Original Research Article

The effect of age on knowledge of HIV/AIDS among African American Undergraduate Students

ABSTRACT

Objective: This study aimed to assess the effect of age on knowledge of HIV/AIDS among African American Undergraduate Students at a Historically Black University. **Methods:** A cross-sectional study design was used. A total of 400 respondents were randomly selected from Jackson State University undergraduate students' population. This study utilized a self-administered questionnaire on HIV/AIDS knowledge. **Results:** Some respondents of this study had misconceptions about the disease. This study found no significant difference between students aged 18-24 and students aged 25 and above on HIV/AIDS knowledge (P = 0.65). **Conclusions:** Some knowledge gaps and misconceptions about HIV/AIDS were identified in this study. This study calls for sustained effective youth friendly HIV prevention programs geared toward eliminating knowledge gaps and misconceptions of the disease identified in this study.

1. Introduction

Human immunodeficiency virus (HIV) has been a devastating inferno that has claimed more than 34 million lives and continues to be a severe public health threat globally [1]. United Nations Program on HIV/AIDS (UNAIDS) estimates that 37.7 million people are living with HIV/AIDS globally. About 1.5 million new HIV infections and 680, 000 thousand AIDS related deaths were recorded in 2020 [1]. In 2019, the Centers for Disease Control and Prevention (CDC) estimated that about 1.2 million individuals are living with HIV in the United States (U.S.) and 15,815 thousand deaths among people with diagnosed HIV in the U.S. [2]. CDC estimates that about 13% of those living with HIV in the U.S. do not know their HIV status and will need testing [3]. African Americans are disproportionately affected by HIV infection more than any other ethnic groups in the U.S. They have the highest rate of HIV diagnoses and African Americans account for 42% of new HIV diagnosed in 2019 [2].

In the U.S., men who have sex with men (MSM) are mostly affected by HIV infections. MSM accounted for about 2% of the population, but 69% of new HIV infections in 2019 [3]. In the same year, heterosexual contact accounted for 23% of all HIV diagnoses in the U.S. [3]. African American MSM continue to drive high rate of HIV infections among MSM in the U.S. [3]. According to CDC, African American MSM account for 37.9% of HIV diagnoses among all MSM in 2019 [3]. African American males have the highest HIV infection among all African Americans, they accounted for 75% of HIV infections among all African Americans, most of which (82%) were attributed to MSM. African American males aged 25–34 years have highest

HIV infection (43%), followed by those aged 13–24 years (27%) in 2019 [4]. The 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. [5-7]. This disproportionate burden of HIV infections among African Americans reiterates the need for sustainable youth friendly HIV prevention programs gear toward addressing HIV knowledge gaps, eliminate misinformation and misconceptions. Also, to curtail and eliminate this skewed HIV infections among African Americans in the U.S.

HIV and other sexually transmitted diseases (STDs) continue to have heavy toll on young people in the U.S. The highest rate of HIV infection was among people aged 25-34 (30%) and followed by young people aged 13 to 24 (21%) [3, 7]. More than half (51%) of youths aged 13-24 living with HIV, do not know their HIV status and will need testing. According to the CDC, young people aged 13 to 24 has highest rate of undiagnosed HIV more than any other age group in the U.S. [8]. HIV infections burden among young people are more pronounced among African Americans under the age of 25 years. African American youths aged 13-24, accounts for more than half (52%) of newly diagnosed HIV infection in that age group [4]. University undergraduate students fall within the age range of people mostly infected by HIV and other STDs in the U.S. [9]. Any investment among this vulnerable age group may be waste of resources, if these youths are not protected from HIV and other STDs [9]. It is quite challenging to prevent HIV infection among young people in any society. Many youths lack basic information about HIV and how to protect themselves from the disease. Young people are also at risk of HIV infections due to low rates of condom use, alcohol or drug abuse, misinformation and misconception of the disease [6-9].

