

Original article

Factors associated with the awareness of contraceptive methods, understanding the prevention of HIV/AIDS and the perception of HIV/AIDS risk among secondary school students in Dar es Salaam, Tanzania

Mayumi Ohnishi¹, Sebald Leshabari², Junichi Tanaka¹, and Mika Nishihara¹

¹Nagasaki University Graduate School of Biomedical Sciences, Japan

²School of Nursing, Muhimbili University of Health and Allied Sciences, Tanzania

Abstract

Objective: To assess the awareness of contraceptive methods, understanding of HIV/AIDS prevention and the perception of HIV/AIDS risks among secondary school students in Tanzania.

Methods: An anonymous self-administered questionnaire survey was conducted among secondary school students in Tanzania. The questionnaire included sociodemographic characteristics, awareness of contraceptive methods, an understanding of HIV/AIDS prevention, and the perception of HIV/AIDS risks. Three secondary schools were selected by considering the gender balance and location, which included the urban and surrounding areas. The research objectives, methods, and ethical considerations were explained, and the students voluntarily completed the questionnaire.

Results: A total of 233 responses were collected, and 204 responses were considered valid for the analysis. The mean and standard deviation of age were 18.5 ± 1.0 . Regardless of the gender, age, religion, and major course of study, the maternal educational status (adjusted odds ratio [AOR]: 3.129; 95% confidence interval [CI]: 1.324, 7.398; $P=0.009$) and the number of information sources (AOR: 7.023, 95% CI: 3.166, 15.579, $P<0.001$) demonstrated associations with the awareness of contraceptive methods. Respondents who lived outside a dormitory (AOR: 3.782; 95% CI: 1.650, 8.671; $P=0.002$) and who currently had a partner (AOR: 3.616; 95% CI: 1.486, 8.800; $P=0.005$) were associated with a high level of understanding of HIV/AIDS prevention regardless of gender, age, religion, and major course of study. Respondents with few information sources were associated with a high level of perception of HIV/AIDS risks (AOR: 0.293; 95% CI: 0.115, 0.747; $P=0.010$), regardless of gender, age, religion, and major course of study.

Conclusion: Factors associated with the awareness of contraceptive methods, the understanding of HIV/AIDS prevention, and perception of HIV/AIDS risks were not consistent. To ensure the improvement of these factors among secondary school students, sexual health education should be integrated into educational programs and provided holistically.

Key words: secondary school students, contraception, HIV/AIDS prevention, Tanzania

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Introduction

According to a recent research of adolescent and young women aged 15–23 years in Tanzania, 75.5% were sexually

active¹. Adolescents and young adults (AYA) in Tanzania engage in high-risk sexual behaviors, including sexual activities with multiple sexual partners and inconsistent use of condoms, and they encounter adverse experiences, such as unwanted pregnancies². More than half of the most recent pregnancies and/or births among East African adolescent girls aged 15–19 years were unintended, and educational attainment, age at first sexual experience, household wealth, family structure, and exposure to media were significantly associated with adolescent pregnancy³. Among unmarried sexually active women aged 15–19 years in Tanzania, educational status, opportunities to learn about modern contraception, perceived partner and/or friend support for contraceptive use, higher knowledge, and self-efficacy for

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Correspondence: Mayumi Ohnishi, Department of Health Sciences, Nagasaki University Graduate School of Biomedical Sciences, 1-7-1 Sakamoto, Nagasaki 852-8520, Japan

E-mail: mohnishi@nagasaki-u.ac.jp

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contraceptives were associated with modern contraceptive use⁴). Another study in Tanzania reported that gender and social cohesion, including social trust and social participation, were related to condom use among school-aged AYA aged 14–19 years⁵). However, a study from Zimbabwe reported that contraceptive use was very low, although knowledge of modern contraceptives is universal among adolescents⁶). There are several views and study findings regarding the relationship between the knowledge and behaviors with respect to sexual and reproductive health. Inconsistent results have been obtained because other factors such as social norms and stigma may play protective roles, preventing behavior that would lead to adverse outcomes.

