraduate students at Historically Black Universities. Against these backdrops, this study will provide the much-needed empirical data critical in promoting youth appealing HIV prevention programs, encourage and improve positive behavior changes among these vulnerable African American undergraduate students.

2. MATERIALS AND METHODS

2.1 Study Area and Design

A cross-sectional study method was conducted from January 10, 2016 to September 30, 2016. Participants of this study were randomly selected from Jackson State University (JSU) undergraduate students. The inclusion criteria of this survey were as follows: (1) participating students must be freshman, sophomore, junior or senior undergraduate students at JSU; (2) respondents must be at least 18 years of age; (3) students must give consent to participate in this study; and (4) students must be African American undergraduates at JSU. JSU main campus is located at the City of Jackson. City of Jackson is the capital of Mississippi State in the U.S. At the time of this study, JSU has a population of about 9,000 undergraduate students. In Mississippi, JSU is the fourth largest institution of higher learning in the State and fourth largest Historically Black Colleges and Universities (HBCUs) in the U.S. [25].

Using the formulas of Michel and Talbot [26,27], a minimum sample size of 369 was calculated. The sample size was increased to total of 400 students to accommodate for possible non-response. JSU undergraduate students were informed and encouraged to participate in the study after obtaining permission and approval of their lecturers before class sessions. Students who agreed to participate were informed that the study was completely voluntary, that they may refuse to answer any specific question, and they have the right to withdraw from the survey without penalty or prejudice. Informed consent letters were signed by the study participants and questionnaires were only distributed to those students who have signed the informed consent letters. The study questionnaires were completed in classrooms, and it took an average of ten minutes to complete.

2.2 Data Collection

This study utilized a self-administered questionnaire composed of three parts. 1) Related to students' demographic backgrounds, 2) HIV/AIDS knowledge assessment level and 3) various risk behaviors relating to HIV infections. The questionnaire items were adopted from the World Health Organization [28] and modified for this study. Additional items in the questionnaire were identified from literature reviews of related studies. A draft of the questionnaire was given to

a group of JSU undergraduate students for feedback, and these undergraduate students were not included in this final study survey. The questionnaire validation test result showed that the Cronbach's alpha for HIV/AIDS knowledge was 0.78 and 0.76 for risk behaviors for HIV infections. Cronbach's alpha coefficient value closer to 1.0 (range 0-1) indicates higher internal consistency of the instrument [26]. Some of items in the HIV/AIDS knowledge section of the questionnaire included basic knowledge of HIV transmission, symptoms of HIV/AIDS, and various methods of preventing HIV infection. Some of items on the risk behaviors to HIV infections included questions related to unprotected vaginal or anal sex, inconsistent condom use, intravenous injection drugs use, multiple sexual partners, sharing of unsterilized sharps such as needles and having sex under the influence of illicit drugs or alcohol.

2.3 Scoring

Each correct response to the questionnaire items was given a score of 1, and a wrong or unsure response was given a score of 0. HIV/AIDS knowledge section of the questionnaire had scores ranged between 0-21. HIV/AIDS Knowledge scores from 0 to 10 were considered as poor knowledge level of HIV/AIDS, while total scores more than 10 were considered as good knowledge level of HIV/AIDS. Risk behaviors for the disease infections were assessed using an 8-item questionnaire. Report of one negative behavior related to HIV infection was considered as the respondent having high risk behavior to the disease infection.

2.4 Data Analysis

Data analyses for this study were conducted using SAS® 9.3 statistical software (SAS Institute Inc., Cary, NC, 2012). Descriptive statistics was used to give a clear picture of the students' background variables like sex, age and other variables in the study questionnaire. A significance level of $\alpha = 0.05$ was taken for analysis in this study. The association between variables was tested using chi square.

3. RESULTS

3.1 Students' Profile

A total of four hundred undergraduate students were randomly enrolled into this study. The mean age of the students was 21.9 years, standard

deviation of ± 5.7 years and ranged from 18 to 57-year-old as shown in Table 1. A total of 141 (35.2%) of the undergraduate students were male, and 259 (64.8%) were females. The 400 participants in this study were all African American undergraduate students. Regarding religion demography of the respondents of the study, A total of 353 (88.3%) of the students were Christians, and 47 (11.7%) of the students indicated Non-Christians (Table 1).

