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Morenike Oluwatoyin Folayan
Obafemi Awolowo University

Olakunle Oginni
Obafemi Awolowo University

Olanrewaju Ibikunle Ibigbami
Obafemi Awolowo University

Uma Philip
Total Health Empowerment and Development Initiative (THEDI)

Nserd Ntonoba Mfam
Federal University of Lafia

See next page for additional authors

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Authors

Morenike Oluwatoyin Folayan, Olakunle Oginni, Olanrewaju Ibikunle Ibigbami, Uma Philip, Nserd Ntonoba Mfam, Chinedu Mbam, Amos Ganyam, Agada A Salem, Christopher Osuji, Cory Bradley, Joanne Lusher, and Nadia Adjoa Sam-Agudu

Associations between mental health and HIV status among sexual minority and heterosexual adolescents in Nigeria

Morenike Oluwatoyin Folayan ¹, Olakunle Oginni,²
Olanrewaju Ibikunle Ibigbami ², Uma Philip,³ Nserd Ntonoba Mfam,⁴
Chinedu Mbam,³ Amos Ganyam,³ Agada A Salem,³ Christopher Osuji,³
Cory Bradley,⁵ Joanne Lusher,⁶ Nadia Adjoa Sam-Agudu^{7,8,9}

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For numbered affiliations see end of article.

Correspondence to
Professor Morenike Oluwatoyin Folayan;
toyinukpong@yahoo.co.uk

ABSTRACT

Background We aimed to determine associations between the mental health status of adolescents by self-reported sexual identity; and to determine associations between the mental health status of sexual minority adolescents living with and without HIV.

Methods This cross-sectional study collected data from Nigerians aged 13–19 years old using an online survey. We collected information on dependent (sexual identity) and independent (presence of depressive symptoms, generalised anxiety disorder, suicidal attempt/ideation, HIV status) study variables. A multivariate regression model determined associations between the dependent and independent variables. A second multivariate regression model was developed to establish associations between HIV status among sexual minority individuals and the dependent variables. All models were adjusted for age, sex assigned at birth and education level.

Results Among 1247 respondents living in Nigeria, 497 (39.9%) identified as sexual minority individuals. Compared with their heterosexual peers, sexual minority adolescents had significantly higher odds of reporting depressive symptoms (adjusted OR (AOR): 5.54; 95% CI: 4.10 to 7.47; $p < 0.001$), high general anxiety (AOR: 3.56; 95% CI: 2.64 to 4.79; $p < 0.001$) and history of suicidal attempt/ideation (AOR: 2.95; 95% CI: 2.20 to 3.94; $p < 0.001$). Sexual minority adolescents living with HIV had significantly higher odds of high general anxiety (AOR: 2.42; 95% CI: 1.21 to 4.84; $p = 0.013$), while those with unknown HIV status had significantly higher odds of depressive symptoms (AOR: 3.82, 95% CI: 2.78 to 5.27; $p < 0.001$), high general anxiety (AOR: 3.09; 95% CI: 2.29 to 4.17; $p < 0.001$) and suicidal attempt/ideation (AOR: 1.65; 95% CI: 1.22 to 2.24; $p = 0.001$).

Conclusion Sexual minority adolescents reported poorer mental health status than heterosexual adolescents. Although there was no significant difference in the mental health status of sexual minority adolescents living and not living with HIV, sexual minority adolescents with unknown HIV status reported worse mental health than their HIV-negative peers. Sexual minority adolescents in Nigeria need comprehensive rights-based care that improves access to mental health services, and those with unknown HIV status may need both HIV and mental health screening and care.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Sexual minority individuals have a higher risk of poor mental health outcomes when compared with heterosexual individuals.

WHAT THIS STUDY ADDS

⇒ Sexual minority adolescents in Nigeria also have a significantly higher risk of poor mental health compared with heterosexual adolescents.
⇒ Among sexual minority adolescents, HIV-positive status was associated with higher risk of anxiety, while unknown HIV status was associated with higher risk of depressive symptoms, anxiety and suicidal ideation.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Providers of adolescent health services in Nigeria need to prioritize and address the mental health needs of sexual minority individuals, especially those living with HIV and with unknown HIV status.

INTRODUCTION

Mental health is a major public health concern in Nigeria, and few studies have been conducted among populations most vulnerable to mental health challenges.¹ In parts of Nigeria, the prevalence of depressive symptoms, generalised anxiety and combined depression/generalised anxiety are 5.5%, 3.5% and 1.2%, respectively, and 20.9% of all cases of depressive symptoms have comorbidity with generalised anxiety.² The national prevalence of depressive symptoms among Nigerian adults was estimated at 3.1% and 1.1% for lifetime and 12-month periods, respectively; however similar data among adolescents in the general population is scarce.³

The prevalence of mental health disorders is higher among vulnerable and stigmatised populations in Nigeria. The prevalence

rates of depressive symptoms among people living with HIV attending outpatient clinics in Nigeria range from 23.1%⁴ to 39.6%.⁵ The prevalence of depressive symptoms was 16% among sexual minority undergraduate university students⁶ and range between 16.3%⁷ to 21.2%⁸ and 44.2%⁹ among adolescents in secondary school. The prevalence of general anxiety disorders among people living with HIV attending outpatient clinic was reported as 32.6%,⁵ 15.8% for men who have sex with men¹⁰ and 23% for adolescents.¹¹ Also, available studies report the prevalence of suicidal ideation among people living with HIV in Nigeria at 13.6%,¹² 30.5% for sexual minorities,¹³ and for adolescents, between 6.1%¹⁴ and 14.9%¹⁵.