Tanzania has a high level of vulnerability related to HIV/AIDS and reproductive health. The HIV prevalence among adults aged 15–49 years was reported to be 4.6%, and 72,000 people were newly infected with HIV in 2018. New HIV infections among young women aged 15–24 years were more than double (16,000) the number of those among young men (7,600). In addition, only 43.08% of AYA aged 15–24 years correctly identified methods to prevent the sexual transmission of HIV⁷). However, the maternal mortality ratio (MMR) per 100,000 live births was 524 in 2017, which had declined from 854 in 2000, accounting for 22% of deaths among females of reproductive age⁸). Tanzania currently has had a high prevalence of HIV and high MMR. Its population was 56,318,348 in 2018⁹), making it the fifth largest country by population, after Nigeria, Ethiopia, the Democratic Republic of Congo, and South Africa, among Sub-Saharan countries. Several educational programs on sexual and reproductive health for AYA have been implemented, and these programs demonstrated the effectiveness in increasing knowledge and understanding immediately after and/or in the short term¹⁰). Tanzanian female undergraduate students reported a low utilization of contraceptive methods, although they had knowledge about the methods¹¹). Additionally, a generation gap exists regarding the practice of and traditional customs related to reproductive health, especially in the urban and suburban areas of Dar es Salaam^{12, 13}), although that trend might not be common in rural areas¹⁴). A supportive approach is required for AYA to help them take appropriate action to avoid unwanted pregnancy and HIV infection by promoting sexual and reproductive health with a contemporary view.

This study aimed to assess the factors associated with the awareness of contraceptive methods, an understanding of HIV/AIDS prevention, and the perception of HIV risks among secondary school students in Dar es Salaam, Tanzania. This concept is not novel and has been examined since the HIV/AIDS epidemic began in Sub-Saharan Africa. However, the same ideas currently influence AYA, and the problem has not been solved. Continuous follow-up studies are required to monitor the conditions and behaviors of

AYA related to sexual, reproductive health, and HIV/AIDS because information sources and general health literacy levels in this group are changing; determining the trend is necessary to implement contemporary approaches. The findings from this study will provide information on current positive factors and constraints to implementing a combined program for preventing unintended pregnancy and HIV infection among AYA in Sub-Saharan African countries, including Tanzania.

Methods

Study procedure

An anonymous, self-administered questionnaire survey was conducted among secondary school students as a cross-sectional study in August 2017 in Dar es salaam, Tanzania. Three secondary schools in Dar es Salaam were selected considering the gender balance; they were located in urban and surrounding areas, which included rural areas.

After the research objectives, methods and ethical considerations were explained, and the students voluntarily completed and submitted the questionnaire in the designated place. The submission of the questionnaire was considered to indicate agreement for research participation. Confidentiality was guaranteed by ensuring the participants' anonymity. Withdrawal from the study was an option available for the respondents at any time.

Measurements

The questionnaire included sociodemographic characteristics (gender, age, religion, mother's educational status, current living conditions, and currently having a partner), awareness of contraceptive methods, understanding of HIV/AIDS prevention, and perception of HIV/AIDS risk in English, and the questions were consistent with demographic health surveys and previous related studies. Awareness of contraception was obtained from data of 11 items (female sterilization, male sterilization, pill, IUD, injectables, implants, male condom, female condom, rhythm method, withdrawal, and emergency contraception); the respondents chose the options on which they had knowledge. The score for overall awareness of contraception was calculated by totaling the "yes" answers for each item, with a range of 0 to 11. The study participants were divided into two groups according to the median score: a low awareness of contraception group ≤ 5 and a high awareness group ≥ 6 . The understanding of HIV/AIDS prevention was evaluated with two questions: Can people reduce their chance of getting HIV by having just one uninfected sex partner who has no other sex partner? Can people reduce their chance of getting HIV by using a condom every time they have sex? Appropriate responses were scored as 1, and inappropriate responses or do not know/no response were scored as 0. The total score

