

RESEARCH ARTICLE

Comprehensive HIV/AIDS knowledge and safer sex negotiation among adolescent girls and young women in sub-Saharan Africa

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Abstract

Globally, HIV/AIDS remains a public health issue, especially in sub-Saharan Africa (SSA). Despite the increased advocacy and dissemination of comprehensive HIV/AIDS information in SSA, it appears that little progress has been made to reduce the incidence of HIV/AIDS in the sub-region. This study, therefore, examined the association between comprehensive HIV/AIDS knowledge and safer sex negotiation among adolescent girls and young women in SSA. Data were taken from the Demographic and Health Surveys conducted between 2010 and 2019 in 30 countries in SSA. The study sample comprised 37,364 adolescent girls and young women aged 15–24. A multivariable binary logistic regression analysis was done to test the hypothesis that there is a positive association between comprehensive HIV/AIDS knowledge and safer sex negotiation. Adolescent girls and young women who had comprehensive knowledge on HIV/AIDS were more likely to negotiate for safer sex compared with those who had no comprehensive knowledge on HIV/AIDS (AOR=1.31, 95% CI: 1.22–1.41). At the country level, the positive association between comprehensive knowledge on HIV/AIDS and safer sex negotiation was significant in Chad, Congo DR, Gambia, Guinea, Liberia, Ethiopia and Malawi. On the other hand, in Togo, adolescent girls and young women who had comprehensive HIV/AIDS knowledge were less likely to negotiate for safer sex. These findings can inform policies and programmes on the crucial role of comprehensive HIV/AIDS education and knowledge in increasing safer sex negotiation among adolescent girls and young women in SSA. The study recommends that Togo needs to address certain practices such as intimate partner violence against adolescent girls and young women, which prevent them from negotiating for safer sex, despite their higher knowledge on comprehensive HIV/AIDS. Lessons can be learnt from Chad, Congo DR, Gambia, Guinea, Liberia, Ethiopia and Malawi about the scale-up of programmes and interventions targeted at young women.

Keywords: Comprehensive HIV/AIDS knowledge; Safer sex negotiation; Adolescent girls and young women

Introduction

HIV/AIDS remains a public health concern in sub-Saharan Africa (SSA) (World Health Organization [WHO], 2018). Global statistics reveal that approximately 37 million people were infected with HIV in 2017, of which nearly 2 million were newly infected cases (WHO, 2018). To

further reduce the cases of HIV each year, efforts to improve comprehensive knowledge on HIV in various populations, especially the young and sexually active population, have been intensified, yet with little success (Badru *et al.*, 2020). Adolescent girls and young women (AGYW) in SSA are at higher risk of contracting HIV than their male peers as a result of early marriage, which predisposes them to HIV acquisition (Mavhu *et al.*, 2018). Hence, there is a need to focus health education and HIV prevention strategies on this vulnerable group (UNAIDS, 2016; Saul *et al.*, 2018).

Unprotected sex is among several factors that account for new HIV infections among AGYW (Wang *et al.*, 2012; Sathiyasuman, 2015; Mwale & Muula, 2018). Also, lack of comprehensive knowledge on HIV has been identified as one of the critical factors contributing to the surge in the incidence of new cases of HIV among AGYW (Siziya *et al.*, 2008; Darteh, 2020). Other factors, including mass media exposure and having attained a secondary or higher level of education, have been found to be predictors of comprehensive HIV knowledge among AGYW (Darteh, 2020). Comprehensive HIV knowledge is low among AGYW in Ghana, and is predicted by marital status, education, region and exposure to mass media (Darteh, 2020). However, a study in Malawi found a high level of comprehensive HIV knowledge among AGYW, depending on age, level of education, wealth index, mass media exposure and employment status (Mandiwa *et al.*, 2021).

In SSA, AGYW's ability to negotiate for safer sex has been a major problem associated with HIV incidence since men are regarded as being more influential and domineering when it comes to sexuality decision-making (Saul *et al.*, 2018; Darteh, 2020). In light of this, the Sustainable Development Goal (SDG) 5 focuses on gender equality to enhance AGYW's control in reproductive issues, attitudes and their overall ability to negotiate for safer sex with their male partners (Exavery *et al.*, 2012; Darteh *et al.*, 2019). In SSA, interventions such as comprehensive sex education, the promotion of condom use, Determined, Resilience, Empowered, AIDS-free, Mentored and Safe (DREAMS), among others, aim to enhance AGYW's control in reproductive issues and these efforts are making some progress (Saul *et al.*, 2018). Several socioeconomic and cultural factors, including place of residence, marital status, age and educational level, have been found to be associated with AGYW's ability to negotiate for safer sex (Exavery *et al.*, 2012; Darteh *et al.*, 2014; Ameyaw *et al.*, 2017).

Evidence suggests that HIV knowledge enhances an individual's ability to negotiate for safer sex, which in turn is linked to a reduction in HIV incidence (De Coninck *et al.*, 2014). For instance, an AGYW who has knowledge about HIV and asks a partner who has contracted or been exposed to HIV to use a condom may be less likely to become infected with the virus. Despite the established link between comprehensive HIV knowledge and safer sex negotiation, and how this contributes to a reduction in HIV incidence, little research attention has been given to this phenomenon in SSA. To the best of the authors' knowledge, there is limited evidence regarding the association between comprehensive HIV/AIDS knowledge and safer sex negotiation among AGYW in SSA. Therefore, this study aimed to examine the association between comprehensive HIV/AIDS knowledge and safer sex negotiation among AGYW in SSA using data from the Demographic and Health Surveys (DHSs). The findings of the study could help inform policy formulation in the sub-region in order to reduce the incidence of HIV/AIDS and unintended pregnancies.