Negative societal attitudes towards mental illness and limited access to mental healthcare increase the risk of poor mental health outcomes for persons with mental health problems in Nigeria. An estimated 80% of individuals with serious mental health needs in Nigeria cannot access care,¹⁶ and only 16.9% of people with a major depressive episode in 12 months access treatment.³ Access of sexual minority individuals to treatment may be poor, as prior experiences of social stigma resulting from homophobia, discrimination, family rejection, feelings of social isolation and victimisation, and human rights violations increase the risk of psychological distress and mental health problems.¹⁷ In addition, experienced social stigma and the criminalisation of same sex identity generate the perceptions of feeling unsafe, which in turn decrease willingness to seek support from general health facilities.^{18,19} This includes uptake of HIV prevention, testing and care services, thereby contributing to increased vulnerability to HIV infection.²⁰ The prevalence of HIV among sexual minorities in Nigeria is extremely high, ranging from 11% to 35% compared with 3.6% in the general population.²¹

In addition, psychological stress and mental health problems mediate the relationship between stress related to their minority status among sexual minority individuals (minority stress) and HIV risk,²² such as multiple and concurrent sexual partners.²³ The experience of chronic, intense social deprivation may also lead to the adoption of a range of behaviours and norms in an effort to create safe spaces without the fear of persecution. These norms include suppressing or concealing sexual identity and HIV status, resorting to social isolation and/or living a life disconnected from natal societies.^{24,25} The psychological stress resulting from the adoption of these survival behaviours, and attempts to comply with and adapt to societal standards, have effects on both mental and physical well-being.^{26,27}

A few studies have explored the mental health of sexual minority individuals in Nigeria or made such comparisons with heterosexual populations.^{19,22,28} No such studies have conducted these investigations exclusively with adolescent sexual minority individuals, neither has this been explored in the context of living with HIV. Understanding unique factors and/or vulnerabilities in the mental health status of adolescent sexual minority

individuals and their relationship to sexual health will be instrumental in the design and implementation of impactful differentiated HIV prevention and treatment services for this vulnerable population. Therefore, this study was designed to address this gap in research by comparing the mental health status of sexual minority versus heterosexual adolescents living in Nigeria, in the context of self-reported HIV-positive or HIV-negative status. The conceptual framework adopted for this analysis draws from the work of Sayce,²⁹ who argued that social exclusion resulting from experiences of stigma and discrimination offers a powerful explanation for mental illness in a population because of the material and non-material disadvantages resulting from these experiences.

We aimed to examine the relationship between the mental health status of adolescents, self-reported sexual identity and the sexual health outcome of HIV status. Specifically, we set out to determine associations between the mental health status of adolescents aged 13–19 years old by sexual identity, and the association between the mental health status of sexual minority adolescents living with and without HIV. It was hypothesised that the mental health (depression, general anxiety and suicidal attempt/ideation) status of adolescents who identified as sexual minority individuals would be less healthy than that of heterosexual adolescents, and that self-reported mental health status of sexual minority individuals living with HIV will be poorer in comparison with those reporting an HIV-negative status.

METHODS

Patient and public involvement

This study was conceived through collaborative efforts established between two local researchers (MOF and OO) and a non-governmental organisation (Total Health Empowerment and Development Initiative (THEDI)), to assess the need for evidence-based services targeting adolescent clients with a high prevalence of mental health diagnoses. THEDI provides health services to marginalised and vulnerable persons in Nigeria, including adolescent sexual minority individuals who identify as gay, lesbian and bisexual.³⁰

Study design, setting and population

This was a subanalysis of a larger dataset collected on the general, oral, mental and sexual health of adolescents and young adults in Nigeria. This cross-sectional study recruited participants using an online electronic survey (SurveyMonkey) disseminated by the study team and accessible to participants from 16 September to 31 October 2020. Participants aged 13 years and above were eligible to participate in the study. There were no other exclusion criteria. Data from respondents aged 13–19 years old were extracted for analysis. Individuals who provided written informed consent for study participation in line with the national ethics guidelines³¹ were

eligible to participate in the online survey and have their data included for analysis.

The online questionnaire was preceded by a brief introduction explaining the purpose of the study, assuring participants of the voluntary basis of participation and confidentiality of their data. The questionnaire took an average of 15 min to complete and was administered in English (English is the unifying national language in a country with over 525 languages). Each participant could complete a single questionnaire on their device only once, although they could edit their answers freely until they chose to submit.