for the overall knowledge of understanding HIV/AIDS prevention was calculated by totaling the appropriate responses for each item from a range of scores from 0 to 2. The study participants were divided into two groups according to the median of the score: a low understanding of HIV/AIDS prevention group ≤ 1 and a high understanding group $= 2$. Perception of HIV/AIDS risk was rated on a 5-point Likert scale ranging from 1 (not at all) to 5 (a great deal) using the question, “How much at risk do you consider yourself from HIV/AIDS?”. The study participants were divided into two groups according to the median score: a low perception of HIV/AIDS risk group ≤ 1 and a high perception group ≥ 2 .

Analysis

IBM SPSS version 25 was used to analyze the data. A χ^2 test was performed to assess differences in gender and awareness of contraceptive methods and the type of information obtained from information sources. Spearman’s rank correlation coefficient was used to measure the association between contraceptive methods, knowledge of HIV/AIDS prevention, and perception of HIV/AIDS risk. The associations between demographic characteristics and awareness of contraceptive methods, knowledge of HIV/AIDS prevention, and perception of HIV/AIDS risk were examined by a χ^2 test. Logistic regression analysis was used to determine the factors associated with contraceptive methods, knowledge of HIV/AIDS prevention, and perception of HIV/AIDS risk. In all the analyses, $P < 0.05$ was used to indicate statistical significance.

Ethical approval

This study was approved by the Ethics Committees of Nagasaki University in Japan (approval number: 16012877) and Muhimbili University of Health and Allied Sciences in Tanzania. Three selected secondary schools approved the research proposal and agreed to allow the study to be conducted at the schools.

Results

A total of 233 responses were collected, and 204 responses were considered valid for the analysis. Only 131 respondents reported perceptions of HIV/AIDS risk. Table 1 displays the sociodemographic characteristics of the respondents. The mean and standard deviation (SD) of age were 18.5 ± 1.0 . The majority of respondents were female, Catholic/Christian, took art or non-science courses, and lived outside the dormitory.

Table 2 illustrates the awareness of contraceptive methods. Among 204 respondents, 196 respondents confirmed their awareness of contraceptive methods. The most popular method was the male condom, which was known to 77.0% of the respondents. Only 19.1% of the respondents reported

Table 1 Sociodemographic characteristics of the study participants (N=204)

	n	%
Gender		
Male	64	31.4
Female	140	68.6
Age		
≤ 17 years	30	14.7
18 years	72	35.3
19 years	81	39.7
≥ 20 years	21	10.3
Religion		
Catholic/Christian	141	69.1
Muslim	59	28.1
Other/don’t know/no response	4	2.0
Major		
Sciences	94	46.1
Art or other (commercial, etc.)	108	52.9
No response	2	1.0
Mother’s educational status		
\leq Primary school completed	54	26.4
Secondary school completed	60	29.4
College or university	65	31.9
Other/don’t know/no response	25	12.3
Current living conditions		
Dormitory/boarding school	79	38.7
Out of dormitory (living with family, relatives, etc.)	121	59.3
Other/no response	4	2.0
Currently have a partner		
No	91	44.6
Yes	97	47.5
No response	16	7.8
Experience with sexual intercourse		
No	74	36.3
Yes	110	53.9
No response	20	9.8

SD: Standard Deviation.

awareness of emergency contraception. There was no statistically significant difference between gender and awareness of contraceptive methods.

Table 3 presents information sources regarding sexual and reproductive health, including contraceptive methods, sexually transmitted infections and HIV/AIDS, as well as the most useful information source. Television (72.1%) and teachers (69.2%) were the most accessible information sources, however Internet websites (30.5%) were the most useful information sources. There was no statistically significant difference between gender and having information sources or the most useful information source. The mean number of information sources was 4.6 ± 2.9 among male respondents and 4.5 ± 2.8 among female respondents (t-test, $P = 0.834$).