3.2 Knowledge about HIV/AIDS

This study results in Table 2 showed that more than 97% of the participants knew that having unprotected sexual intercourse, sharing unsterilized sharps, and infected semen could transmit HIV infections. More than 90% of the students knew that receiving infected blood could transmit HIV infections, as well as infected mother could transmit the disease to child. About 87% of the respondents knew that HIV infection could be avoided through abstinence, and about 85% of participants were aware that the disease is caused by a virus known as human immunodeficiency virus (HIV). However, about 71% of students indicated that consistent use of condom could prevent the disease transmission. Whether HIV affects the immune system of infected individuals, about 93% of the respondents knew that the disease affects immune system; and about 88% of participants knew that the disease is already a pandemic. Whether HIV and AIDS have the same clinical signs and symptoms, about 35% of the students gave appropriate answers. About 75% of the respondents correctly indicated that untreated STDs increase HIV infection risk. About 95% of respondents were aware that having multiple sex partners could increase the risk of getting HIV infection, about 48% of the students indicated that avoiding alcohol and drug abuse could reduce the risk of HIV infection.

This study found some misconceptions relating to the disease, with 55% of students indicated that HIV infection could be transmitted through insects such as mosquito bites, and about 6% of the respondents indicated that HIV-positive individuals could be recognized by looking at their facial appearance. About 20% of the students indicated that HIV infection could be transmitted by sharing clothes, and about 22% of the respondents indicated that HIV infection could be transmitted by sharing toilet with infected individuals.

However, about 4% of the participants indicated that young people do not get infected by the disease, and about 19% of the students indicated that there was a cure for AIDS.

The mean score for HIV/AIDS knowledge in this study was 16.7 ± 2.8 , and scores ranged from 0 to 21. When HIV/AIDS knowledge was stratified into poor knowledge group (scores of 0–10) and good knowledge group (scores of 11–21) as shown in Table 3, about 94% of the male and 98% of the female participants had good knowledge about the disease. There was no significant difference between male and female participants of this study regarding HIV/AIDS knowledge ($\chi^2 = 3.05$; $P = 0.08$).

Table 1. Characteristics of 400 JSU undergraduate students that participated in the study

Characteristics	n (%) or Mean \pm S.D.
Age	21.9 \pm 5.7
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 (3)
 3.2. Knowledge about HIV/AIDS

3.3 Risk Behaviors toward HIV Infection

On the risk behavior question of multiple sexual partners showed that 16.5% of students had multiple sexual partners during the time of this study; more than half (58.5%) of the students have had sex without condom in the last 3months. The study results also showed that 64.2% of the students did not use condom during their last sexual intercourse; about 34.8% of the respondents had sex under influence of alcohol in last 3months and about 13.5% had sex under the influence of illicit drugs within the last 3months prior to this study. The results further showed that about 1.5% of the students were intravenous drug users during the time of the study; about 13.5% of the respondents have had unprotected anal sex in the past and 1.8% of these students regularly share unsterilized sharps such as needles and razor blades with multiple individuals (Table 4).

Table 2. HIV/AIDS knowledge among 400 undergraduate students in the study

Variables	Appropriate responses	n (%)
HIV is a type of virus	True	339 (84.8)
HIV/AIDS affects the immune system	True	373 (93.3)
HIV and AIDS have the same clinical manifestations	False	141(35.3)
Opportunistic infections are common	True	158 (39.5)
HIV is already pandemic disease	True	350 (87.5)
People can get HIV from:		
Sexual intercourse without a condom	True	389 (97.3)
Infected mother-to-child transmission	True	377 (94.3)
Receiving infected blood	True	369 (92.3)
Sharing infected needles and sharps	True	389 (97.3)
Through infected semen	True	389 (97.2)
HIV infection can be prevented through:		
Consistent use of condoms can prevent HIV Infection	True	285 (71.3)
Sexual abstinence		349 (87.3)
HIV Misconceptions:		
HIV is transmitted through insect bites	False	182 (45.5)
HIV is transmitted through sharing clothes	False	320 (80)
HIV is transmitted through using public toilet	False	313(78.3)
Diagnose HIV by looking at facial expression	False	377(94.3)
HIV does not affect young	False	383(95.8)
AIDS is a curable disease	False	324 (81)
HIV infection risk:		
Multiple sex partners increase HIV infection risk	True	380 (95)
Untreated STD increases HIV infection risk	True	299 (74.8)
Avoiding alcohol and drug abuse reduce HIV risk	True	193(48.3)