Methods

Data and study sample

The study used data from the DHSs conducted between 2010 and 2019 across 30 countries in SSA. Specifically, data from the women's recode files were used. The DHS is a nationally representative household survey that is conducted in more than 85 low- and middle-income countries worldwide. It focuses on essential indicators including comprehensive HIV/AIDS knowledge and safer sex negotiation (Corsi *et al.*, 2012). Respondents for the DHS are selected using a two-stage sampling approach stratified by rural and urban locations, which ensures that the data are nationally representative (Corsi *et al.*, 2012). For details of the DHS sampling process,

Table 1. Countries, survey years and study sample of adolescent girls and young women in sub-Saharan Africa

Country	Year of survey	Weighted <i>n</i>	Weighted %
Burkina Faso	2010	2845	4.61
Benin	2018–19	776	2.08
Burundi	2016–17	1546	4.14
Congo DR	2013–14	1765	4.72
Congo	2011–12	1024	2.74
Cote D'Ivoire	2011–12	676	1.81
Cameroon	2018	1386	3.71
Ethiopia	2016	1357	3.63
Gabon	2012	634	1.70
Ghana	2014	488	1.31
Gambia	2013	1131	3.03
Guinea	2018	682	1.83
Kenya	2014	1483	3.97
Comoros	2012	306	0.82
Liberia	2013	803	2.15
Lesotho	2014	236	0.63
Mali	2018	1269	3.40
Malawi	2015–16	4143	11.09
Mozambique	2015	822	2.20
Nigeria	2018	2560	6.85
Niger	2012	1142	3.05
Namibia	2013	351	0.94
Rwanda	2014–15	870	2.33
Sierra Leone	2019	1137	3.04
Senegal	2010–11	1528	4.09
Chad	2014–15	309	0.83
Togo	2013–14	655	1.75
Uganda	2016	2738	7.33
Zambia	2018–19	1488	3.98
Zimbabwe	2015	1216	3.25
All countries		37,364	100.00

see Seidu *et al.* (2020). A total of 37,364 AGYW (15–24 years) who had complete information on all the variables of interest were included in this study. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement informed the study design (Von Elm *et al.*, 2007). Table 1 gives a detailed description of the countries, survey years and study sample. The datasets for the DHS can be accessed freely at <https://dhsprogram.com/data/available-datasets.cfm>

Outcome variable

The outcome variable was 'safer sex negotiation'. This was derived as a composite variable from two questions, 'Can you ever refuse sex with your partner?', and 'Can you ever ask your partner to use a condom during sex?' Responses to these questions were 'yes' or 'no'. For the purposes of this study, respondents who answered 'yes' to at least one of the two questions were considered to be able to negotiate for safer sex and were assigned the code 'yes' and otherwise as 'no'.

Main explanatory variable

The main explanatory variable was 'comprehensive knowledge on HIV/AIDS'. This is defined as correctly knowing two ways to prevent HIV transmission and rejection of the three most common misconceptions about HIV (Ochako *et al.*, 2011). This variable was measured by asking each woman whether or not she agreed with the following five statements: (a) Consistent use of condoms during sexual intercourse can prevent HIV transmission; (b) Limiting sex to just one uninfected faithful partner can prevent HIV transmission; (c) A healthy-looking person can have HIV; (d) A person can get HIV through mosquito bites; (e) A person can get HIV by sharing food with an HIV-infected person (Ochako *et al.*, 2011; Agegnehu *et al.*, 2020; Darteh, 2020). A composite score based on the correct answers to the preceding questions was used to derive a 'comprehensive knowledge on HIV/AIDS' score, which was dichotomously coded as 'Yes' = 1 (correctly responding to all five questions) and 'No' = 0 (incorrectly responding to at least one of the questions).

Control variables

Eleven control variables were considered, broadly clustered into individual level and contextual variables. Individual level variables included age, occupational status, marital status, educational level, frequency of reading newspapers, frequency of listening to the radio, frequency of watching the television, condom use and number of current sexual partners. Contextual variables were wealth index and type of place of residence. These variables were not determined *a priori*; but were instead based on parsimony, theoretical relevance and practical significance with safer sex negotiation (Bharat *et al.*, 2013; Atteraya *et al.*, 2014; Sunmola *et al.*, 2018).

Statistical analyses

Data analyses were conducted using Stata version 14.0 (Stata Corporation, College Station, TX, USA). The first step was the determination of the prevalence of safer sex negotiation and comprehensive knowledge on HIV/AIDS among the respondents in each of the 30 sub-Saharan African countries surveyed. Next, the relationship between the explanatory and control variables and the outcome variable (safer sex negotiation) was analysed using Pearson's chi-squared test. This was followed by the use of a multivariable binary logistic regression to examine the association between comprehensive knowledge and HIV/AIDS and safer sex negotiation among the respondents. Finally, the association between comprehensive knowledge on HIV/AIDS and safer sex negotiation in each of the 30 countries was assessed using logistic regression models. The results of the regression analysis are presented as crude odds ratios (CORs) and adjusted odds ratios (AORs) at 95% confidence intervals (CIs).

