



# The Effect of Age on Knowledge of HIV/AIDS among African American Undergraduate Students

Prince Onyekachi Andrew <sup>a\*</sup> and Rita Nneka Andrew <sup>b</sup>

<sup>a</sup> University of Calgary, 2500 University Drive NW, Calgary Alberta T2N 1N4, Canada.

<sup>b</sup> Springway Consultants 247 E Corporate Drive, Lewisville, TX 75067, USA.

## 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.

## Article Information

DOI: 10.9734/AJRID/2022/v9i230263

## Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/83906>

Original Research Article

Received 25 December 2021

Accepted 02 February 2022

Published 05 February 2022

## ABSTRACT

**Objective:** This study assessed the effect of age on HIV knowledge level among African American undergraduates at Jackson State University (JSU).

**Methods:** A total of 400 respondents were randomly selected from undergraduate students at JSU. A cross-sectional study design was utilized. Self-administered questionnaires regarding HIV knowledge level were used.

**Results:** Some respondents of this study had HIV knowledge gaps and misconceptions about the disease. This research results showed that majority of the students had good HIV knowledge level and there was no significant difference between students aged 18-24 and students aged 25 and above regarding HIV knowledge ( $P = 0.65$ ).

**Conclusions:** Some knowledge gaps and misconceptions about HIV/AIDS were identified in this study. This research study suggests the use of drama and other social media messaging platforms that are more appealing to this vulnerable age group in the elimination of HIV knowledge gaps and misconceptions identified in this study.

**Keywords:** HIV/AIDS; undergraduate Students; HIV knowledge; CDC.

\*Corresponding author: E-mail: prince.andrew@ucalgary.ca, princeandrew55@gmail.com;

## 1. INTRODUCTION

Human immunodeficiency virus (HIV) has been a devastating inferno and a global public health menace that has claimed 36.3 million lives since the start of HIV epidemic [1]. It is estimated that 37.7 million individuals are living with HIV/AIDS globally. In 2020, about 1.5 million new infections were recorded and AIDS related deaths accounted for 680,000 thousand deaths [1]. In the United States (U.S.), it is estimated that about 1.2 million residents are living with HIV and 15,815 thousand deaths occurred among individuals living with the disease [2]. Centers for Disease Control and Prevention (CDC) estimates that about 13% of those living with the disease in the U.S. do not know their HIV status and will need testing [3]. In the U.S, African Americans are disproportionately affected more than any other ethnic groups. Highest rate of HIV infections diagnoses was recorded among African Americans, and they accounted for about 42% of new HIV infections 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 U.S. population but accounted for 69% of new HIV infections recorded in 2019 [3]. In the same year, heterosexual contact accounted for 23% of all HIV diagnoses [3]. In the U.S., African American MSM are driving the high HIV infection rate seen among MSM [3]. CDC estimates that 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]. HIV knowledge gaps and misconceptions have impeded fight against this disease among African Americans [5-7]. This heavy toll of HIV infections seen among African Americans underscores the need for effective HIV prevention campaigns gear toward eliminating lack of HIV knowledge, misinformation and misconceptions common among African Americans youths.

Sexually transmitted diseases (STDs) continue to have heavy burden on young adults. The highest rate of HIV infection was recorded among people aged 25-34 (30%) and followed by youths aged 13 to 24 (21%) [3,7]. More than half (51%) of youths aged 13-24 that are living with the

disease, do not know their HIV status. Highest rate of undiagnosed HIV infection is found among young people aged 13 to 24 [8]. Most university undergraduates are within the age range that are mostly infected by HIV and other STDs [9]. If these youths are not protected from HIV and other STDs, any future investment among these young adults may be waste of human resources [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 adults are also at risk of HIV infections due to low rates of condom use, misinformation, alcohol or drug abuse and misconception of the disease [6-9].

