Original Research Article

Perception of HIV/AIDS among tertiary education students in the Tamale Metropolis and their willingness to take the HIV test

Abstract

Aim: The study assessed the perception of HIV/AIDS among students in tertiary education institutions in northern Ghana and their willingness to take the HIV test.

Study design: Descriptive cross-sectional study.

Place and duration of study: Tamale Metropolis from September 2020 to June 2021.

Methodology: A convenience sampling technique was employed to select 374 students aged 15-30 years. Data from participants was collected using a standardized structure questionnaire and analyzed on Epi Info version 7. Cross tabulation was used to estimate the association between outcome variables and independent variables.

Results: Almost all participants (366; 93.61% [95% CI: 90.73 – 95. 63]) were aware of HIV/AIDS, having acquired information about the disease mostly from a health worker. A very high proportion of the respondents (346; 88.49% [95% CI: 84.95 – 91.29]) were also aware of the modes of transmission of HIV, with 64.41% of participants identifying unprotected sexual intercourse as a major mode of HIV transmission. Though aware of how HIV is transmitted, almost half (46.21%) of sexually active participants did not use a condom in their last sexual intercourse. More than half (221; 56.52% [95% CI: 51.57 – 61.35]) of respondents had never heard of any HIV/AIDS support groups in their schools or communities. Though a majority (58.57%) of respondents were aware of free HCT in the country, the majority (207; 52.94% [95% CI: 47.99 – 57.84]) of the respondents had never taken the HIV test. Close to half (167; 42.71% [95% CI: 37.90 – 47.66]) of respondents had no plans to take the HIV test in the future.

Conclusion: Our results revealed the need to intensify HIV/AIDS education, especially among the youth, emphasizing the increasing risk of HIV infection, importance of regular HIV tests for sexually active persons and the use of protection during casual sex.

Keywords: Knowledge, Attitudes, Young people, HIV test, Ghana

Abbreviations:

HIV : Human Immunodeficiency Virus

AIDS : Acquired Immunodeficiency Syndrome

GAC : Ghana AIDS Commission

HCT : HIV Counselling and Testing

1. Introduction

HIV/AIDS remains a public health threat globally with no cure or vaccine [1,2]. An estimated 79.3 million people have been infected with HIV since AIDS was first clinically described in 1981, 36.3 million of whom have lost their lives to AIDS-related illnesses [1]. Sub-Saharan Africa has the heaviest HIV/AIDS burden accounting for more than 70% of global cases and deaths [2,3]. Major advances in the management of HIV infection and AIDS has generally transformed an otherwise virulent disease into a chronic one thereby reducing mortality and morbidity globally [2–4]. But this success has caused complacency and thus new infections continue to be high every year in some countries and more people are living with HIV now than before [2,4,5]. Of greater concern are young people who are at a higher risk of HIV infection [2,6]. Previous studies indicate that over 45% of new global HIV infections occur among the age group of 15 – 24 years [7–9].

Ghana, as is the case for most sub-Saharan African countries, is endemic to HIV and has a current national prevalence of 2.0% [10]. In 2019, an estimated 20,068 new infections were recorded, 28% of which occurred in young people only in the age bracket of 15 – 24 years most of whom are women [2,11]. These figures, though can be seen as a reduction from previous years due to the impact of HIV control policies implemented by the Ghana Aids Commission (GAC), are still are very high [2,5]. For instance, the national HIV prevalence in adults aged 15 – 49 years increased from 1.6% in 2016 to 1.7% in 2017 [4,5]. HIV prevalence in some regions of the country is also well above the 2019 national rate including Bono, Greater Accra, and Eastern Regions with 2.88%, 2.47% and 2.07% rates respectively [5,11]. Ghana has achieved major milestones in the prevention of mother-to-child HIV transmission, availability of voluntary HIV Counseling and Testing (HCT), antiretroviral therapy for infected persons, and general education on HIV prevention and transmission especially among the youth [3,5]. Yet, transmission rates

remain high. It would seem these achievements are not translated into behavior that would reduce transmission and control the HIV epidemic [6,7].