Participant recruitment

The study adopted a respondent-driven sampling approach. Twenty-three THEDI peer educators and six additional study staff (UP, NNM, CM, AG, AAS and CO) shared the survey link with their networks of sexual minority and heterosexual individuals. These initial participants were encouraged to share the survey link with their contacts. The recruitment was also augmented with convenient sampling. The survey link was posted on social media (Facebook, Twitter and Instagram) and network email lists and WhatsApp groups. Data collection was supported by providing an open link in the office of the non-governmental organisation and that of its partners, to enable target populations with low literacy fill the study questionnaire with support from the peer educators.

Data variables included in the analysis

Sociodemographic variables

Age at last birthday (in years) and education level completed (no formal education, primary, secondary, university, postgraduate).

Independent variables

HIV status

The survey posed a single question on self-reported HIV status with responses including 'positive', 'negative', 'do not know' and 'prefer not to report'. Study participants who preferred not to report their HIV status were excluded from the study ($n=51$). For the logistic regression, participants who responded 'do not know' were included in the analysis as a discrete response category, as prior research has demonstrated that the profile of HIV-unknown respondents differs distinctly from that of HIV-negative and HIV-positive self-report respondents.³²

Sexual identity

Information on sexual identity (heterosexual, gay, lesbian, bisexual, prefer not to say) was extracted for this analysis. Sexual minority individuals are described here as participants who reported a sexual identity other than heterosexual. For this study, we clustered all types of sexual minorities into one, as they have similar mental health profile when compared with heterosexual individuals.³³

Dependent variables: mental health status

Depressive symptoms

The Patient Health Questionnaire is a nine-item questionnaire which scores each of the nine DSM-IV (The Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition) criteria for diagnosing depression.³³ Respondents indicate the severity of symptoms experienced in the preceding 2 weeks, from 0 (not at all) to 3 (nearly every day). Possible scores range from 0 to 27, with scores of 0–4 indicating no depressive symptoms, 5–9: mild depressive symptoms, 10–14: moderate depressive symptoms, 15–19: moderately severe depressive symptoms, and 20–27: severe depressive symptoms.³⁴ It has a 1-month test–retest reliability of 0.89 among young Nigerian adults.³⁵ For the regression analysis, the scores were collapsed into two categories: absence (0–4) or presence (5 and above) of depressive symptoms. For this study, the Cronbach's alpha was 0.93.

Generalised anxiety symptoms

The seven-item Generalised Anxiety Disorder-7 (GAD-7) scale was used to measure anxiety symptoms. The GAD-7 requires participants to rate how often they have been bothered by each of seven core anxiety symptoms, over the preceding 2 weeks. Response categories include 'not at all', 'several days', 'more than half the days' and 'nearly every day', scored as 0, 1, 2 and 3, respectively, with a total score ranging from 0 to 21. The recommended cut-off score of 10 or higher provides a sensitivity of 89% and a specificity of 82% to detect generalised anxiety disorder.³⁶ The scores were categorised into two: low (0–9) and high (10 and above) general anxiety. For this study, the Cronbach's alpha was 0.91.

Suicidal behaviour assessment

Here, we used the Suicide Behaviour Questionnaire-Revised (SBQ-R). This four-item tool evaluates the frequency of past, and likelihood of future suicidal thoughts and behaviours, with responses scored on Likert scales.^{37 38} The tool had a Cronbach's alpha of 0.75 among patients with mental disorders in an outpatient setting.³⁹ It has also been validated for use among undergraduate students in Nigeria (Cronbach's alpha 0.80).⁴⁰ For this study, the Cronbach's alpha was 0.84. Item 1 of the SBQ-R assessed lifetime suicide ideation or suicide attempts by asking respondents: 'Have you ever thought about or attempted to harm yourself?' Responses to this question were dichotomised to 'presence' or 'absence' of suicidal attempt/ideation.

Data analysis

Descriptive statistics were calculated as means and SDs or as frequencies and percentages. Two sets of multivariate regression models were developed. The first set was to determine the association between mental health status of adolescents 13–19 years old by sexual identity (heterosexual vs sexual minority); and the second was to determine the association between the mental health status of

sexual minority adolescents living with and without HIV, and with unknown HIV status.

In the first multivariate regression analyses, the independent variable was sexual identity (sexual minority adolescents compared with heterosexual adolescents) and the dependent variables were the presence of depressive symptoms, high generalised anxiety, a history of suicidal attempt/ideation (included in three separate logistic regression models). The second set of multivariate regression analyses included data from only sexual minority individuals. The independent variable was the HIV status of sexual minority individuals, while the outcome variables were presence of depressive symptoms, high generalised anxiety and a history of suicidal attempt/ideation included in three separate logistic regression models. The models were adjusted for age, sex assigned at birth and education level. ORs/regression coefficients and their 95% CIs were calculated. Exploratory analyses were conducted by repeating the second set of multivariate logistic regressions among heterosexual participants only. IBM SPSS software V.23 was used for statistical analysis. Significance was set at 5%.