There may be positive behavior changes among young adults if they are well informed about the various risks of HIV infections. Some previous studies have found that an increase in HIV knowledge will lead to positive behavior changes [9-13]. Youth friendly HIV education programs tailored toward young adults remain a vital tool for providing HIV information among youths. A similar study has shown that well executed health information program increased knowledge and positive sexual behaviors among their study participants [14]. There is public health need to prevent young adults from being infected with this dreadful disease. Young adults being valuable work force of our society, they should be guided with effective and youth friendly HIV education programs. Some previous studies have shown that misconceptions and lack of HIV knowledge are more frequent among undergraduate students [15–19]. Common misconceptions of the disease are that HIV can be transmitted through shaking hands, mosquitoes' bites, sharing clothes and public toilet with infected individuals [16–19]. These common misconceptions should be replaced with current scientific findings about this infectious disease.

These misconceptions relating to HIV infections underscore the need to keep these undergraduate students well educated about this dreadful disease. A similar study found that age-appropriate health education program led to increased perceived susceptibility to HIV infection and facilitated positive sexual behavior changes among their study participants [20]. According to CDC, young adults under the influence of alcohol or illicit drugs are at higher risk of HIV infections [21]. Absence of parental supervisions at the various higher institutions of

learning in the U.S. have exposed youths to risk HIV infections and opportunity to explore risk sexual behaviors such as having multiple sexual partnerships, having unprotected anal sex, lack or inconsistent use of condoms, having sexual intercourse under the influence of illicit drugs use and excessive alcohol consumptions [21-24].

This research findings will provide important empirical data on HIV knowledge that may serve as a useful tool in formulating HIV prevention policies among U.S. undergraduate students. It will also provide scientific data on the association between age and HIV knowledge among undergraduate students necessary to reduce the prevalence of HIV infections. There are serious knowledge gaps and misconceptions about HIV infections among young adults. Thus, it is imperative to investigate the effect of age on the knowledge of HIV among these undergraduates. Also, there are very few studies that have examined the association between age and HIV knowledge level among African American undergraduate students in the U.S. Thus, this study assessed the effect of age on HIV knowledge among this study participants.

## **2. STUDY METHODOLOGY**

### **2.1 Study Design**

We conducted a cross-sectional study among Jackson State University (JSU) undergraduate students. Main campus of Jackson State University is located at Jackson. Jackson is a city in the State of Mississippi and serve as the capital of Mississippi State in the U.S. JSU had about 9,000 undergraduates at the time of this study. Among institutions of higher learning in Mississippi State, JSU was the fourth largest institution of higher learning in the State and fourth largest Historically Black Universities in the U.S. [25]. This study respondents were randomly selected, and the inclusion criteria were as follows: (a) participants must be senior, junior, sophomore or freshman undergraduate students at Jackson State University; (b) respondents must give consent to participate in the study; (c) participants must be African American undergraduate students at Jackson State University; and (d) must be at least 18 years of age.

Michel and Talbot formulas were utilized in this study [26,27] to calculate the minimum sample size of 369 undergraduate students. Sample size was later increased to 400 respondents to accommodate for the possibilities of non-

responses. JSU undergraduate students were encouraged to participate in the study. The survey questionnaires were answered in classrooms after obtaining permission from their lecturers. All study participants signed informed consent forms before participating in this study. The survey questionnaires took participants an average of eight minutes to complete. Participants of this study were told that the survey was a voluntary study, that they have absolute right to withdraw from the study anytime and may refuse to respond to any specific question without penalty or prejudice against them.

### **2.2 Study Data Collection**

Approval for this research was obtained from JSU Institutional Review Board. Anonymous structured survey questionnaires (which was divided into two sections, section A: students demographic backgrounds and section B: knowledge of HIV/AIDS assessment were administered for completion by undergraduate students from January to September 2016, to seek basic information about their knowledge of HIV symptoms, prevention methods and transmission. Prior to administration of the study survey questionnaires, some samples were given to a group of JSU undergraduates to ascertain clarity. The survey questionnaire Cronbach's alpha coefficient value was 0.78 on HIV/AIDS knowledge. Cronbach's alpha coefficient value closer to 1.0 (range 0-1) shows higher internal consistency of the survey questionnaire [26,28]. We analyzed 400 properly completed questionnaires. Data were analyzed using chi-square ( $p < 0.05$ ) of SAS® 9.3 statistical software (SAS Institute Inc., Cary, NC, 2012).