The main objective of the present study was to examine the perception of HIV/AIDS among students in tertiary institutions in the Tamale Metropolis and their willingness to take the HIV test. Findings from the study could help design more effective HIV educational policies that target students in tertiary institutions and lead to improved control and prevention of HIV infection among Ghanaian youth.

2. Materials and Methods

2.1 Study area and period

The study was conducted in the Tamale Metropolis, the capital of the Northern Region of Ghana. The metropolis has a total population of 374,744 according to the 2021 Ghana Population and Housing Census with young people within the age group of 15 – 34 years making 38.31% of the population [12]. At an estimated regional adult (19 – 49 years) HIV prevalence of 0.31%, the Northern Region has one of the lowest HIV prevalence in Ghana [11]. Muslims make up 90.5% of the population of the metropolis. However, there is also a significant percentage (8.8%) of Christians in various denominations living in the metropolis [13]. The study was conducted from September 2020 to June 2021.

2.2 Study design and population

A descriptive cross-sectional study was carried out in the two tertiary institutions located in the Tamale Metropolis namely, the University for Development Studies (UDS) with a total student population of 8,041 and the Nursing and Midwifery Training College (NMTC) with a total student population of 720. The target group for this study was young people within the age group of 15 – 30 years, coming from various parts of the country and enrolled in any of the two institutions.

2.3 Sampling technique

The sample size was calculated using Slovin's formula [14] considering a confidence interval of 95% (margin of error = 0.05). The calculation was based on a total enrolled student population of 8,761 for the two institutions. A sample size of 383 was arrived at using the formula but this

number was adjusted upwards by 10% to 421 to cater for non-responding participants. In our final analysis, however, data from 391 participants was used due to non-response and incomplete questionnaire. A convenience sampling technique was used to recruit students within the target age group who were willing to participate in the study.

2.4 Data collection

A structured self-administered questionnaire containing both closed- and open-ended questions was used to collect data on socio-demographic characteristics of the 391 respondents as well as their awareness and perception of HIV/AIDS. The questionnaire was first pretested for clarity and feasibility of use and after necessary adjustments, was administered to respondents to complete themselves. The questionnaire was organized into three sections: section A assessed respondents' socio-demographic characteristics such as age, gender, religion, marital status, and level of study; section B assessed respondents' awareness and perception of HIV/AIDS including the mode of transmission and prevention of the disease, and the source of their HIV/AIDS education; while section C assessed respondents' willingness to take the HIV test and their use of condoms during sexual intercourse.

The purpose of the study was well explained to all respondents and participation was voluntary. To ensure confidentiality, respondents completed the questionnaire anonymously. This approach encouraged participation and allowed for truthfulness in answering even very personal research questions. Participants also had access to the link of the questionnaire on google forms for their convenience.

2.5 Data analysis

Data was initially entered into a customized Microsoft Excel sheet after which it was exported onto the statistical package, Epi Info version 7, CDC, USA, for management and analysis including the calculation of frequencies, means, and standard deviation. Cross tabulation was used to estimate the association between outcome variables and independent variables.

3. Results

3.1 Sociodemographic characteristics

The sociodemographic characteristics of respondents are presented in Table 1. A total of 391 respondents ranging in age from 15 – 30 years old were recruited for the study. The majority

(212; 54.22%) of respondents were in the age group of 20 – 24 years. The overall mean age of respondents was 24.00 years (SD±3.81). The mean ages for males and females were 24.41 years (SD±3.91) and 23.66 years (SD±3.70) respectively. More than half (221; 56.52%) of the respondents were female while 170 (43.48%) were male. Concerning the marital status of respondents, a majority (327; 83.63%) of respondents were single while 53 (13.55%) were married at the time of the study. Only a single respondent was widowed. The rest (10; 2.56%) of the respondents were either divorced or separated. Between the sexes, a higher proportion (87.65%) of males were married compared to 80.54% of females. With regards to religion, a majority (214;

54.73%) were Christians while 171 (43.73%) and 5 (1.28%) were Muslims and traditionalists respectively. Only 1 person was practicing a religion other than Christianity, Islam, or African Traditional Religion. While the majority (103; 60.59%) of males were Christians, the majority (111; 50.23%) of the females were Muslims.