RESULTS

Complete data from 1247 adolescent participants were extracted for analysis. The mean age of study participants was 17.10 (± 1.61) years. In this cohort, 750 (60.1%) respondents identified as heterosexual, and 497 (39.9%) identified as sexual minority individuals, with 116 (23.3%), 293 (59.0%) and 88 (17.7%) of this subgroup identifying as lesbian, gay and bisexual, respectively. A total of 691 (55.4%) participants reported mild depressive symptoms, 338 (27.1%) reported high levels of general anxiety and 309 (24.8%) indicated a history of suicidal attempt/ideation (table 1). There were 41 participants (3.3%) who self-reported as HIV positive.

Compared with those with no formal education, adolescents who had completed primary education had significantly lower odds of high general anxiety (adjusted OR (AOR): 0.39, 95% CI: 0.17 to 0.91; $p=0.029$) and suicidal attempt/ideation (AOR: 0.28, 95% CI: 1.13 to 0.64, $p=0.002$); similarly, those with tertiary education also had significantly lower odds of high general anxiety (AOR: 0.23, 95% CI: 0.12 to 0.45; $p<0.001$) and suicidal attempt/ideation (AOR 0.22; 95% CI: 0.12 to 0.40, $p<0.001$), but not depressive symptoms.

As shown in table 1, compared with their heterosexual peers, sexual minority individuals had significantly higher odds of depressive symptoms (AOR: 5.54, 95% CI: 4.10 to 7.47, $p<0.001$), high general anxiety (AOR: 3.56, 95% CI: 2.64 to 4.79, $p<0.001$) and history of suicidal attempt/ideation (AOR: 2.95, 95% CI: 2.20 to 3.94, $p<0.001$). In the overall cohort, self-reported HIV-positive status among adolescents was associated with increased odds of high general anxiety (AOR: 2.42; 95% CI: 1.21 to 4.84; $p=0.013$), but not depression or suicidal attempt/ideation. Adolescents reporting an unknown HIV status

was associated with significantly higher odds of depressive symptoms (AOR: 3.82, 95% CI: 2.78 to 5.27, $p<0.001$), high general anxiety (AOR: 3.09, 95% CI: 2.29 to 4.17, $p<0.001$) and a history of suicidal attempt/ideation (AOR: 1.65, 95% CI: 1.22 to 2.24, $p=0.001$).

Table 2 shows factors associated with depression, general anxiety and suicidal attempt/ideation among respondents who identified as sexual minority individuals. Having an unknown HIV status was associated with significantly higher odds of experiencing depressive symptoms (AOR: 3.11, 95% CI: 1.76 to 5.49, $p<0.001$) and high general anxiety (AOR: 2.32, 95% CI: 1.55 to 3.48, $p<0.001$). Compared with having no formal education, receiving tertiary education was associated with significantly lower odds of experiencing depressive symptoms (AOR: 0.12, 95% CI: 0.04 to 0.40, $p=0.001$), high general anxiety (AOR: 0.18, 95% CI: 0.08 to 0.41, $p<0.001$) and suicidal attempt/ideation (AOR: 0.16, 95% CI: 0.07 to 0.37, $p<0.001$). Receiving primary education (vs no formal education) was associated with significantly lower odds of high general anxiety (AOR: 0.27, 95% CI: 0.09 to 0.83, $p=0.023$); those with secondary education had lower odds of suicidal attempt/ideation (AOR: 0.21, 95% CI: 0.11 to 0.40, $p<0.001$).

Exploratory analyses among heterosexual participants showed that, like sexual minority individuals, unknown HIV status was associated with an increased likelihood of reporting depressive and anxiety symptoms and self-harm/suicidal ideation in this study. The adjusted ORs were comparable in these latter multivariate models among heterosexual and sexual minority participants, though these were relatively larger in sexual minority individuals (see online supplemental table 1).

DISCUSSION

Our findings showed that when compared with heterosexual peers, sexual minority adolescents had significantly higher odds of reporting depressive symptoms, high general anxiety and history of suicidal ideation. Among sexual minority adolescents, those with unknown HIV status had significantly higher odds of reporting depressive symptoms and generalised anxiety disorder. These findings partially support the hypotheses.

Findings should be interpreted in light of the study limitations. First, the online data collection process introduces selection bias, as access to the internet varies widely by socioeconomic status and geographical location. This bias increases the risk of recruiting a sample of respondents skewed to those who have higher education and/or have access to internet-enabled smartphones. In addition, the use of non-probability sampling techniques—convenient and respondent-driven sampling—which have a high degree of bias, makes it difficult to draw statistically significant conclusions from study results. The combination of a convenient and respondent-driven sampling method, however, helped to obtain a more effective sample.⁴¹ In addition, the use of non-probability



Table 1 Multivariate logistic regression analysis to determine association between sexual orientation, HIV status, mental health status of adolescents 13–19 years old in Nigeria (N=1247)