### **2.3 Scoring of HIV Knowledge**

Each correct answer to the survey questionnaire questions was given a score of 1. Any wrong or unsure answer was given a score of 0. HIV/AIDS knowledge section had scores ranged between 0-21. HIV Knowledge level scores from 0 to 10 were considered as poor knowledge level of the disease, while total scores more than 10 were considered as good knowledge level of the disease.

## **3. STUDY RESULTS**

### **3.1 Respondents' Profile**

A total of 400 respondents participated in the study. Of the respondents 353 (88.3%) were

Christians and 47 (11.7%) students were non-Christians. The mean age of the research population was  $21.9 \pm 5.7$  and the students ages ranged from 18 to 57-year-old (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. Of the 400 study participants, 35.2% were male while 64.8% were female.

**Table 1. Characteristics of the students that participated in the study**

Characteristics	n (%) or Mean $\pm$ S.D.
<b>Age</b>	21.9 $\pm$ 5.7
<b>Gender</b>	
Female	259 (64.8)
Male	141 (35.2)
<b>Religion</b>	
Non-Christians	47 (11.7)
Christians	353 (88.3)

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

### 3.2 HIV/AIDS Knowledge Results

This research findings showed that more than 97% of the undergraduate students indicated that unprotected sex, infected semen and sharing unsterilized sharps such as needle could transmit HIV infections (Table 2). More than 90% of the study respondents indicated that infected mothers could transmit HIV infections to their children and receiving infected blood could transmit the disease. Whether abstinence practice could prevent HIV infections, about 87.3% of the students indicated that abstinence

could prevent infections. About 84.8% of respondents knew that HIV is a virus. About 95% of respondents indicated that multiple sexual partners could predispose partners to HIV infections. About 28.7% of respondents knew that inconsistent condom use could increase the risk of HIV infections. Whether infected persons immune systems are affected by the virus, about 93.3% indicated that HIV attacks immune systems. However, about 35.3% of the students indicated that HIV and AIDS do not have the same signs and symptoms in all infected individuals. About 48.3% of respondents knew that avoiding excessive alcohol consumptions and illicit drug abuse could lower HIV infections risk. About 87.5% of respondents indicated that HIV is a pandemic disease; and about 74.8% of respondents knew that untreated STDs increase HIV infections risk.

This research findings showed that about 20% of the study participants answered that sharing clothes with infected persons will transmit HIV infections, and about 21.7% of the students indicated that sharing toilet with infected persons will transmit the disease. There are misconceptions toward HIV/AIDS identified in this study. About 54.5% of respondents answered that insects' bites transmit HIV infections. About 5.7% of the students answered that HIV infected persons could be recognized from their facial appearances. However, about 4.2% of the students answered that HIV cannot infect youths, and about 19% of the respondents answered that there was a total cure for HIV/AIDS.

**Table 2. HIV/AIDS knowledge among study participants**

Variables	Appropriate responses	n (%)
HIV/AIDS affects the immune system	True	373 (93.3)
HIV is already pandemic disease	True	350 (87.5)
Opportunistic infections are common	True	158 (39.5)
HIV and AIDS have the same clinical manifestations	False	141(35.3)
HIV is a type of virus	True	339 (84.8)
<b>People can get HIV from:</b>		
Through infected semen	True	389 (97.2)
Infected mother-to-child transmission	True	377 (94.3)
Sharing infected needles and sharps	True	389 (97.3)
Receiving infected blood	True	369 (92.3)
Sexual intercourse without a condom	True	389 (97.3)
<b>HIV infection can be prevented through:</b>		
Sexual abstinence	True	349 (87.3)
Consistent use of condoms can prevent HIV Infection	True	285 (71.3)

Variables	Appropriate responses	n (%)
<b>HIV Misconceptions:</b>		
HIV is transmitted through sharing clothes	False	320 (80)
HIV is transmitted through insect bites	False	182 (45.5)
Diagnose HIV by looking at facial expression	False	377(94.3)
HIV is transmitted through using public toilet	False	313(78.3)
AIDS is a curable disease	False	324 (81)
HIV does not affect young	False	383(95.8)
<b>HIV infection risk:</b>		
Avoiding alcohol and drug abuse reduce HIV risk	True	193(48.3)
Multiple sex partners increase HIV infection risk	True	380 (95)
Untreated STD increases HIV infection risk	True	299 (74.8)

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

After stratifying HIV knowledge into poor HIV knowledge group (scores of 0–10) and good HIV knowledge group (scores of 11–21) about 96.5% of the students  $\leq 24$  years and 96.7% of respondents  $\geq 25$  years had good HIV knowledge. Mean score regarding HIV knowledge level was  $16.7 \pm 2.8$  (Table 3). The study found no significant difference between students  $\leq 24$  years and students  $\geq 25$  years regarding HIV knowledge level ( $P = 0.65$ ).