Table 2 Frequency of awareness of contraceptive methods (N=196)

	Male (n=59)		Female (n=137)		P-value
	n	%	n	%	
Female sterilization	33	55.9	84	61.3	0.481
Male sterilization	36	61.0	72	52.6	0.275
Pill	37	62.7	85	62.0	0.929
IUD	15	25.4	35	25.5	0.985
Injectables	23	39.0	73	53.3	0.066
Implants	27	45.8	65	47.4	0.829
Male condom	52	88.1	105	76.6	0.064
Female condom	38	64.4	93	67.9	0.635
Rhythm method	11	18.6	30	21.9	0.607
Withdrawal	36	61.0	85	62.0	0.892
Emergency contraception	8	13.6	31	22.6	0.145

χ^2 test was performed. Other/do not know/no response were excluded from the calculations. IUD: intrauterine device.

Table 3 Frequency of access to information sources regarding sexual and reproductive health, such as contraceptive methods, sexually transmitted infection, and HIV/AIDS

	Information sources (n=201)		Most useful information source (n=162)*	
	n	%	n	%
Radio	121	60.2	15	9.0
Television	145	72.1	33	19.8
Newspaper or magazine	99	49.3	4	2.4
Internet website	100	49.8	51	30.5
Friends	110	54.7	8	4.8
Health facility/Pharmacy	51	25.4	3	1.8
Health personnel	54	26.9	7	4.2
Teacher	139	69.2	28	16.8
Family	89	44.3	18	10.8

*: Respondents who indicated no information source and two or more information sources were excluded from the analysis. HIV: human immunodeficiency virus; AIDS: acquired immunodeficiency syndrome.

Table 4 reports the information that the respondents obtained from the information sources mentioned in Table 3. Information related to sexually transmitted infections and HIV/AIDS was the most common content obtained regardless of gender (male: 74.6%, female: 78.3%, χ^2 test, $P=0.567$). Information regarding pregnancy was more likely to be obtained by females (43.5%) than males (27.0%), with a statistically significant difference (χ^2 test, $P=0.023$), although information related to contraceptive methods did not show a significant difference by gender (male: 39.7%, female: 42.8%, χ^2 test, $P=0.682$).

Table 5 presents the correlations between the scores in the awareness of contraceptive methods, understanding of HIV/AIDS prevention, the perception of HIV/AIDS risk, and the number of information sources. Spearman's rank corre-

lation coefficient between understanding of HIV/AIDS prevention and the perception of HIV/AIDS risk was $\rho=0.184$ ($P=0.036$). However, there was no correlation between the awareness of contraceptive methods and an understanding of HIV/AIDS prevention ($\rho=0.019$, $P=0.782$) and the perception of HIV/AIDS risk ($\rho=-0.138$, $P=0.116$). The number of information sources was related to an awareness of contraceptive methods ($\rho=0.654$, $P<0.001$), but there was no relationship with the understanding of HIV/AIDS prevention ($\rho=0.065$, $P=0.361$) and the perception of HIV/AIDS risk ($\rho=-0.168$, $P=0.057$). Cronbach's alpha for the scores of awareness of contraceptive methods and understanding of HIV/AIDS prevention and the number of information sources had the values of 0.881, 0.464, and 0.832, respectively.

Data regarding the awareness of contraceptive methods,

Table 4 Type of information obtained by information sources (N=201)

	Male (n=63)		Female (n=138)		P-value
	n	%	n	%	
Contraceptive method	25	39.7	59	42.8	0.682
Pregnancy	17	27.0	60	43.5	0.026
STI and HIV/AIDS	47	74.6	108	78.3	0.567
Sexual relationships	39	61.9	78	56.5	0.473

χ^2 test was performed. STI: sexually transmitted infections; HIV: human immunodeficiency virus; AIDS: acquired immunodeficiency syndrome.