The women's sample weight (v005/1,000,000) was applied to correct for over- and under-sampling and the survey command (*svy*) in Stata was used in both the chi-squared and regression analyses to account for the complex survey design and generalizability of the findings. According to Hatt and Waters (2006), pooling data can bring about broader results that are 'often obscured by the noise of individual data sets'. To calculate the pooled values, further adjustment was needed to account for the variability in the number of individuals sampled in each country. This was accomplished using the weighting factor $1/(A \cdot n_c/n_t)$, where A is the number of countries that

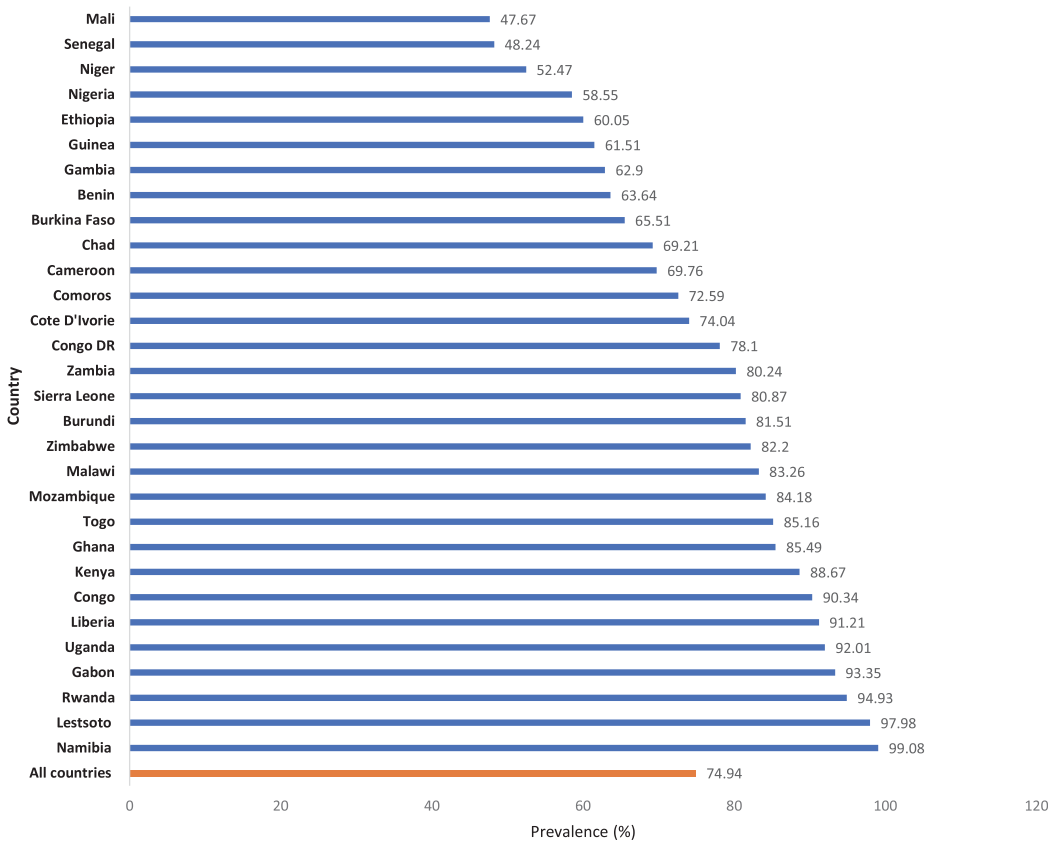


Figure 1. Prevalence of safer sex negotiation among AGYW in 30 countries in SSA.

asked a particular question, n_c is the number of respondents in a country c and n_t is the total number of respondents over all countries asked the question (Peng *et al.*, 1998).

Results

Prevalence of comprehensive HIV/AIDS knowledge and safer sex negotiation

The overall prevalence of safer sex negotiation among AGYW in the 30 sub-Saharan African countries was 74.9%, ranging from 47.7% in Mali to 99.1% in Namibia (Figure 1). The overall prevalence of comprehensive HIV/AIDS knowledge in the 30 countries in SSA was 41.6%, with the highest in Rwanda (74.3%) and lowest in Congo (15.0%) (Figure 2).

Distribution of safer sex negotiation by knowledge on HIV/AIDS and other covariates

Table 2 presents the results of the bivariate analysis of comprehensive HIV/AIDS knowledge, control variables and safer sex negotiation among AGYW in SSA. A larger proportion (80.1%) of respondents with comprehensive knowledge on HIV/AIDS had safer sex negotiation than those with no comprehensive knowledge on HIV/AIDS (71.3%). More than three-quarters of women aged 20–24 (76.5%) had higher safer sex negotiation than those aged 15–19 (70.3%). A higher proportion of women who were working (77.2%) had safer sex negotiation than those who were not working (71.0%). Those who were cohabiting (88.4%), who had secondary or higher education