#### 4. DISCUSSION

We have succeeded in assessing the effect of age on HIV knowledge level among this study participants. Some undergraduate students still have misconceptions regarding HIV infections and practice sexual risk behaviors. There are misconceptions identified in this study, and some of these misconceptions include the belief that sharing toilet and clothes can transmit HIV infections. Some students still believe that insects' bites could transmit HIV infections. These misconceptions can be eliminated through effective youth friendly programs. It is disturbing that some students believed that HIV does not infect youths. Some respondents believed that HIV can be diagnosed by looking at the infected person's facial expression and that HIV can be cured. Closely related research studies found similar results among their study participants [15-19]. Some of these erroneous beliefs identified among this study participants about HIV

infections are quite disturbing. Some of the participants of this study believed that inconsistent use of condoms and sexual abstinence do not reduce the risk of HIV transmission among young adults. However, the higher scores regarding HIV knowledge level recorded among this study respondents may be attributed to university education they have acquired as university undergraduate students. If this study is conducted among youths that are not enrolled in university, we may record less HIV/AIDS knowledge level and more misconceptions. Thus, it is important to develop well-planned and effective youths' friendly prevention programs geared toward increasing their competency and resilient to avoid risk behaviors to HIV infections. Some of the knowledge gaps identified among these young adults are startling considering global efforts to improve HIV knowledge level since the inception of HIV pandemic. This study did not find any significant difference between respondents  $\leq 24$  years and those respondents  $\geq 25$  years of age regarding HIV knowledge level. This finding is consistent with similar research finding [29]. Age-appropriate HIV prevention programs that will eliminate knowledge gaps and misconceptions identified in this study should be promoted at various institutions of higher learning. HIV prevention campaigns should focus on abstinence practice promotion, consistent use of condoms and sexual partner fidelity among these vulnerable young adults. Although some studies

**Table 3. Differences in distribution of HIV/AIDS knowledge level by age**

Age	Knowledge		P
	Good knowledge n (%)	Poor knowledge n (%)	
$\leq 24$ years	328 (96.5)	12 (3.5)	0.65
$\geq 25$ years	58 (96.7)	2 (3.3)	

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

have shown that mass media play important role in dispensing HIV prevention information [30-35]. However, health educators should explore other HIV prevention methods such as role play and the use of social media messaging platforms that are more appealing and youth friendly.

## 5. CONCLUSIONS

This study has succeeded in identifying some of the knowledge gaps and misconceptions regarding HIV/AIDS that may be aiding the spread of the disease among these young adults. This study did not find any significant difference between respondents  $\leq 24$  years and those respondents  $\geq 25$  years of age regarding HIV knowledge level. Age-appropriate HIV prevention programs that will eliminate knowledge gaps and misconceptions identified in this study should be promoted at various institutions of higher learning. Finally, health educators should explore other HIV prevention methods such as role plays and the use of social media messaging platforms that are more appealing to this vulnerable age group.

## CONSENT

All study participants signed informed consent forms before participating in this study.

## ETHICAL APPROVAL

It is not applicable.

## ACKNOWLEDGEMENTS

The authors acknowledge Jackson State University and all the students who participated in the study, for their support throughout the study. Authors received no funding for this study.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. The Joint United Nations Program on HIV/AIDS. 2020 Global HIV statistics; 2021. Available: [https://www.unaids.org/sites/default/files/media\\_asset/UNAIDS\\_FactSheet\\_en.pdf](https://www.unaids.org/sites/default/files/media_asset/UNAIDS_FactSheet_en.pdf)
2. CDC. HIV in the United States basic statistics; 2021.