HIV/AIDS knowledge may be an initial step towards risk behavior change among youths. Studies have shown that an increase in HIV/AIDS knowledge will lead to positive behavior changes [9-13]. Youth friendly health education programs tailored toward young adults remain an excellent tool for providing HIV/AIDS information among this vulnerable age group. A study by Chaves and colleagues found that well-planned and executed health education program about HIV and sexual risk behaviors increased HIV/AIDS knowledge and reduced risk behaviors among the participants of their study [14]. There is public health need to prevent young adults from falling prey to this dreadful disease. Young people are valuable human resources of any society, in the absence of a cure for HIV infection, youths should be armed with young people HIV/AIDS education programs. Some previous studies have shown that misconceptions and lack of knowledge relating to HIV/AIDS are common among young adults [15–19]. Some common misconceptions among young people include that HIV infections can be transmitted through insect bites, shaking hands, sharing clothes and toilet with HIV positive individuals [15–19]. Thus, these common misconceptions among these vulnerable young adults should be placed with latest HIV/AIDS information.

These common misconceptions about the disease underscore the important of continuous HIV prevention awareness programs that will keep young adults well informed about this dreadful HIV pandemic. A study conducted by Zhang and colleague found that age-appropriate HIV prevention awareness program led to increased perceived susceptibility of youths to HIV

infections and facilitated positive behavior changes among their study participants [20]. According to CDC, young adults are at much higher risk of engaging in sexual risk behaviors when under the influence of alcohol or illicit drugs [11]. Majority of undergraduate students in the U.S. fell within the age range of high rates of HIV infections [21]. Absence of parental supervisions at the various university campuses in the U.S. further expose youths to risk of HIV infections. Lack of parental supervisions at the universities offers these undergraduate students' greater opportunity to explore sexual risk experiments such as multiple sexual partnerships, unprotected anal sex, lack or inconsistent use of condoms, sex under the influence of alcohol and illicit drugs [21-24].

This study will provide the much-needed empirical data on HIV/AIDS knowledge that can serve as a useful tool and guide on this disease prevention policy formulation among U.S. undergraduate students. Also, provide scientific data on the relationship between age and HIV knowledge among African American undergraduates necessary in the fight to reduce the prevalence of HIV and other STDs among these young adults. In the absence of total cure for this disease, assessing the effect of age on knowledge of HIV/AIDS among these undergraduate students will provide vital information on the students' knowledge of this disease and possible common misconceptions. There are very few epidemiological studies that have evaluated the relationship between the level of HIV/AIDS knowledge and age among African American undergraduate students. Thus, this study assessed the effect of age on knowledge of HIV/AIDS among these African American undergraduate students.

2. Materials and Methods

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.

Data collection

This study utilized a self-administered questionnaire composed of two parts. 1) Related to students' demographic backgrounds and 2) HIV/AIDS knowledge assessment level. 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. 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.

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.

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.

Ethical considerations

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.

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 340 (85%) students were between the age of 18- to 24-year-old and total of 60 (15%) were between the age of 25- to 57-year-old. 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).

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

Characteristics	**n (%) or Mean ± S.D.**
Age	21.9 ± 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

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

There were some misconceptions relating to the disease found in this study, with 55% of respondents indicated that HIV infection could be transmitted through insects such as mosquito bites, and about 6% of the students indicated that HIV-positive persons could be recognized by looking at their facial appearance. About 20% of the respondents indicated that the disease could be transmitted by sharing clothes, and about 22% of the students indicated that HIV infection could be transmitted by sharing toilet with infected persons. However, about 4% of the

respondents indicated that young people cannot be infected by the disease, and about 19% of the respondents indicated that there was a cure for HIV and AIDS.

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

The study mean score for HIV/AIDS knowledge 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 96.5% of the students ≤ 24 years and 96.7% of participants ≥ 25 years had good knowledge about the disease. There was no significant difference between students ≤ 24 years and students ≥ 25 years of this study participants regarding HIV/AIDS knowledge (P = 0.65).