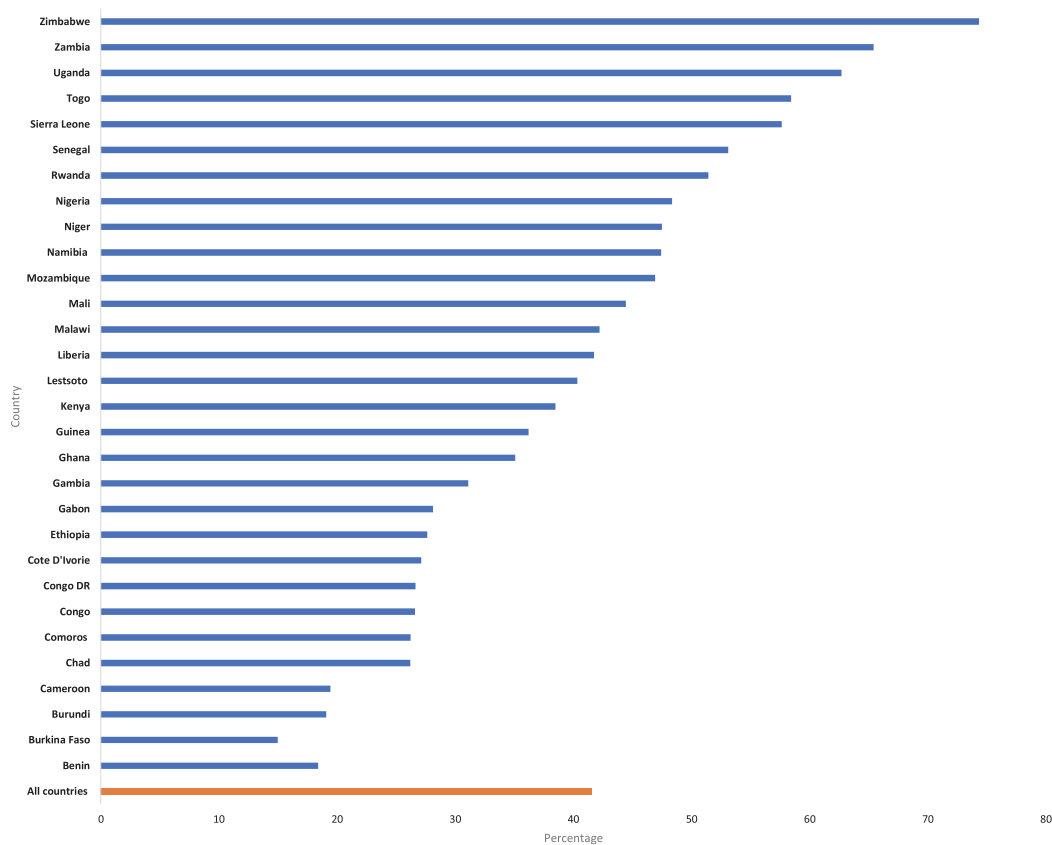


Figure 2. Prevalence of comprehensive knowledge on HIV/AIDS among AGYW in 30 countries in SSA.

(85.0%), were in the richest wealth quintile (81.6%), resided in urban areas (81.3%), were exposed to newspapers (97.8%), radio (88.3%) and television almost every day (89.8%) and who used condoms (93.4%) had higher proportions of safer sex negotiation. Finally, women who had a single current sexual partner (74.2%) had a higher proportion of safer sex negotiation than those with multiple current sexual partners (68.9%).

Association between comprehensive knowledge on HIV/AIDS and safer sex negotiation

Table 3 presents the binary logistic regression analysis on the association between comprehensive knowledge on HIV/AIDS and safer sex negotiation among AGYW in SSA. As shown in Model II, women who had comprehensive knowledge on HIV/AIDS were more likely to have safer sex negotiation compared with those who had no comprehensive knowledge on HIV/AIDS (AOR=1.31, 95% CI: 1.22–1.41). In addition, women who had comprehensive knowledge on HIV/AIDS were more likely to have safer sex negotiation in Congo, Congo DR, Gambia, Guinea, Liberia, Ethiopia and Malawi.

Discussion

The results show that the prevalence of safer sex negotiation was high while that of comprehensive HIV/AIDS knowledge was low among AGYW in SSA in 2010 to 2019. There was also a significant

Table 2. Bivariate analysis of safer sex negotiation, comprehensive HIV/AIDS knowledge and selected covariates of adolescent girls and young women in sub-Saharan Africa

Variable	Weighted <i>n</i>	Weighted %	Can refuse sex (%)	<i>p</i> -value	Can ask partner to use condom (%)	<i>p</i> -value	Safer sex negotiation	<i>p</i> -value
Comprehensive knowledge on HIV/AIDS				<0.001		<0.001		<0.001
No	21,831	58.4	60.7		55.7		71.3	
Yes	15,533	41.6	70.5		67.5		80.1	
Age				<0.001		<0.001		<0.001
15–19	9419	25.2	60.4		56.0		70.3	
20–24	27,945	74.8	66.3		62.1		76.5	
Occupational status				<0.001		<0.001		<0.001
Not working	13,830	37.0	60.8		57.5		71.0	
Working	23,534	63.0	67.1		62.4		77.2	
Marital status				<0.001		<0.001		<0.001
Married	27,970	74.9	60.0		55.1		70.4	
Cohabiting	9394	25.1	78.9		76.9		88.4	
Education level				<0.001		<0.001		<0.001
No education	10,295	27.5	46.4		36.6		56.3	
Primary education	13,996	37.5	68.0		66.3		79.3	
Secondary/higher education	13,073	35.0	74.3		73.3		85.0	
Wealth index				<0.001		<0.001		<0.001
Poorest	7414	19.8	60.6		53.7		70.5	
Poorer	8296	22.2	63.4		56.3		72.1	
Middle	7657	20.5	63.7		59.6		73.9	
Richer	7652	20.5	67.4		64.9		77.9	
Richest	6349	17.0	69.6		70.2		81.6	

(Continued)

Table 2. (Continued)