Variables	Total n (%)	Depressive symptoms		AOR (95% CI) P value		High general anxiety		AOR (95% CI) P value		Suicidal ideation		AOR (95% CI) P value	
		Yes n (%)	No n (%)	Yes n (%)	No n (%)	Yes n (%)	No n (%)	Yes n (%)	No n (%)	Yes n (%)	No n (%)	Yes n (%)	No n (%)
Sexual orientation													
Heterosexual	750 (60.1)	292 (38.9)	458 (61.1)	1.00	1.00	115 (15.3)	635 (84.7)	1.00	1.00	111 (14.8)	639 (85.2)	1.00	1.00
Sexual minority*	497 (39.9)	399 (80.3)	98 (19.7)	5.54 (4.10 to 7.47) <0.001	5.54 (4.10 to 7.47) <0.001	223 (44.9)	274 (55.1)	3.56 (2.64 to 4.79) <0.001	3.56 (2.64 to 4.79) <0.001	198 (39.8)	299 (60.2)	2.95 (2.20 to 3.94) <0.001	2.95 (2.20 to 3.94) <0.001
HIV status													
Negative	795 (63.8)	332 (80.8)	79 (19.2)	1.00	1.00	195 (47.4)	216 (52.6)	1.00	1.00	149 (18.7)	646 (81.3)	1.00	1.00
Positive	41 (3.3)	29 (70.7)	12 (29.3)	1.81 (0.85 to 3.88) 0.125	1.81 (0.85 to 3.88) 0.125	17 (41.5)	24 (58.5)	2.42 (1.21 to 4.84) 0.013	2.42 (1.21 to 4.84) 0.013	12 (29.3)	29 (70.7)	1.15 (0.56 to 2.36) 0.712	1.15 (0.56 to 2.36) 0.712
Unknown	411 (33.0)	330 (41.5)	465 (58.5)	3.82 (2.78 to 5.27) <0.001	3.82 (2.78 to 5.27) <0.001	126 (15.8)	669 (84.2)	3.09 (2.29 to 4.17) <0.001	3.09 (2.29 to 4.17) <0.001	148 (36.0)	263 (64.0)	1.65 (1.22 to 2.24) 0.001	1.65 (1.22 to 2.24) 0.001
Age in years (mean (SD))	17.10 (1.61)	16.95 (1.79)	17.30 (1.32)	1.01 (0.92 to 1.11) 0.846	1.01 (0.92 to 1.11) 0.846	16.87 (1.83)	17.19 (1.51)	0.95 (0.87 to 1.04) 0.246	0.95 (0.87 to 1.04) 0.246	17.14 (1.58)	17.09 (1.62)	1.05 (0.96 to 1.15) 0.322	1.05 (0.96 to 1.15) 0.322
Educational status													
No formal education	76 (6.1)	61 (80.3)	15 (19.7)	1.00	1.00	42 (55.3)	34 (44.7)	1.00	1.00	48 (63.2)	28 (36.8)	1.00	1.00
Primary education	61 (4.9)	41 (67.2)	20 (32.8)	1.43 (0.58 to 3.53) 0.439	1.43 (0.58 to 3.53) 0.439	12 (19.7)	49 (80.3)	0.39 (0.17 to 0.91) 0.029	0.39 (0.17 to 0.91) 0.029	13 (21.3)	48 (78.7)	0.28 (1.13 to 0.64) 0.002	0.28 (1.13 to 0.64) 0.002
Secondary education	796 (63.8)	513 (64.4)	283 (35.6)	1.09 (0.55 to 2.16) 0.814	1.09 (0.55 to 2.16) 0.814	259 (32.5)	537 (67.5)	0.82 (0.48 to 1.40) 0.462	0.82 (0.48 to 1.40) 0.462	198 (24.9)	598 (75.1)	0.30 (0.18 to 0.50) <0.001	0.30 (0.18 to 0.50) <0.001
Tertiary education	314 (25.2)	76 (24.2)	238 (75.8)	0.25 (0.12 to 0.52) <0.001	0.25 (0.12 to 0.52) <0.001	25 (8.0)	289 (92.0)	0.23 (0.12 to 0.45) <0.001	0.23 (0.12 to 0.45) <0.001	50 (15.9)	264 (84.1)	0.22 (0.12 to 0.40) <0.001	0.22 (0.12 to 0.40) <0.001
Cox & Snell R ²				0.292	0.292			0.195	0.195			0.110	0.110
Nagelkerke R ²				0.391	0.391			0.282	0.282			0.164	0.164
Omnibus test of model coefficients				430.50	430.50			269.87	269.87			145.71	145.71
Hosmer-Lemeshow test				22.28	22.28			11.00	11.00			3.57	3.57

*Out of 497 participants identifying as sexual minority individuals, 116 (23.3%) were lesbian, 293 (59.0%) were gay and 88 (17.7%) were bisexual. AOR, adjusted OR.