- Available: <https://www.cdc.gov/hiv/basics/statistics.html>
3. CDC. HIV Surveillance Reports; 2021. Available: <https://www.cdc.gov/hiv/library/reports/hiv-surveillance.html>
4. CDC. Estimated HIV incidence and prevalence in the United States, 2014–2018. HIV Surveillance Supplemental Report. 2020;25(1). Available: <http://www.cdc.gov/hiv/library/reports/hiv-surveillance.html>
5. 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.
6. 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.
7. CDC. HIV and Youth; 2019. Available: <https://www.cdc.gov/hiv/group/age/youth/index.html>
8. CDC. HIV in the United States and dependent areas; 2019. Available: <https://www.cdc.gov/hiv/statistics/overview/ataglance.html>
9. Bigala P, Adebowale 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. Youth risk behavior survey: Data summary and trends report 2007–2017; 2018. Available: <https://www.cdc.gov/healthyouth/data/yrbs/pdf/trendsreport.pdf>
12. Oladipo SE, Kalule-Sabiti I. Knowledge of HIV/AIDS and risky Sexual Behavior among Tertiary Institution Students in Nigeria; 2014.
13. Omoyeni ST, Akinyemi AI, Fatusi A. 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*. 2014;27(2):331–342.

14. Chaves CB, Bentoa MT, et al. Knowledge about HIV/AIDS: The influence of lifestyles and self-regulation in adolescents. *The European Journal of Counseling Psychology*. 2013;2195-7614.
15. Andrew PO, Bhuiyan AR, 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):1-8.
16. 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.
17. 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.
18. 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.
19. Tavoosi A, Zaferani A, Enzevaei A, Tajik P, Ahmadinezhad Z. Knowledge and attitude towards HIV/AIDS among Iranian students. *BMC Public Health*. 2004; 4(17):1-16.
20. 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.
21. 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.
22. 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.
23. Nakornkhet N, Crowe JW, Torabi MR, Ding KD. Sexual behaviours and alcohol use among college students. *International Conference on AIDS Abstracts*. 1998;12:1010.
24. 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.
25. Historically Black Colleges and Universities. Jackson State Becomes the 4th Largest HBCU by Enrollment; 2015. Available:<http://hbculifestyle.com/jackson-state-enrollment-rank/>
26. Mishel MH. Methodological studies: Instrument development. In *Advance Design in Nursing Research*; Sage Publications: Thousand Oaks, CA, USA. 1998;235-282.
27. Talbot LA. *Principles and Practice of Nursing Research*; Mosby Year Book: St. Louis, MO, USA; 1995.
28. World Health Organization. Interview schedule on knowledge, attitude, beliefs and practices on AIDS/KABP survey. Geneva, World Health; 1988.
29. Okeke CE, Onwasigwe CN, Ibegbu MD. The effect of age on knowledge of HIV/AIDS among army personnel. *African Health Sciences*. 2012;12(3):291-296. DOI: 10.4314/ahs.v12i3.7
30. Ugarte WJ, Valladares E, Essén B. Sexuality and risk behavior among men who have sex with men in León, Nicaragua: A mixed methods approach. *J. Sex Med*. 2012;9(16):34-48.
31. Romer D, Sznitman S, DiClemente R, et al. 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*. 2009;99:2150-2159.
32. Andrew PO, Bhuiyan AR, 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.
33. Andrew PO, Bhuiyan AR, Mawson A, Shahbazi M. Association between HIV/AIDS knowledge and attitudes among Undergraduate Students in Jackson. *Asia Journal of Research in Infectious Diseases*. 2020;3(2):29-40. DOI: <https://doi.org/10.9734/ajrid/2020/v3i2>
34. Andrew PO, Bhuiyan AR, Mawson A, Shahbazi M. Assessment of Risk Behaviors for HIV Infection among Undergraduate Students at a Historically Black University. *Asian Journal of Research in Infectious Diseases*. 2020;3(2):10-20. DOI: <https://doi.org/10.9734/ajrid/2020/v3i2>

35. Andrew PO, Andrew RN. 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. 2020;4(1):1-13.  
DOI: <https://doi.org/10.9734/AJRID/2020/v4i130136>

© 2022 Andrew and Andrew;; 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:*  
<https://www.sdiarticle5.com/review-history/83906>