Table 1. Sociodemographic characteristics of respondents (N=374)

Characteristic	Frequency		Total n (%)
	Male n (%)	Female n (%)	
Age-group (Years)			
15 - 19	7 (4.12)	24 (10.86)	31 (7.93)
20 - 24	90 (52.94)	122 (55.20)	212 (54.22)
25 - 30	73 (42.94)	75 (33.94)	148 (37.85)
Marital status			
Single	149 (87.65)	178 (80.54)	327 (83.63)
Married	17 (10.00)	36 (16.29)	53 (13.55)
Divorced/Separated	4 (2.35)	6 (2.71)	10 (2.56)
Widowed	0 (0.00)	1 (0.45)	1 (0.26)
Religion			
Christian	103 (60.59)	111 (50.23)	214 (54.73)
Muslim	64 (37.65)	107 (48.42)	171 (43.73)
Traditionalist	2 (1.18)	3 (1.36)	5 (1.28)
Others	1 (0.59)	0 (0.00)	1 (0.26)

N = number

3.2 Awareness and Knowledge on HIV/AIDS

Results of the assessment of respondents' awareness and knowledge of HIV/AIDS is presented on Table 2. The majority (366; 93.61% [95% CI: 90.73 – 95. 63]) of respondents indicated that they have heard of HIV/AIDS as a disease. Only 25 (6.39%) respondents indicated that they have never heard of the disease. Regarding the source of respondents' information on HIV/AIDS, the majority (146; 37.33% [95% CI: 33.85 – 43.62]) of respondents indicated their source as a health worker they interacted with. Television, radio, and peers were also cited as sources of information on HIV/AIDS having been cited by 29.16%, 14.58%, and 8.95% of respondents respectively. A few (26; 6.65%) respondents also indicated that they heard about the disease from their parents. Concerning knowledge about the transmission of HIV, the majority (346; 88.49% [95% CI: 84.95 – 91.29] of respondents correctly indicated either unprotected sex, blood transfusion, or sharing of needles and blades (or their combinations) as modes of HIV transmission. A significant number (45; 11.51%) of respondents either incorrectly indicated contact with an infected person or his/her body fluids as routes of HIV infection or did not know the mode of transmission of the virus altogether. With regards to knowledge on symptoms of HIV/AIDS, a majority (281; 71.87% [95% CI: 67.21 – 76.09]) correctly identified at least three symptoms of the disease including unexplained weight loss, night sweats, swollen lymph nodes, rashes, and opportunistic infections. When respondents were asked to state at least one way to prevent HIV infection, a majority (242; 61.89% [95% CI: 57.93 – 67.53]) of respondents correctly indicated that abstinence from sex. Close to a third (111; 28.39%) and 8.18% of respondents also correctly identified the condom use and mutual faithfulness of sexual partners respectively as preventive measures to HIV infection. Only 1.54% of respondents were unable to indicate a way to prevent HIV infection. More than half (229; 58.57% [95% CI. 53.62 – 63.34]) of respondents were aware of the availability of free voluntary HCT in government health facilities. The majority (342; 87.47% [95% CI: 83.83 – 90.39]) of respondents were also aware that voluntary HCT can help reduced the spread of HIV while less than half (170; 43.48% [95%: 38.63 – 48.43]) were aware of an HIV awareness campaign group in their community or school.