Variable	Weighted <i>n</i>	Weighted %	Can refuse sex (%)	<i>p</i> -value	Can ask partner to use condom (%)	<i>p</i> -value	Safer sex negotiation	<i>p</i> -value
Place of residence				<0.001		<0.001		<0.001
Urban	11,846	31.7	70.5		68.8		81.3	
Rural	25,518	68.3	62.1		56.8		72.0	
Frequency of reading newspapers				<0.001		<0.001		<0.001
Not at all	31,250	83.6	62.7		57.1		72.6	
Less than once a week	3769	10.1	75.4		77.2		87.0	
At least once a week	2229	6.0	74.7		79.2		86.9	
Almost every day	115	0.3	87.1		89.6		97.8	
Frequency of listening to radio				<0.001		<0.001		<0.001
Not at all	15,336	41.0	62.2		56.2		71.9	
Less than once a week	7491	20.1	64.7		60.0		74.5	
At least once a week	13,833	37.0	67.4		64.9		77.9	
Almost every day	704	1.9	71.4		78.1		88.3	
Frequency of watching TV				<0.001		<0.001		<0.001
Not at all	23,130	61.9	63.8		57.4		73.2	
Less than once a week	4692	12.6	64.4		61.4		74.5	
At least once a week	8090	21.6	65.8		65.6		77.4	
Almost every day	1452	3.89	76.3		81.4		89.8	
Condom used at last sex				<0.001		<0.001		<0.001
No	35,176	94.1	63.8		58.7		73.8	
Yes	2188	5.9	80.0		90.3		93.4	
Number of sexual partners				<0.001		<0.001		<0.001
One	35,140	94.1	64.1		59.7		74.2	
Many	2224	5.9	75.4		74.0		68.9	

Table 3. Logistic regression on the association between comprehensive knowledge on HIV/AIDS and safer sex negotiation of adolescent girls and young women among countries in sub-Saharan Africa

Country	Model I COR (95% CI; <i>p</i> -value)	Model II AOR (95% CI; <i>p</i> -value)
All countries	1.67 (1.56–1.79; <0.001)	1.31 (1.22–1.41; <0.001)
Central Africa		
Cameroon	1.23 (0.96–1.57; 0.095)	1.25 (0.94–1.60; 0.136)
Chad	3.03 (1.59–5.76; 0.001)	3.16 (1.51–6.62; 0.002)
Congo	1.05 (0.58–1.91; 0.864)	0.99 (0.53–1.86; 0.978)
Congo DR	1.74 (1.32–2.30; <0.001)	1.59 (1.20–2.11; 0.001)
Gabon	2.85 (1.19–6.84; 0.019)	1.93 (0.71–5.19; 0.195)
West Africa		
Benin	1.22 (0.83–1.80; 0.306)	1.11 (0.73–1.68; 0.683)
Burkina Faso	1.51 (1.27–1.79; <0.001)	1.20 (1.00–1.45; 0.053)
Cote D'Ivoire	1.26 (0.81–1.96; 0.310)	0.91 (0.56–1.49; 0.717)
Gambia	2.06 (1.56–2.72; <0.001)	1.42 (1.05–1.94; 0.024)
Ghana	2.60 (1.16–5.83; 0.021)	1.89 (0.80–4.45; 0.144)
Guinea	2.14 (1.54–3.00; <0.001)	2.00 (1.41–2.83; <0.001)
Liberia	2.06 (1.19–3.56; 0.010)	2.19 (1.21–3.95; 0.009)
Mali	1.22 (0.94–1.58; 0.133)	1.13 (0.86–1.48; 0.381)
Nigeria	1.15 (0.98–1.35; 0.094)	0.92 (0.77–1.10; 0.356)
Niger	0.92 (0.72–1.18; 0.502)	0.85 (0.65–1.12; 0.249)
Sierra Leone	1.15 (0.86–1.54; 0.359)	1.13 (0.83–1.54; 0.439)
Senegal	1.36 (1.11–1.67; 0.003)	1.06 (0.84–1.32; 0.634)
Togo	0.71 (0.47–1.08; 0.102)	0.56 (0.36–0.88; 0.012)
East Africa		
Burundi	1.28 (0.98–1.67; 0.074)	1.21 (0.92–1.59; 0.178)
Comoros	1.11 (0.70–1.79; 0.652)	0.87 (0.50–1.51; 0.619)
Ethiopia	2.37 (1.81–3.10; <0.001)	1.90 (1.42–2.52; <0.001)
Kenya	2.39 (1.78–3.22; <0.001)	1.35 (0.96–1.89; 0.085)
Rwanda	1.07 (0.54–2.13; 0.839)	1.16 (0.57–2.36; 0.675)
Uganda	1.42 (1.09–1.86; 0.011)	1.15 (0.87–1.52; 0.320)
Southern Africa		
Lesotho	1.67 (0.30–9.32; 0.559)	0.91 (0.10–8.60; 0.934)
Malawi	1.56 (1.31–1.85; <0.001)	1.42 (1.19–1.69; <0.001)
Mozambique	1.51 (1.03–2.22; 0.035)	1.38 (0.92–2.07; 0.120)
Namibia	1.40 (0.20–10.07; 0.737)	1.06 (0.08–14.17; 0.963)
Zambia	0.93 (0.72–1.19; 0.549)	0.84 (0.65–1.09; 0.189)
Zimbabwe	1.31 (0.98–1.76; 0.068)	1.25 (0.93–1.70; 0.137)

Model II adjusted for age, occupational status, marital status, education level, frequency of reading newspapers, frequency of listening to the radio, frequency of watching the television, condom use, number of current sexual partners, wealth index and type of place of residence. COR=Crude odds ratio; AOR: Adjusted odds ratio

association between comprehensive HIV/AIDs knowledge and safer sex negotiation among the study respondents.