Table 2 Multivariate logistic regression analysis to determine association between HIV status and mental health status among sexual minority adolescents 13–19 years old in Nigeria (N=497)

Variables	Total n (%)	Depressive symptoms		AOR (95% CI) P value	High general anxiety		AOR (95% CI) P value	Suicidal ideation		AOR (95% CI) P value
		Yes n (%)	No n (%)		Yes n (%)	No n (%)		Yes n (%)	No n (%)	
HIV status										
HIV negative	246 (49.5)	174 (70.7)	72 (29.3)	1.00	79 (32.1)	167 (67.9)	1.00	77 (31.3)	169 (68.7)	1.00
HIV positive	29 (5.8)	24 (82.8)	5 (17.2)	2.25 (0.78 to 6.48) 0.132	14 (48.3)	15 (51.7)	2.09 (0.93 to 4.69) 0.073	12 (41.4)	17 (58.6)	1.47 (0.66 to 3.28) 0.352
Unknown HIV status	222 (44.7)	201 (90.5)	21 (9.5)	3.11 (1.76 to 5.49) <0.001	130 (58.6)	92 (41.4)	2.32 (1.55 to 3.48) <0.001	109 (49.1)	113 (50.9)	1.47 (0.98 to 2.22) 0.064
Age in years, mean (SD)	17.10 (1.61)	17.32 (1.62)	17.44 (1.29)	1.16 (0.98 to 1.37) 0.093	17.15 (1.70)	17.49 (1.41)	0.95 (0.84 to 1.08) 0.459	17.08 (1.65)	17.51 (1.47)	0.90 (0.79 to 1.02) 0.090
Educational status										
No formal education	59 (11.9)	55 (93.2)	4 (6.8)	1.00	40 (67.8)	19 (32.2)	1.00	45 (76.3)	14 (23.7)	1.00
Primary education	20 (4.0)	18 (90.0)	2 (10.0)	1.07 (0.17 to 6.63) 0.939	6 (30.0)	14 (70.0)	0.27 (0.09 to 0.83) 0.023	11 (55.0)	9 (45.0)	0.43 (0.15 to 1.29) 0.132
Secondary education	336 (67.6)	283 (84.2)	53 (15.8)	0.58 (1.19 to 1.76) 0.340	162 (48.2)	174 (51.8)	0.62 (0.34 to 1.15) 0.131	120 (35.7)	216 (64.3)	0.21 (0.11 to 0.40) <0.001
Tertiary education	82 (16.5)	43 (52.4)	39 (47.6)	0.12 (0.04 to 0.40) 0.001	15 (18.3)	67 (81.7)	0.18 (0.08 to 0.41) <0.001	22 (26.8)	60 (73.2)	0.16 (0.07 to 0.37) <0.001
Cox & Snell R ²			0.121	–		0.115	–		0.096	–
Nagelkerke R ²			0.192	–		0.154	–		0.130	–
Omnibus test of model coefficients			64.00	<0.001		60.68	<0.001		50.04	<0.001
Hosmer-Lemeshow test			9.36	0.313		9.69	0.288		7.13	0.523
AOR, adjusted OR.										

sampling allows respondents to participate in a survey that they are interested in and comfortable answering questions to.^{42–43} Furthermore, this cross-sectional study does not reflect context-related changes in mental health status of study participants. There is also the risk of receiving socially desirable responses on questions about HIV status and sexual identity among respondents in unsupportive environments like Nigeria. The study, however, included a sample of participants drawn from all the states in Nigeria thereby ensuring that the findings are nationally representative.

Our study is likely the first to report on the mental health status of adolescents in Nigeria in the context of sexual minority and HIV status. Much of the prior research on the mental health of adolescent sexual minority individuals has focused on high-income countries outside Africa.^{44–47} To date, the few studies on the mental health of sexual minority individuals in Africa have been conducted largely among adults, with a focus on men who have sex with men^{48–53}. A paucity of African studies have focused on adolescent sexual minority individuals.^{54–56}

In our cohort of adolescents living in Nigeria, approximately one-third identified as sexual minority individuals. While this estimate may be exaggerated from participant sampling and the self-report method, there are no data available on the proportion of sexual minority individuals in Nigeria that may otherwise help with the weighting of these data. Nevertheless, this outcome further compels attention to the mental health needs and protection of the human rights of this population. Moreover, the findings indicate that sexual minority adolescents have an increased risk of experiencing mental health distress (presence of depressive symptoms, high general anxiety and a history of suicidal attempt/ideation) when compared with their heterosexual counterparts.

Furthermore, previous studies have indicated that sexual minority adolescents are almost three times more likely to report suicidal ideation and depressive symptoms compared with their heterosexual counterparts.⁵⁷ Our results are in line with prior evidence. The current cohort of sexual minority adolescents in this study had almost three times greater odds of suicidal attempt/ideation, which is more than three times higher odds of general anxiety and more

than five times higher odds of having depressive symptoms, when compared with their heterosexual counterparts. Mental health disorders can emerge early in adolescence and persist into adulthood if unaddressed, leading to disability-adjusted life years lost.¹⁷

The risk of mental health problems among sexual minority adolescents in Nigeria may not only be due to the minority stress they experience,¹⁹ but also social exclusion (restriction in full participation in economic, social, political and cultural life⁵⁸) by the criminalisation of sexual minority individuals through the enacted 2013 Same Sex Marriage (Prohibition) Act. Though the Act is framed to discourage same-sex marriage, it is often used to justify unfair prosecution and harassment of sexual minorities in Nigeria. The ubiquitous application of the Act represents a stark exemplar of the cultural and political institutionalisation of such exclusion, which perpetuates barriers to sexual minority individuals accessing social, health and other relational and asset-based support in their communities.⁵⁹ In addition, limitations in access to healthcare services due to parental consent requirements further complicate issues for sexual minority adolescents.^{56–60–62}