Table 2. Awareness and knowledge on HIV/AIDS

Subject	Frequency		Total n (%)
	Male n (%)	Female n (%)	

Heard of HIV/AIDS			
Yes	161 (94.71)	205 (92.76)	366 (93.61)
No	9 (5.29)	16 (7.24)	25 (6.39)
*Source of HIV/AIDS information**			
Television	53 (31.18)	61 (27.60)	114 (29.16)
Radio	23 (13.53)	34 (15.39)	57 (14.58)
Peers	16 (9.41)	19 (8.59)	35 (8.95)
Parents	17 (10.00)	9 (4.07)	26 (6.65)
Health worker	58 (34.12)	88 (39.82)	146 (37.33)
Other sources	3 (1.76)	10 (4.53)	13 (3.33)
Transmission routes of HIV			
Yes	153 (90.00)	193 (87.33)	346 (88.49)
No	17 (10.00)	28 (12.67)	45 (11.51)
Symptoms of HIV/AIDS			
Yes	126 (74.12)	155 (70.14)	281 (71.87)
No	44 (25.88)	66 (29.86)	110 (28.13)
*Prevention of HIV/AIDS**			
Abstinence from sex	106 (62.35)	136 (61.54)	242 (61.89)
Faithfulness to partner	8 (4.71)	24 (10.86)	32 (8.18)
Use of condoms	52 (30.59)	59 (26.70)	111 (28.39)
Don't know	4 (2.35)	2 (0.90)	6 (1.54)
Awareness of free HCT			
Yes	95 (55.88)	134 (60.63)	229 (58.57)
No	75 (44.12)	87 (39.37)	162 (41.43)
Aware HCT reduces HIV spread			
Yes	145 (85.29)	197 (89.14)	342 (87.47)
No	25 (14.71)	24 (10.86)	49 (12.53)
Aware of HIV/AIDS campaign groups			
Yes	74 (43.53)	96 (43.44)	170 (43.48)
No	96 (56.47)	125 (56.56)	221 (56.52)
Member of HIV/AIDS campaign group			
Yes	33 (44.59)	43 (44.79)	76 (44.71))
No	41 (55.41)	53 (55.21)	94 (55.29)

n = number

3.3 HIV risk assessment and willingness to access HCT

Table 3 presents respondents' perception of their risk of contracting HIV, their attitudes towards interventions to control HIV infection, and their willingness to access voluntary HCT. Concerning respondents' perception of their risk of being infected with HIV, more than half (204; 52.17% [95% CI: 47.23 – 50.08]) indicated that they were not at risk. This misconstrued perception was higher (98; 57.65%) among males than among females, 47.93% of whom indicated that they were not at risk of HIV infection. The majority (290; 74.17% [95% CI: 69.61 – 78.26]) of respondents indicated that they were sexually active with females being more (76.02%) sexually active than males (71.76%). However, only about half (156; 53.76% [95% CI: 47.68 – 59.32]) of respondents practiced safe sex in their last sexual encounter. The majority (96; 71.64% [95% CI: 65.43 – 75.10]) of respondents who did not use a condom in their last sexual encounter stated that condom use reduces sexual pleasure. Other reasons were that condom use creates suspicion between partners or that they trusted their partners to be safe from sexually transmitted diseases. With regards to HIV counseling and testing, less than half (184; 47.06% [95% CI: 42.16 – 52.01]) of respondents have ever taken the test. Most persons (129; 70.11% [95% CI: 63.32 – 74.24]) who were tested for HIV did so voluntarily compared to 16.85% and 7.61% who were advised to take the test by a health worker and partner/parent respectively. A few (5.43%) respondents were advised to take the HIV test by institutions such as churches and schools they belonged to. Finally, the majority (74; 43.53% [95% CI: 35.95 – 51.33]) of respondents mentioned lack of confidentiality of HIV test results by health facilities as the reason why they will not patronize the free voluntary HCT policy of the government. Other reasons that were mentioned include the fear of stigmatization if test results turn out positive and the fear of knowing status which were mentioned by 32.94% and 22.35% of the respondents respectively.