Despite the high prevalence of safer sex negotiation, the widespread reports of gender inequalities, unequal sexual power relations, rising cases of child marriages and socio-cultural practices can serve as barriers to safer sex negotiation among AGYW in SSA (UNAIDS, 2016; George *et al.*, 2020; Melesse *et al.*, 2020). These barriers could explain the low prevalence of comprehensive HIV/AIDs knowledge among AGYW in SSA (UNICEF, 2016; Shayo & Kalomo, 2019; McKinnon & Vandermorris, 2019). The high prevalence of safer sex negotiation in SSA reported in this study is, however, consistent with a previous study conducted in Ethiopia (De Coninck *et al.*, 2014). This could be attributed to the education level of the majority of the respondents in the present study, as most (72.5%) had completed at least primary education. Young women who are educated are more likely to be able to negotiate for safer sex compared with their counterparts who are not educated (De Coninck *et al.*, 2014). The low prevalence of comprehensive HIV/AIDs knowledge among AGYW in SSA found in this study is also consistent with the findings of previous studies (Idele *et al.*, 2014; Asaolu *et al.*, 2016). A possible reason for this finding could be the place of residence of the respondents, as the majority (68.3%) were living in rural areas where access to comprehensive sex education is sometimes a problem (Secor-Turner *et al.*, 2017).

The low prevalence of comprehensive HIV knowledge among AGYW in SSA implies that the global target of 90% by 2020 (UNAIDS, 2016) was not achieved as a result of the variations in the prevalence of comprehensive HIV/AIDs knowledge among the selected countries. For instance, while some countries (Rwanda, Kenya and Burundi) had a high prevalence of comprehensive HIV/AIDs knowledge, others (Congo, Benin and Ghana) had a low prevalence. This observation falls short of the intention of providing comprehensive sex education in the countries of SSA. The sub-region is still far from meeting the 95% target by 2030 given the slow progress so far.

A key finding of this study is the significant association between comprehensive HIV/AIDs knowledge and safer sex negotiation among AGYW in SSA. Specifically, those who had comprehensive knowledge of HIV/AIDs had higher odds of safer sex negotiation. Comprehensive HIV/AIDs knowledge resulted in higher safer sex negotiation in Chad and Congo DR in Central Africa; Gambia, Guinea and Liberia in West Africa; Ethiopia in East Africa; and Malawi in Southern Africa. However, it decreased safer sex negotiation among AGYW in Togo. A possible reason for this finding could be that in Togo, certain practices, such as intimate partner violence and physical violence against AGYW, prevent adolescent girls and young women from negotiating for safer sex despite their higher knowledge in comprehensive HIV/AIDs (Burgos-Soto *et al.*, 2014). This finding corroborates findings from a previous study in Ethiopia (De Coninck *et al.*, 2014). Comprehensive HIV/AIDs knowledge is widely reported to influence people's sexual behaviour and sexual autonomy (Iqbal *et al.*, 2019). Also, this supports the Health Belief Model, which posits that gaining consciousness and knowledge about a health condition is the first step to informing the needed precaution (Becker, 1974). It is therefore not a surprise that AGYW in SSA who had comprehensive HIV/AIDs knowledge were more likely to negotiate for safer sex.

In sharp contrast with the findings of this study, a systematic review by Zgambo *et al.* (2018) showed that even though adolescents living with HIV/AIDs in SSA had comprehensive knowledge about the disease and knew their positive HIV status and its implications, they still engaged in risky sexual behaviours and could not negotiate for safer sex. Aboki *et al.* (2014), in their study in Nigeria, also found an insignificant relationship between comprehensive HIV knowledge and safer sex negotiation among adolescents. The disparities in the findings could be the result of differences in the socio-demographic characteristics of the respondents sampled for the various studies. Perhaps certain socio-cultural practices and the dominant patriarchal culture, which often leads to the subordination of women in sexual relationships, exacerbates women's inferiority and affords them little or no power, makes it difficult for even AGYW with comprehensive

HIV/AIDS knowledge to negotiate for safer sex in SSA (Uchem & Ngwa, 2014; Madiba & Ngwenya, 2017; Sikweyiya *et al.*, 2020).

The study had its strengths and limitations. Its key strength is its use of nationally representative DHS data from 30 sub-Saharan African countries. The DHS data collection techniques and methodology follow best practices using experienced and well-trained data collectors, resulting in a high response rate across all countries. The study findings can therefore be generalized to all adolescent girls and young women in SSA. However, it used a cross-sectional study design, and as such causality could not be deduced. Also, the relationships established between the explanatory and outcome variables may vary over time.

In conclusion, this study found that the overall prevalence of safer sex negotiation among AGYW in SSA was relatively high in 2010–2019, but that of comprehensive HIV/AIDS knowledge was relatively low. Also, a strong statistically significant association was found between comprehensive HIV/AIDS knowledge and safer sex negotiation. These findings will inform policies and programmes in the sub-Saharan African region on the crucial role of comprehensive HIV/AIDS education and knowledge in increasing safer sex practice among AGYW. The study recommends that Togo addresses certain practices, such as intimate partner violence and physical violence against AGYW adolescent girls and young women in the country, which prevent them from negotiating for safer sex, despite their high knowledge in comprehensive HIV/AIDS. Lessons could be learnt from countries like Chad, Congo DR, Gambia, Guinea, Liberia, Ethiopia, and Malawi, which have scaled-up programmes and interventions targeted at enhancing safer sex negotiation among AGYW.