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

Age	Knowledge		P
	Good knowledge n (%)	Poor knowledge n (%)	
≤ 24 years	328 (96.5)	12 (3.5)	0.65
≥ 25 years	58 (96.7)	2 (3.3)	

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

4. Discussion

This study has succeeded in providing vital information regarding the effect of age on knowledge of HIV/AIDS among African American undergraduate students. This study findings revealed some lack of knowledge regarding HIV infections, despite global efforts to improve the knowledge of this disease. Some respondents of this study still have misconceptions about the disease and practice sexual risk behaviors to HIV infections. Some of the misconceptions identified during this study include the belief that the disease can be transmitted through insect bites, sharing clothes and toilet can be addressed through effective youth friendly HIV prevention awareness programs. Some other disturbing erroneous beliefs found in this study include the beliefs that the disease does not infect young people, HIV can be diagnosed by looking at facial expression, HIV and AIDS are curable disease. Closely related studies reported similar findings in their studies [15-19]. Some of these misconceptions about this disease among these undergraduate students are quite disturbing. It is noteworthy that some of the participants of this study did not belief that sexual abstinence and consistent use of condoms can reduce the risk of HIV infections among young adults. However, the higher good knowledge scores observed among majority of the respondents may be attributed to better education as these students are university undergraduates. It is possible that youths not enrolled in institutes of higher learning may demonstrate more lack of knowledge and misconceptions regarding this disease. Against this backdrop, it is imperative for more effective youths' friendly HIV prevention programs that will increase the competency of these vulnerable young adults in the fight against this disease. This study found no difference in HIV/AIDS knowledge between undergraduate students ≤ 24 years and those students ≥ 25 years of age, and this is consistent with a similar study finding [29]. However, this comparison should be treated with caution, as different questionnaire was used. Irrespective of the age, more youth appealing HIV/AIDS education programs that will eliminate some of this disease misconceptions should be promoted and encouraged at various universities. These HIV prevention programs should be geared toward promotion of abstinence, fidelity practice and consistent use of condoms among these vulnerable young adults. Although some studies have shown that mass media HIV prevention programs

play vital role in dispensing HIV/AIDS information [30-35]. However, health educators should explore the use of drama and social media messaging platforms that are more youth appealing and friendly in this disease prevention campaigns.

5. Strength and limitations of the Study

Limitations of this study may affect the interpretation of the result findings. This study targeted only undergraduate students, which was not representative of all university students, thus, the result findings should not be generalized to all students in HBCUs. Other limitation of this study was that a cross-sectional survey that was based on retrospective memory data collection process was used. There was possibility of memory recall bias or selective memory recall bias may have occurred in this research study. Another limitation identified was the use of that cross-sectional design used in this study makes it difficult in differentiating cause and effect from the simple association. Finally, because the sensitive nature of this disease, social desirability bias of the respondents may have occurred, considering that young adults reluctant to provide information about their sexual lifestyles. Non-response bias was controlled during the study design stage by drawing on a larger sample size (compensation technique); and during the data collection stage by ensuring quality control throughout the study. Social desirability bias was minimized by using a standardized measuring instrument, ensuring the confidentiality and anonymity of the questionnaires hopefully encouraged study participants to be honest in their responses. However, the strength of this research study was the good response rate of 100% from all study participants. Despite these limitations, the study succeeded in determining the effect of age on knowledge of HIV/AIDS among this study's participants.

6. Conclusions

This research study has provided relevant and updated information on some of the factors that may be aiding the spread of HIV infection among these undergraduate students at this historical black college and university. Some HIV/AIDS knowledge gaps and misconceptions about the disease were identified in this study. This investigation found no significant differences in HIV/AIDS knowledge between students ≤ 24 years and students ≥ 25 years. This study suggests for more effective approaches and youth-friendly HIV education programs that are directed towards eliminating the disease knowledge gaps and misconceptions identified. Finally, there are urgent need to examine the role of drama and other forms of social media messaging campaigns that are more appealing to undergraduate students can play in preventing HIV infections among these vulnerable age group.