Table 3. HIV risk assessment and patronage of HCT

Characteristic	Frequency		Total n (%)
	Male n (%)	Female n (%)	
Are you at risk to HIV infection			
Yes	72 (42.35)	115 (52.04)	187 (47.83)
No	98 (57.65)	106 (47.96)	204 (52.17)
Are you sexually active			

Yes	122 (71.76)	168 (76.02)	290 (74.17)
No	148 (28.24)	53 (23.98)	101 (25.83)
Did you use a condom in last sex			
Yes	66 (54.10)	90 (53.57)	156 (53.79)
No	56 (45.90)	78 (46.43)	134 (46.21)
Reason you did not use protection			
Married	2 (3.57)	4 (5.13)	6 (4.48)
Creates suspicion	5 (8.93)	8 (10.26)	13 (9.70)
Reduces sexual pleasure	40 (71.43)	56 (71.79)	96 (71.64)
Other reasons	9 (16.07)	10 (12.82)	19 (14.18)
Have you ever tested for HIV			
Yes	86 (50.59)	98 (44.34)	184 (47.06)
No	84 (49.41)	123 (55.66)	207 (52.94)
Who advised you to take the test			
Voluntary	60 (71.43)	69 (50.10)	129 (70.11)
Health worker	14 (16.67)	17 (13.82)	31 (16.85)
Institution	4 (4.76)	6 (4.88)	10 (5.43)
Partner	6 (7.14)	8 (6.50)	14 (7.61)
Reason why you do not patronize HCT			
I don't want to know my status	19 (26.39)	19 (19.39)	38 (22.35)
Lack of confidentiality of my test results	27 (37.50)	47 (47.96)	74 (43.53)
Fear of stigmatization if infected	26 (36.11)	30 (30.61)	56 (32.94)
I am a virgin	0 (0.00)	2 (2.04)	2 (1.18)

n = number

3.4 Association of HIV/AIDS knowledge with sociodemographic characteristics

Analysis of the association of HIV/AIDS knowledge of respondents with their sociodemographic characteristics using the chi square test is presented in table 4. Considering an association *P*-value of less than or equal to .05 to be statistically significant, the was a significant association (X^2=15.53, *P*=.00) between HIV/AIDS knowledge and the marital status of respondents. All other sociodemographic variables showed no significant association with HIV/AIDS knowledge.

Table 4. Association of HIV/AIDS knowledge with sociodemographic characteristics

HIV/AIDS knowledge

Variable	Knowledgeable n (%)	Not Knowledgeable n (%)	X^2	*P*-value
Gender				
Male	161	9	0.61	.43
Female	205	16		
Age-group (Years)				
15 - 19	29 (7.92)	2 (8.00)	1.24	.54
20 - 24	201 (54.92)	11 (44.00)		
25 - 30	136 (37.16)	12 (48.00)		
Marital status				
Single	313 (85.52)	14 (56.00)	15.53	.00
Married	14 (12.02)	9 (36.00)		
Divorced/Separated	8 (2.19)	2 (8.00)		
Widowed	1 (0.27)	0 (0.00)		
Religion				
Christian	205 (56.01)	9 (36.00)	4.94	.18
Muslim	156 (42.62)	15 (60.00)		
Traditionalist	4 (1.09)	1 (4.00)		
Others	1 (0.27)	0 (0.00)		

n = number

3.5 Association of self-reported attitudes with HIV testing

Analysis of the association of respondents' self-reported attitudes with their patronage of HCT using the chi square test is presented in table 5. A *P*-value of .05 was considered statistically significant. There was a significant relationship between HIV testing and respondents' awareness of free HCT (X^2=24.84, *P*=0.00), perception of their risk of HIV infection (X^2=10.53, *P*=0.00) and willingness to access HCT (X^2=8.93, *P*=0.00). A significant association (X^2=15.53, *P*=0.00) was also observed between respondents' awareness of free HCT and their patronage of HIV testing. No significant association was observed between the other variables and HIV testing of the respondents.