STD= Sexual transmitted disease; HIV= Human immunodeficiency virus; AIDS=acquired immune deficiency syndrome; n = Number of students; %=Percentage

Table 3. Differences in distribution of HIV/AIDS knowledge for all respondents by Sex

Sex	Knowledge		χ ²	P
	Good knowledge n (%)	Poor knowledge n (%)		
Male	133 (94.3)	8 (5.7)	3.05	0.08
Female	253 (97.7)	6 (2.3)		

P: p-value; p < 0.05 is considered significant; n = Number of students in each group; χ²= Chi-square; %= Percentage

In this study, risk behavior was assessed using eight questions relating to risk behaviors to HIV infection. A report of one negative risk behavior related to the disease infection was considered as having high risk behavior by the student. The results in Table 5 showed that majority of respondents (75.8%) have had at least one high risk behavior related to HIV infection in this survey.

The study results as shown in Table 6 revealed that about 70.9% of male students have had at least one risk behavior related to HIV infection. Among female students showed that about 78.4% of participants have had at least one risk behavior related to the disease infection. There was no significant difference between risk

behaviors of male and female students toward HIV infections ($\chi^2 = 2.76$; $P = 0.1$).

3.4 Association Between Knowledge and Risk Behaviors

The results in Table 7 showed a significant association between HIV/AIDS knowledge and risk behaviors of participants of this study ($p = 0.03$, Pearson's $\chi^2 = 5.237$).

4. DISCUSSION

This study has succeeded in providing vital information regarding the relationship between HIV/AIDS knowledge and risk behaviors among these undergraduate students. Despite pandemic

Table 4. 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

Table 5. 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

Table 6. Differences in distribution of sexual behaviors for all respondents by sex

Variables	Behaviors		Chi-Square test	p-value
	Risk n (%)	Non-risk n (%)		
Sex			2.76	0.1
Male	100 (70.9)	41 (29.1)		
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

nature of this disease and global efforts to improve HIV/AIDS knowledge, the findings in this study revealed some lack of knowledge regarding this disease. Some of the study participants still have misconceptions about the disease and practice risk behaviors to HIV infection. Some of the misconceptions identified include the belief that HIV infection can be transmitted through insect bites, sharing clothes and toilet should be addressed through HIV prevention awareness programs. Some other

erroneous beliefs found in this study include the beliefs that HIV infections can be diagnosed by looking at facial expression, AIDS is a curable disease and that the disease does not infect young adults. Past studies reported similar findings in their studies [15-19]. These misconceptions about HIV/AIDS common among these undergraduate students are quite disturbing. It is noteworthy that majority of these students had good knowledge about the disease (96.5%). However, some of the students did not

Table 7. Association between knowledge and risk behaviors among respondents

Knowledge	Behaviors		p-value of Pearson Chi-Square
	Risk n (%)	Normal n (%)	
Poor	7 (50)	7 (50)	0.03
Good	296 (76.7)	90 (23.3)	

n = Number of students; % = Percentage

belief that sexual abstinence and consistent use of condoms can reduce the risk of HIV infections. The higher good knowledge scores observed among majority of the students may be result of better education as these respondents are university undergraduates. It is possible that young adults not enrolled in institutes of higher learning may even demonstrate more lack of knowledge and misconceptions regarding HIV/AIDS. Against this backdrop, it is imperative for more effective HIV prevention intervention that will increase the competency of these students in the fight against HIV infections. This study found no difference in HIV/AIDS knowledge between male and female undergraduate students. This contrasts with a similar study that found that male students were more knowledgeable than female students in their study [29]. However, this comparison should be treated with caution, as different questionnaire and undergraduate students were used. More youth friendly health education programs that will eliminate some of the misconceptions about the disease and improve positive behavioral changes should be promoted and encouraged at various campuses. These programs should be geared toward the promotion of abstinence, fidelity practice and consistent use of condoms. Although previous studies have shown that mass media play vital role in dispensing HIV/AIDS information among young people [30,31]. However, there is the need to explore the use of drama and social media messaging platforms that are more youth friendly in this global HIV prevention campaigns.