7. Recommendations

HIV prevention strategies currently been used for general population may not be effective for these students. This study suggests that undergraduate students cannot be considered as homogenous population for which one type of HIV prevention strategy will be effective. Taking into consideration the fact that not all undergraduate students are currently sexually active,

developing youth appealing strategies that will delay sex or negotiate safer sexual practices should be promoted at various campuses. HIV prevention interventions should be tailored to HIV/AIDS knowledge gaps and misconceptions and identified in this research study. This study also suggests the use of drama and various forms of social media messaging platforms that are more appealing to youths in the fight against this disease. Finally, more recreational centers are needed to allow students to channel their energies towards sports and other forms of positive entertainments in our campuses.

References

1. The Joint United Nations Program on HIV/AIDS. (2021). *2020 Global HIV statistics*. Retrieved from https://www.unaids.org/sites/default/files/media_asset/UNAIDS_FactSheet_en.pdf

2. CDC. (2021). *HIV in the United States basic statistics*. Retrieved from https://www.cdc.gov/hiv/basics/statistics.html

3. CDC. (2021). *HIV Surveillance Reports.* Retrieved from https://www.cdc.gov/hiv/library/reports/hiv-surveillance.html

4. CDC. (2020). Estimated HIV incidence and prevalence in the United States, 2014–2018. *HIV Surveillance Supplemental Report* 2020;25(1). Retrieved from http://www.cdc.gov/hiv/library/reports/hiv-surveillance.html.

5. Dillon, P.J., & Basu, A. (2014). HIV/AIDS and minority men who have sex with men: A meta-ethnographic synthesis of qualitative research. *Health Communication*, (29), 182–192.

6. Dodge, B., Jeffries, W. L. I. V., & Sandfort, T. G. M. (2008). 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*, (37), 683–696.

7. CDC. (2019). *HIV and Youth*. Retrieved from https://www.cdc.gov/hiv/group/age/youth/index.html

8. CDC (2019). *HIV in the United States and dependent areas*. Retrieved from https://www.cdc.gov/hiv/statistics/overview/ataglance.html

9. Bigala, P., Adebowale, S. A. & Oladipo, S.E. (2014). Influence of HIV testing on knowledge of HIV/AIDS prevention practices and transmission among undergraduate youths in North-West University, Mafikeng. *Gender & Behavior*, 12(2), 6286-6300.

10. Fennie, T., & Laas, A. (2014). HIV/AIDS-related knowledge, attitudes and risky sexual behavior among a sample of South African university students. *Gender & Behaviour,*12 (1), 6035-6044.

11. CDC. (2018). *Youth risk behavior survey: Data summary and trends report 2007–2017*. Retrieved from https://www.cdc.gov/healthyyouth/data/yrbs/pdf/trendsreport.pdf

12. Oladipo, S.E., & Kalule-Sabiti, I. (2014). *Knowledge of HIV/AIDS and risky Sexual Behavior among Tertiary Institution Students in Nigeria.*

13. Omoyeni, S.T., Akinyemi A.I., & Fatusi, A. (2014). Adolescents and HIV-related behaviour in Nigeria: does knowledge of HIV/AIDS promote protective sexual behaviour among sexually active adolescents? *African Population Studies*. *Special issue on Nigeria*, 27(2), 331-342.

14. Chaves, C.B., Bentoa, M.T. et al. (2013). Knowledge about HIV/AIDS: The influence of lifestyles and self-regulation in adolescents. *The European Journal of Counseling Psychology*, 2195-7614

15. Andrew, P.O., Bhuiyan, A.R., Mawson, A., Buxbaum, S.G., Sung, J.H., & Shahbazi, M. (2018). HIV/AIDS knowledge of undergraduate students at a Historically Black College and University. *Diseases,* 6 (98), 1-8

16. Maimaiti, A., Shamsuddin, K., Abdurahim, A. et al. (2010). Knowledge, attitude and practice regarding HIV/AIDS among university students in Xinjiang. *Global Journal of Health Science*, 2(2), 51-60

17. Al-Rabeei, N.A., Dallak, A.M., & Al-Awadi, F.G. (2012). Knowledge, attitude and beliefs towards HIV/AIDS among students of health institutes in Sana'a city. *Eastern Mediterranean Health Journal*, 18(3), 221-226.

18. Shiferaw, Y., Alemu, A., Girma, A., Getahun, A. et al. (2011). 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*, 4(505), 1-8.