Table 5. Association of self-reported attitudes with patronage of HIV testing

	HIV Testing

Variable	Tested n (%)	Not Tested n (%)	X^2	*P*-value
Knowledge about HIV/AIDS				
Yes	175 (95.11)	191 (92.27)	1.31	.25
No	9 (4.87)	16 (7.73)		
Awareness of free HCT				
Yes	131 (71.20)	98 (47.34)	22.84	.00
No	53 (28.80)	109 (52.66)		
Aware of HIV/AIDS campaign groups				
Yes	89 (48.37)	81 (39.13)	3.38	.07
No	95 (51.63)	126 (60.87)		
Member of HIV/AIDS campaign group				
Yes	37 (25.17)	39 (25.66)	0.01	.92
No	110 (74.83)	113 (74.34)		
Perception of HIV infection risk				
Yes	104 (56.52)	83 (40.10)	10.53	.00
No	80 (43.48)	124 (59.90)		
Sexually active				
Yes	133 (72.28)	157 (75.85)	0.65	.42
No	50 (27.72)	51 (24.15)		
Practice protected sex				
Yes	75 (54.74)	89 (56.69)	0.11	.74
No	62 (45.26)	68 (43.31)		
Willing to go for HCT				
Yes	120 (65.22)	104 (50.24)	8.93	.00
No	64 (34.78)	103 (49.76)		

n = number

4. Discussion

Our study assessed the perception of HIV/AIDS among tertiary education students in the Tamale Metropolis and their willingness to take the HIV test. The results revealed a high impact of HIV/AIDS education among young adults in Ghana as more than three quarters (93.61%) of youth have heard and are aware of the disease. This result is consistent with the findings of previous studies [4,6,8,15,16]. Surprisingly, rather than mass media that was reported in previous

studies [6], our results highlight the contribution of health workers to HIV/AIDS education as 37.33% of respondents indicated a health worker as the source of their HIV information.

In general, the level of knowledge about HIV transmission, symptoms, and prevention was also high among the study group. Transmission routes that included unprotected sex, blood transfusion, and sharing of sharp objects were well known by participants. HIV/AIDS symptoms such as nights sweats, unexplained weight loss, and infection by opportunistic infections were widely known by participants, as were preventive measures such as abstinence from sexual intercourse, the use of protection during sex, or being faithful to one's sexual partner. These findings are consistent with previous reports of high level of knowledge of HIV/AIDS transmission, symptoms, and preventive measures among young adults [4,6,15,16]. Unfortunately, a considerable number (11.51%) of study participants either did not know how HIV is transmitted or held the erroneous notion that HIV can be transmitted through contact with mere contact with an infected person or their body fluids. This unfounded notion is a major driver of HIV/AIDS stigmatization which is a serious challenge to the fight against the pandemic [17–19].

The high impact of HIV/AIDS education was also evident in our findings that more than half of respondents were aware of the availability of free HCT centers in government health facilities and the significance of these facilities to the mitigation of the spread of the disease. Similar findings were reported in previous findings [4,6,8]. Nevertheless, the awareness of free HCT centers did not translate into HIV testing among respondents which is in congruence with findings from previous studies [4,6,8,9]. Less than half (47.06%) of respondents have ever taken the HIV test. The two main barriers to the patronage of the free HCT among study respondents were complaints of lack of confidentiality of test results by health officials and the fear of stigmatization when test results turn out to be positive. Similar barriers to the promotion of free HCT were also reported in a previous study [9]. It was soothing, however, to know that the majority (70.11%) of respondents who have ever taken the HIV test in the past did so voluntarily rather than by order of a health officer. The desire to know once HIV status was also reported as the main drive for HIV testing in a related study in Ghana [20]. Voluntary counseling and testing are vital components of the national HIV control program.

Personal evaluation of the risk of HIV infection especially among the sexually active promotes behavioral changes that prevent infection and serve as a motivation to patronize free HCT

[3,21,22]. The perception of risk of HIV infection in the study population was unfortunately low (47.83%) especially among males (42.35%) even though the majority (75.85%) were sexually active. This low perception of HIV infection may explain why close to half of the respondents do not practice safe sex nor access the free HCT. Our results are in congruence with previous studies that reported a low perception of the risk of HIV infection among young adults that translated into high-risk behavior and low patronage HIV counseling and testing in Ghana [21–25].