The present study also assessed the mental health of adolescents identifying as a sexual minority relative to their self-reported HIV status as an indicator of their sexual health. Interestingly, sexual minority adolescents self-reporting HIV-positive status were not any different from their heterosexual peers with regard to depression, anxiety and suicidal ideation. On the other hand, self-reporting an unknown HIV status was associated with the presence of depressive symptoms and increased odds of high general anxiety, when compared with seronegative peers. These results may suggest that in addition to the mental distress associated with their sexual identity, adolescents in Nigeria who identify as sexual minority individuals incur another layer of mental distress related to uncertainty about their HIV status.

Several considerations may explain the relationship between unknown HIV status and mental health status among sexual minority adolescents. One consideration is that some sexual minority adolescents may have preferred responding 'unknown' to avoid disclosing their (possibly positive) HIV status. In a different account, it may be that Nigerian adolescents with a marginalised sexual identity experience depression and anxiety to an extent that it disrupts their uptake of HIV testing and other sexual health services, in addition to the restrictions that real or perceived stigma and discrimination the health system imposes. Regardless, given our findings and that of prior studies, sexual minority-inclusive health communication messaging and mental health interventions should be incorporated into adolescent health services, to maximise opportunities to achieve and maintain optimal sexual and mental health among sexual minority Nigerian adolescents.

Additionally, we found that adolescents with higher educational status (compared with no formal education) had lower odds of reporting mental health challenges. Prior studies have associated higher educational status with

better mental health, by way of having a greater sense of agency, increased opportunities for upward mobilisation and fuller integration into society (as opposed to social exclusion).⁶³ This suggests that access to opportunities for educational advancement may mitigate mental health distress for adolescents in Nigeria and may have an even higher impact on mental health for sexual minority adolescents. Nigeria has one of the highest rates of out-of-school children globally. One in every five of the world's out-of-school children is in Nigeria, and only 61% of children aged 6–11 years old regularly attend primary school.⁶⁴ The proportion of out-of-school children increases from primary to tertiary level—only 44.9% of the ≥25-year-old population completed secondary school and 17.3% completed post-secondary education.⁶⁵ Thus, interventions at the level of improving educational attainment present a formidable task and opportunity for improving the mental health of all Nigerian adolescents, including those who identify as sexual minority individuals.

CONCLUSION

The conditions of social exclusion, stigma and violations of the human rights of sexual minority individuals in Nigerian society are not benign, and are consequential to individual well-being, and by extension, the well-being of Nigerian communities. Without the scale up of comprehensive interventions to address the mental health needs of adolescents in Nigeria—including increased opportunities for education, availability of trained providers and integrated, rights-based sexual and mental health services—, high-risk adolescents transitioning into adulthood may be more likely to experience both physical and sexual health problems resulting from unaddressed mental health challenges.

Author affiliations

- ¹Department of Child Dental Health, Obafemi Awolowo University, Ile-Ife, Nigeria
- ²Department of Mental Health, Obafemi Awolowo University, Ile-Ife, Nigeria
- ³Total Health Empowerment and Development Initiative (THEDI), Makurdi, Nigeria
- ⁴Department of Epidemiology and Community Medicine, Federal University of Lafia, Lafia, Nigeria
- ⁵Department of Medicine, Washington University School of Medicine in St Louis, St Louis, Missouri, USA
- ⁶Regent's University London, London, UK
- ⁷International Research Center of Excellence, Institute of Human Virology Nigeria, Abuja, Nigeria
- ⁸University of Maryland School of Medicine, Institute of Human Virology, Baltimore, Maryland, USA
- ⁹Department of Paediatrics and Child Health, University of Cape Coast School of Medical Sciences, Cape Coast, Ghana

Twitter Olanrewaju Ibikunle Ibigbami @lanrebigbami, Cory Bradley @1stludv and Nadia Adjoa Sam-Agudu @NASAdoc

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Contributors UP, NNM, CM, AG, AAS and CO conceived the idea of the study. MOF, OO, UP, NNM, CM, AG, AAS and CO designed and implemented the study. OII analysed the data. MOF wrote the first draft of the manuscript. MOF, OO, UP, NNM, CM, AG, AAS, CO, OII, CB, JL and NAS-A read the draft manuscript and made inputs prior to the final draft. All authors approved the final manuscript for submission.

MOF accepts full responsibility for the work and/or the conduct of the study, had access to the data, and controlled the decision to publish.