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Ethical Approval. The DHS reports that ethical clearance was obtained from the Ethics Committee of ORC Macro Inc. and ethics boards of the partner organizations of the various countries, including the Ministries of Health. The DHS follows the standards for ensuring the protection of respondents' privacy. ICF International ensures that the survey complies with the US Department of Health and Human Services' regulations for the respect of human subjects. This study was a secondary analysis of the survey data and thus no further approval was required since the data is available in the public domain. Further information about the DHS data usage and ethical standards are available at <http://goo.gl/ny8T6X>. The authors assert that all procedures contributing to this study comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

References

- Aboki H, Folayan MO, Daniel U and Ogunlayi M (2014) Changes in sexual risk behaviour among adolescents: is the HIV prevention programme in Nigeria yielding results? *African Journal of Reproductive Health* 18, 109–117.
- Agegehu CD, Geremew BM, Sisay MM, Muchie KF, Engida ZT, Gudayu TW *et al.* (2020) Determinants of comprehensive knowledge of HIV/AIDS among reproductive age (15–49 years) women in Ethiopia: further analysis of 2016 Ethiopian demographic and health survey. *AIDS Research and Therapy* 17(1), 1–9.
- Ameyaw EK, Appiah F, Agbesi CS and Kannor P (2017) Contraceptive use in Ghana: what about women empowerment? *Advances in Sexual Medicine* 7(1), 44–64.
- Asaolu IO, Gunn JK, Center KE, Koss MP, Iwelunmor JJ and Ehiri JE (2016) Predictors of HIV testing among youth in sub-Saharan Africa: a cross-sectional study. *PLoS One* 11(10), e0164052.
- Atteraya MS, Kimm H and Song IH (2014) Women's autonomy in negotiating safer sex to prevent HIV: findings from the 2011 Nepal demographic and health survey. *AIDS Education and Prevention* 26(1), 1–12.
- Badru T, Mwaisaka J, Khamofu H, Agbakwuru C, Adedokun O, Pandey SR *et al.* (2020) HIV comprehensive knowledge and prevalence among young adolescents in Nigeria: evidence from Akwa Ibom AIDS Indicator Survey, 2017. *BMC Public Health* 20(1), 1–10.
- Becker MH (1974) The health belief model and personal health behaviour. *Health Education Monograph* 2, 324–473.

- Bharat S, Mahapatra B, Roy S and Saggurti N** (2013) Are female sex workers able to negotiate condom use with male clients? *The case of mobile FSWs in four high HIV prevalence states of India. PLoS One* **8**(6), e68043.
- Burgos-Soto J, Orne-Gliemann J, Encrenaz G, Patassi A, Woronowski A, Kariyare B *et al.*** (2014) Intimate partner sexual and physical violence among women in Togo, West Africa: prevalence, associated factors, and the specific role of HIV infection. *Global Health Action* **7**(1), 23456, <https://doi.org/10.3402/gha.v7.23456>
- Corsi DJ, Neuman M, Finlay JE and Subramanian SV** (2012) Demographic and Health Surveys: a profile. *International Journal of Epidemiology* **41**(6), 1602–1613.
- Darteh EK** (2020) Individual and contextual predictors of comprehensive HIV and AIDS knowledge among young females in Ghana. *African Journal of AIDS Research* **19**(3), 222–230.
- Darteh EKM, Dickson KS and Doku DT** (2019) Women's reproductive health decision-making: a multi-country analysis of Demographic and Health Surveys in sub-Saharan Africa. *PLoS One* **14**(1), e0209985.
- Darteh EKM, Doku DT and Esia-Donkoh K** (2014) Reproductive health decision making among Ghanaian women. *Reproductive Health* **11**(1), 1–8.
- De Coninck Z, Feyissa IA, Ekström AM and Marrone G** (2014) Improved HIV awareness and perceived empowerment to negotiate safe sex among married women in Ethiopia between 2005 and 2011. *PLoS One* **9**(12), e115453.
- Exavery A, Kanté AM, Jackson E, Noronha J, Sikustahili G, Tani K *et al.*** (2012) Role of condom negotiation on condom use among women of reproductive age in three districts in Tanzania. *BMC Public Health* **12**(1), 1–11.
- George AS, Amin A, de Abreu Lopes CM and Ravindran TS** (2020) Structural determinants of gender inequality: why they matter for adolescent girls' sexual and reproductive health. *BMJ* **368**, l6985
- Hatt LE and Waters HR** (2006) Determinants of child morbidity in Latin America: a pooled analysis of interactions between parental education and economic status. *Social Science & Medicine* **62**(2), 375–386.
- Idele P, Gillespie A, Porth T, Suzuki C, Mahy M, Kasedde S and Luo C** (2014) Epidemiology of HIV and AIDS among adolescents: current status, inequities, and data gaps. *Journal of Acquired Immune Deficiency Syndromes* **66**(2), S144–S153.
- Iqbal S, Maqsood S, Zafar A, Zakar R, Zakar MZ and Fischer F** (2019) Determinants of overall knowledge of and attitudes towards HIV/AIDS transmission among ever-married women in Pakistan: evidence from the Demographic and Health Survey 2012–13. *BMC Public Health* **19**(1), 1–14.
- McKinnon B and Vandermorris A** (2019) National age-of-consent laws and adolescent HIV testing in sub-Saharan Africa: a propensity-score matched study. *Bulletin of the World Health Organization* **97**(1), 42–50.
- Madiba S and Ngwenya S** (2017) Cultural practices, gender inequality and inconsistent condom use increase vulnerability to HIV infection: narratives from married and cohabiting women in rural communities in Mpumalanga province, South Africa. *Global Health Action* **10** (supplement 2), 1341597.
- Mandiwa C, Namondwe B and Munthali M** (2021) Prevalence and correlates of comprehensive HIV/AIDS knowledge among adolescent girls and young women aged 15–24 years in Malawi: evidence from the 2015–16 Malawi demographic and health survey. *BMC Public Health* **21**(1), 1–9.
- Mavhu W, Rowley E, Thior I, Kruse-Levy N, Mugurungi O, Ncube G and Lederc-Madlala S** (2018) Sexual behavior experiences and characteristics of male–female partnerships among HIV positive adolescent girls and young women: qualitative findings from Zimbabwe. *PLoS One*, **13**(3), e0194732.
- Meslele DY, Mutua MK, Choudhury A, Wado YD, Faye CM, Neal S and Boerma T** (2020) Adolescent sexual and reproductive health in sub-Saharan Africa: who is left behind? *BMJ Global Health* **5**(1), e002231.
- Mugweni E, Omar M and Pearson S** (2014) Understanding barriers to safer sex practice in Zimbabwean marriages: implications for future HIV prevention interventions. *Health Education Research* **30**(3), 388–399.
- Mwale M and Muula AS** (2018) Effects of adolescent exposure to behaviour change interventions on their HIV risk reduction in Northern Malawi: a situation analysis. *SAHARA-J: Journal of Social Aspects of HIV/AIDS* **15**(1), 146–154.
- Ochako R, Ulwodi D, Njagi P, Kimetu S and Onyango A** (2011) Trends and determinants of comprehensive HIV and AIDS knowledge among urban young women in Kenya. *AIDS Research and Therapy* **8**(1), 1–8.
- Peng YK, Hight-Laukaran V, Peterson AE and Perez-Escamilla R** (1998) Maternal nutritional status is inversely associated with lactational amenorrhea in Sub-Saharan Africa: results from demographic and health surveys II and III. *Journal of Nutrition* **128**(10), 1672–1680.
- Saul J, Bachman G, Allen S, Toiv NF, Cooney C and Beamon TA** (2018) The DREAMS core package of interventions: a comprehensive approach to preventing HIV among adolescent girls and young women. *PLoS One* **13**(12), e0208167.
- Sathiyasuman A** (2015) Associated risk factors of STIs and multiple sexual relationships among youths in Malawi. *PLoS One* **10**(8), e0134286.
- Secor-Turner M, Randall BA, Christensen K, Jacobson A and Loyola Meléndez M** (2017) Implementing community-based comprehensive sexuality education with high-risk youth in a conservative environment: lessons learned. *Sex Education* **17**(5), 544–554.
- Seidu AA, Darteh EKM, Kumi-Kyereme A, Dickson KS and Ahinkorah BO** (2020) Paid sex among men in sub-Saharan Africa: Analysis of the demographic and health survey. *SSM-Population Health* **11**, 100459.