Studies have shown that good knowledge about HIV/AIDS may not be enough to bring a positive behavioral change among young adults [17-18]. Rather, some social and cultural factors such as peer pressure, level of education, religion, poverty level, and negative attitude towards patients can also affect individual behaviors [17-18]. It is quite disturbing that majority (75.8%) of students indicated having at least one risk behavior to HIV infection. This study participants engaged in various risk behaviors such as having unprotected anal and vaginal sex, sharing of unsterilized sharps, multiple sexual partnerships,

inconsistent use of condoms during sexual intercourse, having sex under the influence of alcohol and other illicit drugs. These findings are consistent with other similar studies [7,17-18]. To expedite HIV prevention among these vulnerable students, HIV prevention programs should be geared toward addressing these risk behaviors identified in this study. Some of the study participants (16.5%) had multiple sexual partners during this survey period. This study result finding (16.5%) was higher than similar study conducted by CDC, who reported that 14.8% of high school African American students had multiple sexual partners during their survey period [11]. This study figure may be higher than CDC study result because undergraduate students are more sexually active and experienced than high school students. However, this study figure of 16.5% was lower in comparison to a similar study conducted among undergraduate students. In their study, they found that about 41% of participants had multiple partnerships during the period of their study [18]. According to CDC, having multiple sexual partners predispose young adults to HIV infections [7]. These findings underscore the need for a more robust youth friendly HIV prevention program that will address the various sexual risk behaviors common among young adults.

It is important to note that some of the students (13%) have had unprotected anal sex in the past. The membrane lining of the rectum wall is very thin, getting infected with HIV is much higher during unprotected anal sex [32]. A study suggested that youths seeking for more sexual sensations have translated to frequent unprotected anal sexual intercourse, multiple sexual partners, low and inconsistent condom use [33]. Having unprotected anal sexual intercourse carries the highest risk of HIV infection transmission if either partner tested positive for the disease [32]. This risk of HIV infection could be prevented or reduced during anal sexual intercourse through consistent condoms use practice or abstinence among young adults [32].

It is noteworthy that more than half (58.5%) of the students have had sex without the use of condom in the last 3 months before participating in this study. Also, more than half [64.2%] of this study participants did not use condom during last sexual intercourse. A study conducted by CDC among U.S. high school students found that about 46.2% of their study participants who were sexually active, did not use condom during their last sexual intercourse [11]. This study result was also higher than a similar study conducted at other Historically Black University. Their study found that about 36.2% of the students in their study did not use condom during last sexual intercourse [34]. CDC estimates that lack or inconsistent use of a condom during vaginal and anal intercourse remains one of the common routes of HIV infection among young adults in the U.S. [11]. CDC survey among sexually active U.S. students showed a decrease in condom use from 62% in 2007 to 54% in 2017 [12]. Studies among HBCUs students have shown that condom use is currently at suboptimal level among these students [34-37]. Studies have also shown that some factors have contributed to this low level of condom use seen among these young adults. Some of these factors include lack of perceived HIV infection threat, lack of awareness of condom use as disease preventive measure, misinformation about condoms and beliefs that condom use may signify mistrust of a partner [38,39]. HIV prevention programs should be geared toward enlightening young adults on the various health benefits of condom use in preventing not only STDs, but also, in preventing unwanted pregnancies. Adopting new positive behaviors among youths should be encouraged at all levels of our education systems and young adults should be taught that health benefits of positive sexual behaviors outweigh the health consequences of negative sexual risk behaviors.