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Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

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Ethics approval Ethical approval was obtained from the Health Research Ethics Committee of the Institute of Public Health at Obafemi Awolowo University in Ile-Ife, Nigeria (PHOAU/12/1571). There was a waiver of parental consent for adolescents 13–17 years old in view of the sensitivity to the issues of sexual identity in Nigeria and the non-intrusive nature of the study in line with the national guidelines on sexual and reproductive health research conduct with adolescents. Participants were required to provide informed consent by checking a box to indicate their consent to participate in the study prior to completing the online questionnaire. Those who indicated they were not willing to continue with the survey after reading the information sheet were exited from the survey and thanked for their interest. All data were irrevocably anonymised. We took measures to prevent the unintended collection of internet protocol, the privacy of participants and the confidentiality of the information provided. Internet protocol addresses were instantly decoupled from the questionnaire, encrypted and deleted at the end of the online survey by the survey tool. The questionnaire did not install any tracker cookies on the device of the respondents. The study was made available to the target population through a secure, sockets layer encrypted connection link. Data in transit (while responding online) were encrypted using transport layer security cryptographic protocols. SurveyMonkey certified its compliance with the EU-US Privacy Shield Framework and Swiss-US Privacy Shield. Due to the anonymity given to participants and the IP addresses being decoupled and encrypted automatically during the time that the survey is online, there was no possibility to provide further direct information to participants after completion of the survey. All participants who completed the online survey were offered compensation for internet data of 100 naira, which is approximately US\$0.27. Those interested in receiving compensation were requested to provide their phone number. A research team member (UP) was designated to upload these phone numbers with the internet data and thereafter, immediately destroy the phone numbers.

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ORCID iDs

Morenike Oluwatoyin Folayan <http://orcid.org/0000-0002-9008-7730>
Olanrewaju Ibikunle Ibigbami <http://orcid.org/0000-0003-0234-4651>

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Table S1 shows factors associated with depression, general anxiety and suicidal attempt/ideation among respondents who identified as heterosexual individuals only. Having an unknown HIV status was associated with significantly higher odds of experiencing depressive symptoms (AOR: 3.92, 95% CI: 2.66-5.78, $p<0.001$), high general anxiety (AOR: 4.16, 95% CI: 2.63-6.56, $p<0.001$) and suicidal attempts/ideation (AOR: 2.06, 95% CI: 1.28-3.30, $p=0.003$). Being older was also associated with higher odds of experiencing suicidal ideations/attempts (AOR: 1.30, 95% CI: 1.11-1.52, $p=0.001$).

Table S1: Multivariate logistic regression analysis to determine association between HIV status and mental health status among 13-19 year-old adolescents in Nigeria (heterosexuals alone - N=750)

Variables	Total n (%)	Depressive symptoms		AOR (95% CI) <i>p</i> value	High general anxiety		AOR (95% CI) <i>p</i> value	Suicidal ideation		AOR (95% CI) <i>p</i> value
		Yes n (%)	No n (%)		Yes n (%)	No n (%)		Yes n (%)	No n (%)	
HIV status										
HIV negative	549 (73.2)	156 (28.4)	393 (71.6)	1.00	47 (8.6)	502 (91.4)	1.00	72 (13.1)	477 (86.9)	1.00
HIV positive	12 (1.6)	5 (41.7)	7 (58.3)	1.46 (0.44-4.87) 0.534	3 (25.0)	9 (75.0)	3.12 (0.80-12.28) 0.103	0 (0)	12 (100)	0.00 (0.00-0.00) 0.999
Unknown HIV status	189 (25.2)	131 (69.3)	58 (30.7)	3.92 (2.66-5.78) <0.001	65 (34.4)	124 (65.6)	4.16 (2.63-6.56) <0.001	39 (20.6)	150 (79.4)	2.06 (1.28-3.30) 0.003
Age in years mean (SD)	17.10 (1.61)	16.45 (1.90)	17.27 (1.32)	0.96 (0.85-1.07) 0.436	16.33 (1.94)	17.06 (1.53)	0.97 (0.84-1.11) 0.612	17.25 (1.42)	16.89 (1.65)	1.30 (1.11-1.52) 0.001
Educational status										

No formal education	17 (2.3)	6 (35.3)	11 (64.7)	1.00	2 (11.8)	15 (88.2)	1.00	3 (17.6)	14 (82.4)	1.00
Primary education	41 (5.5)	23 (56.1)	18 (43.9)	1.89 (0.54-6.55) 0.318	6 (14.6)	35 (85.4)	0.99 (0.17-5.86) 0.989	2 (4.9)	39 (95.1)	0.33 (0.05-2.27) 0.259
Secondary education	460 (61.3)	230 (50.0)	230 (50.0)	1.70 (0.59-4.91) 0.324	97 (21.1)	363 (78.9)	1.87 (0.40-8.68) 0.427	78 (17.0)	382 (83.0)	0.84 (0.23-3.07) 0.793
Tertiary education	232 (30.9)	33 (14.2)	199 (85.8)	0.41 (0.14-1.26) 0.120	10 (4.3)	222 (95.7)	0.52 (0.10-2.73) 0.438	28 (12.1)	204 (87.9)	0.49 (0.13-1.90) 0.304
Cox & Snell R²			0.187	-		0.106	-		0.036	-
Nagelkerke R²			0.253	-		0.184	-		0.063	-
Omnibus test of model coefficients			154.81	<0.001		83.83	<0.001		27.34	<0.001
Hosmer Lemeshow test			34.45	<0.001		18.43	0.010		8.78	0.269