- Shayo FK and Kalomo MH** (2019) Prevalence and correlates of sexual intercourse among sexually active in-school adolescents: an analysis of five sub-Saharan African countries for the adolescent's sexual health policy implications. *BMC Public Health* **19**, 1285.
- Sikweyiya Y, Addo-Lartey AA, Alangea DO, Dako-Gyeke P, Chirwa ED, Coker-Appiah D et al.** (2020) Patriarchy and gender-inequitable attitudes as drivers of intimate partner violence against women in the central region of Ghana. *BMC Public Health* **20**, 1–11, <https://doi.org/10.1186/s12889-020-08825-z>
- Siziya S, Muula AS and Rudatsikira E** (2008) HIV and AIDS-related knowledge among women in Iraq. *BMC Research Notes* **1**(1), 1–6.
- Sunmola AM, Mayungbo OA, Fayeahun OA, Opayemi RS and Morakinyo LA** (2018) Is women's tendency to negotiate safer sex another opportunity for intimate partner violence in Nigeria? *Journal of Interpersonal Violence* **36** (7–8), NP3624–NP3645.
- Uchem RN and Ngwa SE** (2014) Subordination of women in 21st century Africa: cultural sustainability or a new slavery? Implications for educational development. *Church and Society* **4**(24), 143–150.
- UNAIDS** (2016) *HIV Prevention Among Adolescent and Among Adolescent Girls & Young Women*. URL: https://www.unaids.org/sites/default/files/media_asset/UNAIDS_HIV_prevention_among_adolescent_girls_and_young_women.pdf on 08/02/2021 (accessed 17th June 2021).
- Von Elm E, Altman DG, Egger M, Pocock SJ, Gotsche PC and Vandenbroucke JP** (2007) The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Annals of Internal Medicine* **147**(8), 573–577.
- Wang W, Alva S and Wang S** (2012) *HIV-Related Knowledge and Behaviors Among People Living with HIV in Eight High HIV Prevalence Countries in sub-Saharan Africa*. ICF International. URL: <https://dhsprogram.com/publications/publication-as29-analytical-studies.cfm> (accessed on 6th June, 2021).
- World Health Organization (WHO)** (2018) *Fact Sheet on HIV and AIDS*. URL: <https://www.who.int/en/news-room/fact-sheets/detail/hiv-aids> (accessed 17th June 2021).
- Zgambo M, Kalembo FW and Mbakaya BC** (2018) Risky behaviours and their correlates among adolescents living with HIV in sub-Saharan Africa: a systematic review. *Reproductive Health* **15**, 180.