Minority students in the U.S. are at a greater risk for injecting illegal drugs, alcohol abuse and misusing prescription opioids [11]. An individual judgment can be impaired by alcohol and illicit drug abuse. This impairment may lead to unprotected sexual intercourse practice among young adults [11]. Some participants of this study (34.8%) indicated to have had sex under the influence of alcohol in last 3months prior the study survey. This study also found that about 13.5% indicated have had sex under the influence of illicit drugs within the last 3months and few of the students (1.5%) were intravenous injection drug users during this study period. A

study among U.S. high school students reported that about 14% of their study participants had used one form of illicit drugs prior their study survey [11]. Studies have shown that alcohol and illicit drugs abuse can predispose young adults to vulnerability of practicing unsafe sex, sharing of unsterilized needles and other risk behaviors to HIV infections [11,40]. Young adults may engage in risk behaviors to HIV infection due to alcohol and illicit drugs related disinhibitions [40-45]. More effective and robust approach to alcohol and illicit drugs abuse prevention messages must be explored to save these young adults from this pandemic infectious disease. This study found no significant difference in risk behaviors for HIV infection between male and female undergraduate students. However, there was an association between HIV/AIDS knowledge and risk behaviors relating to the disease infection among the study participants. It is generally assumed that young adults with higher level of education are better informed about HIV and should therefore practice less risk behaviors [46,47]. This study just demonstrated that such assumption bears no resemblance to reality among students in higher institution of learning. The participants of this study were aware of what construes risky behaviors, nonetheless majority of the students (75.8%) have had at least one risk behavior related to HIV infection. Therefore, more emphasis should be given on designing youth friendly strategies to reduce risky behaviors to HIV infection and eliminate various misconceptions of the disease among these undergraduate students.

5. STRENGTH AND LIMITATIONS OF THE STUDY

Methodological limitations of this study may affect the interpretation of the result findings. Because the study targeted only regular undergraduate students, which was not representative of all university students, the findings therefore should not be generalized to all students in HBCUs. This study was a cross-sectional survey based on retrospective memory data collection process. The possibility of memory recall bias or selective memory recall may have occurred in this study. Another limitation identified was the use of the cross-sectional design in the conduct of a quantitative survey. Cross-sectional design makes it difficult in differentiating cause and effect from the simple association. Finally, because the questionnaire was self-administered, social desirability bias of the respondents may have occurred, considering

the sensitive nature of the disease as well as young adults reluctant to provide information about their sexual lifestyles. Non-response bias was handled during the design stage by drawing on a larger sample (compensation technique); and during the data collection stage by ensuring quality control daily. Minimizing social desirability bias has been addressed by using a standardized instrument, ensuring the confidentiality and anonymity of the questionnaires hopefully encouraged students to be honest in their responses. Our assessment of condom use was limited to the last 3 months and most recent sex encounter to enhance accurate recall. However, the strength of this study was the good response rate of 100% from participants of this study. Despite these limitations, the study succeeded in determining HIV/AIDS knowledge and risk behaviors among this study's participants.

6. CONCLUSIONS

This study findings have provided relevant and updated information on factors that may be conducive to the spread of HIV infection among these undergraduate students. This study identified some misconceptions about the disease, knowledge gaps, risk behaviors being practice by these students and association between HIV/AIDS knowledge and risk behaviors. This investigation found no significant gender differences in HIV/AIDS knowledge and risk behaviors among participants of this study. There was an association between HIV/AIDS knowledge and risk behaviors relating to the disease infection. This survey findings have shown that good knowledge about HIV/AIDS may not translate into positive behavior change. This study suggests for more motivational approaches and youth-specific HIV education programs that are directed towards eliminating HIV/AIDS knowledge gaps, misconceptions and various risk behaviors identified. Finally, future research is needed to examine the role of drama and other forms of social media messaging platforms that are more appealing to young adults can play in the fight against HIV and AIDS.

7. RECOMMENDATIONS

HIV prevention Interventions currently been used for general population may not be appropriate for these young adults. This study suggests that undergraduate students cannot be considered as homogenous population for which one type of intervention will be effective. 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. Policies and interventions can be tailored to HIV/AIDS knowledge gaps, misconceptions and risk behaviors identified in this study. Primary goal of such interventions should focus on the competency of young people to prevent new HIV infections. This study also suggests for more HIV prevention awareness programs through drama and various forms of social media messaging platforms that are more appealing to our young adults. Finally, more recreational centers are needed in campuses to allow students to channel their energies towards sports and other forms of entertainments.

CONSENT AND ETHICAL APPROVAL

This study ethical clearance was obtained from the JSU Institutional Review Board. Every participant of this study signed informed consent form before participating in this study. Data obtained during this study were analyzed as aggregates and kept private. Participants of this study privacy were protected by withholding the students' identities and other personal information from all persons not directly connected to this study.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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