19. Tavoosi, A., Zaferani, A., Enzevaei, A., Tajik, P., & Ahmadinezhad, Z. (2004). Knowledge and attitude towards HIV/AIDS among Iranian students. *BMC Public Health*, 4 (17), 1-16.

20. Zhang, J.M., & Chock, T.M. (2014). Effects of HIV/AIDS public service announcements on attitude and behavior: Interplay of perceived threat and efficacy. *Social Behavior and Personality*, 42(5), 799-810.

21. Lewis, J.E., Malow, R.M., & Ireland,S.J. (1997). HIV/AIDS risk in heterosexual college students - a review of a decade of literature. J. Am. Coll. Health, 45(4), 147–158.

22. Duncan, C., Miller, D.M., Borskey, E.J., Fomby, B., Dawson, P., & Davis, L. (2002). Barriers to safer sex practices among African American college students. J. Natl. Med. Assoc., 94, 944–951.

23. Nakornkhet, N., Crowe, J.W., Torabi, M.R., Ding, K.D. (1998). Sexual behaviours and alcohol use among college students. International Conference on AIDS Abstracts, 12, 1010.

24. Prince, A., & Bernard, A.L. (1998). Sexual behaviors and safer sex practices of college students at a commuter campus. J. Am. Coll. Health, 47(1),11–21.

25. Historically Black Colleges and Universities. (2015). *Jackson State Becomes the 4th Largest HBCU by Enrollment*. Retrieved from http://hbculifestyle.com/jackson-state-enrollment-rank/

26. Mishel, M.H. (1998). Methodological studies: Instrument development. *In Advance Design in Nursing Research*; Sage Publications: Thousand Oaks, CA, USA, pp. 235–282.

27. Talbot, L.A. (1995). *Principles and Practice of Nursing Research*; Mosby Year Book: St. Louis, MO, USA.

28. World Health Organization (1988). Interview schedule on knowledge, attitude, beliefs and practices on AIDS/KABP survey. *Geneva, World Health*.

29. Okeke, C.E., Onwasigwe, C. N., & Ibegbu, M.D. (2012). The effect of age on knowledge of HIV/AIDS among army personnel. *African Health Sciences*, 12 (3), 291–296. doi: 10.4314/ahs.v12i3.7.

30. Ugarte, W.J., Valladares, E, & Essén, B. (2012). Sexuality and risk behavior among men who have sex with men in León, Nicaragua: A mixed methods approach. *J. Sex Med.*, 9 (16), 34–48.

31. Romer, D., Sznitman, S., DiClemente, R., et al. (2009). Mass media as an HIV-prevention strategy: using culturally sensitive messages to reduce HIV-associated sexual behavior of at-risk African American youth. *Am J Public Health*, 99, 2150–2159.

32. Andrew, P.O., Bhuiyan, A.R., Mawson, A., & Shahbazi, M. (2019). Assessment of Attitudes toward HIV and AIDS among Undergraduate Students at a Historically Black University. *Journal of AIDS and HIV Treatment*, 1(2), 25-32

33. Andrew, P.O., Bhuiyan, A.R., Mawson, A., & Shahbazi, M. (2020). Association between HIV/AIDS knowledge and attitudes among Undergraduate Students in Jackson. Asia *Journal of Research in Infectious Diseases*, 3 (2), 29-40. DOI:https://doi.org/10.9734/ajrid/2020/v3i2

34. Andrew, P.O., Bhuiyan, A.R., Mawson, A., & Shahbazi, M. (2020). Assessment of Risk Behaviors for HIV Infection among Undergraduate Students at a Historically Black University. *Asian Journal of Research in Infectious Diseases,* 3(2):10-20. DOI:https://doi.org/10.9734/ajrid/2020/v3i2

35. Andrew, P.O., & Andrew, R.N. (2020). Association between HIV/AIDS knowledge and risk behaviors among African American undergraduate students at a Historically Black University. *Asian Journal of Research in Infectious Diseases,* 4(1):1-13. DOI:https://doi.org/10.9734/AJRID/2020/v4i130136