Our analysis of the association of sociodemographic characteristics of respondents with their knowledge of HIV/AIDS only showed a significant relation (X^2=15.53, *P*=0.00) between the marital status of participants and their HIV/AIDS knowledge. Similar findings were reported previously [6]. A plausible explanation of the association may be the intensification of HIV/AIDS awareness campaigns across the country and the inclusion of HIV/AIDS education in marriage guidance and counseling sessions in churches and mosques.

Several patterns of association were observed between respondents' self-reported attitudes and their HIV testing behavior. Our results revealed a significant association between HIV testing and study participants' awareness of free voluntary HCT provisions in health centers, perception of HIV infection risk, and their readiness to access HCT. Previous studies reported similar findings [6,7]. However, in contrast to our findings and the findings of Asante [6], Djan [7] also reported an association between HIV testing and knowledge about HIV. A plausible explanation for the lack of association between HIV/AIDS knowledge and HIV testing may be the complacency that has unfortunately bedeviled the successes Ghana has gained over the years in the management of HIV/AIDS in Ghana.

5. Conclusion

Our results highlight the high level of HIV/AIDS knowledge among young adults in Ghana. Sadly, the results also reveal that this knowledge is not translated into behavioral change or the patronage of free HCT which are important measures against the impact of the pandemic in the country. Despite the high level of sexual activity among students in tertiary institutions, safe sex is poorly practiced with a significantly high false perception of invulnerability to HIV infection. Fear of stigmatization and mistrust of health workers with HIV test results have negatively impacted on patronage of free voluntary HIV counseling and testing even though education on

the significance of this control measure is high. Our results emphasize the the need to intensify youth HIV/AIDS education, emphasizing the significance of regular HIV tests for sexually active persons and the use of protection during casual sex.

Consent and ethical considerations

Ethical review and approval for this study were sought from the School of Medicine and Health Sciences and School of Allied Health Sciences Joint Institutional Review Board (SMHS-SAHS JIRB) of the University for Development Studies. Data collection only commenced after ethical clearance was obtained. Before the data collection process, written permission was acquired from the administration of the two institutions and the Municipal Education Office. Verbal informed consent was first sought from each respondent after which a signed consent was obtained before enrollment.

References

[1] UNAIDS. Global HIV & AIDS statistics - Fact sheet 2021. https://www.unaids.org/en/resources/fact-sheet

[2] Kharsany ABM, Karim QA. HIV Infection and AIDS in Sub-Saharan Africa: Current Status, Challenges and Opportunities. Open AIDS J. 2016;10:34–48.

[3] Abubakari GMR, Turner DA, Ni Z, Conserve DF, Dada D, Otchere A, et al. Community-Based Interventions as Opportunities to Increase HIV Self-Testing and Linkage to Care Among Men Who Have Sex With Men – Lessons From Ghana, West Africa. Front Public Heal. 2021;9:1–6.

[4] Asare BYA, Yeboaa HY, Dwumfour-Asare B. Acceptance and utilization of HIV testing among the youth: A cross-sectional study in Techiman, Ghana. Afr Health Sci. 2020;20:142–9.

[5] Adam A, Fusheini A, Ayanore MA, Amuna N, Agbozo F, Kugbey N, et al. HIV stigma and status disclosure in three municipalities in Ghana. Ann Glob Heal. 2021;87:1–12.

[6] Asante KO. HIV / AIDS knowledge and uptake of HIV counselling and testing among undergraduate private university students in Accra , Ghana. Reproductive Health. 2013:1–8.

[7] Djan D. Factors Affecting the Attitude of Young People towards HIV Testing Uptake in

Rural Ghana. J HIV Retro Virus. 2018;04:10–5.

[8] Oppong Asante K, Oti-Boadi M. HIV/AIDS knowledge among undergraduate university students: Implications for health education programs in Ghana. Afr Health Sci. 2013;13:270–7.

[9] Agamlor E, Pencille L, Lutala P, Akoku DA, Tarkang E. Uptake of hiv testing and counseling among tertiary institution students in the hohoe municipality, ghana. J Public Health Africa. 2019;10:95–100.

[10] Ali H, Amoyaw F, Baden D, Durand L, Bronson M, Kim A, et al. Ghana's HIV epidemic and PEPFAR's contribution towards epidemic control. Ghana Med J. 2019;53:59–62.

[11] Ghana AIDS Commission. GHANA'S HIV FACT SHEET. 2019. https://www.ghanaids.gov.gh/pages/fact-sheets-reports

[12] Ghana Statistical Service. FACT SHEET 2019. https://www.ghanaids.gov.gh/mcadmin/Uploads/2019.

[13] Ghana Statistical Service. 2010 Population and Housing Census. District Analytical Report: Tamale Metropolis. 2014. https://www2.statsghana.gov.gh/docfiles/2010_District_Report/Northern/Tamale

[14] Stephanie Ellen. Slovin's Formula Sampling Techniques. Sciencing n.d. https://sciencing.com/slovins-formula-sampling-techniques-5475547.html

[15] Agyemang S. The extent of knowledge about HIV/AIDS among young people in the Ejura-Sekyedumase district of Ghana. J AIDS HIV Res. 2012;4:241–7.

[16] Kenu E, Obo-Akwa A, Nuamah GB, Brefo A, Sam M, Lartey M. Knowledge and disclosure of HIV status among adolescents and young adults attending an adolescent HIV clinic in Accra, Ghana. BMC Res Notes. 2014;7:1–6.

[17] Fauk NK, Hawke K, Mwanri L, Ward PR. Stigma and discrimination towards people living with hiv in the context of families, communities, and healthcare settings: A qualitative study in indonesia. Int J Environ Res Public Health. 2021;18.

[18] Fauk NK, Ward PR, Hawke K, Mwanri L. HIV Stigma and Discrimination: Perspectives and Personal Experiences of Healthcare Providers in Yogyakarta and Belu, Indonesia. Front Med. 2021;8:1–11.

[19] Amo-Adjei J, Darteh EKM. Drivers of young people's attitudes towards HIV/AIDS stigma and discrimination: evidence from Ghana. Afr J Reprod Health. 2013;17:51–9.

[20] Apanga PA, Akparibo R, Awoonor-Williams JK. Factors influencing uptake of voluntary

counselling and testing services for HIV/AIDS in the Lower Manya Krobo Municipality (LMKM) in the Eastern Region of Ghana: A cross-sectional household survey. J Heal Popul Nutr. 2015;33:1–7.

[21] Sheppard Z, Madise N, Hennink M. Gender and risk of HIV in Ghana and Uganda 2001:1–20. https://healtheducationresources.unesco.org/sites/default/files/resources.

[22] Afriyie J, Essilfie ME. Association between risky sexual behaviour and HIV risk perception among in-school adolescents in a municipality in Ghana. Ghana Med J. 2019;53:29–36.

[23] Darteh EKM, Kumi-Kyereme A, Awusabo-Asare K. Perception of risk of HIV among adolescents' living in an Urban Slum in Ghana. Afr J Reprod Health. 2016;20:62–70.

[24] Ganle JK, Tagoe-Darko E, Mensah CM. Youth, HIV/AIDS risks and sexuality in contemporary Ghana: examining the gap between awareness and behaviour change. Int J Humanit Soc Sci 2012;2:88–99.

[25] Yawson AE, Appiah LK, Yawson AO, Bonsu G, Aluze-Ele S, Owusu Amanhyia NAK, et al. Sex differences in perceived risk and testing experience of HIV in an urban fishing setting in Ghana. Int J Equity Health 2014;13:1–8.