Table 5 Correlation between the awareness of contraceptive methods, understanding of HIV/AIDS prevention, and perception of HIV/AIDS risk

	Awareness of contraceptive methods		Understanding of HIV/AIDS prevention		Perception of HIV/AIDS risk	
	ρ	P-value	ρ	P-value	ρ	P-value
	Awareness of contraceptive methods (range: 0–11) (N=204)	1				
Understanding of HIV/AIDS prevention (range: 0–2) (N=204)	0.019	0.782	1			
Perception of HIV/AIDS risk (range: 0–5) (N=131)	-0.138	0.116	0.184	0.036	1	
Number of information sources (range: 0–9) (N=201)	0.654	<0.001	0.065	0.361	-0.168	0.057

Spearman's rank correlation coefficient (ρ) was calculated. HIV: human immunodeficiency virus; AIDS: acquired immunodeficiency syndrome.

understanding of HIV/AIDS prevention and perception of HIV/AIDS risk by sociodemographic characteristics among secondary school students are presented in Table 6. The median of awareness of contraceptive methods score was 6, the median understanding of HIV/AIDS prevention score was 2, and the median of the perception of HIV/AIDS risk score was 1, which was lesser than the mean of 2.5. Awareness scores for contraceptive methods were higher among respondents with higher maternal educational status (χ^2 test, $P=0.006$) and many information sources (χ^2 test, $P<0.001$). The score for understanding of HIV/AIDS prevention was higher among respondents with art or non-science majors, those who lived outside the dormitory, those who currently had a partner, and those who were sexually experienced (χ^2 test, $P=0.020$, $P=0.023$, $P=0.031$ and $P=0.011$, respectively). The perception scores for HIV/AIDS risk were higher among respondents who were sexually experienced (χ^2 test, $P=0.019$).

The factors associated with the awareness of contraceptive methods, an understanding of HIV/AIDS prevention, and the perception of HIV/AIDS risk were examined by logistic regression analysis (Table 7). Regardless of gender, age, religion, and major course of study, while maternal educational status (adjusted odds ratio [AOR]: 3.129; 95% confidence interval [CI]: 1.324, 7.398; $P=0.009$) and the number of information sources (AOR: 7.023, 95% CI: 3.166, 15.579, $P<0.001$) demonstrated associations with awareness of contraceptive methods. Respondents who lived outside the dormitory (AOR: 3.782; 95% CI: 1.650, 8.671; $P=0.002$) and who currently had a partner (AOR: 3.616; 95% CI: 1.486, 8.800; $P=0.005$) were associated with a high level of

understanding of HIV/AIDS prevention regardless of gender, age, religion, and major course of study. Respondents with few information sources were associated with a high level of perception of HIV/AIDS risk (AOR: 0.293; 95% CI: 0.115, 0.747; $P=0.010$), regardless of gender, age, religion, and major course of study.

Discussion

The male condom was the contraceptive method, which the respondents were aware of the most. This may be due to the promotion and education of HIV/AIDS prevention rather than the sole promotion of contraceptive methods. Male condoms constitute an appropriate and affordable contraceptive method among AYA because they prevent HIV infection and unintended pregnancy using non-hormonal methods. The respondents had the lowest level of awareness for emergency contraception, and although it does not prevent HIV infection, it offers the possibility of avoiding unwanted pregnancy. In this study, male respondents mentioned the perception of a higher risk of HIV. Female respondents obtained information related to pregnancy more often than male respondents did because this issue may have been more important to the female respondents. Thus, an appropriate knowledge of and access to effective and affordable contraceptive methods including emergency contraception is important for AYA. A previous study also reported that very few female undergraduate students knew about emergency contraception¹⁵. Additionally, female undergraduate students with prior experience using emergency contracep-

Table 6 Awareness of contraceptive methods, an understanding of HIV/AIDS prevention, and the perception of HIV/AIDS risk by sociodemographic characteristics among high school students in Tanzania

	Contraceptive methods (range: 0–11) (N=204)					HIV/AIDS prevention (range: 0–2) (N=204)					Perception of HIV/AIDS risk (range: 1–5) (N=131)				
	Low (≤ 5)		High (≥ 6)		P	Low (≤ 1)		High ($=2$)		P	Low (≤ 1)		High (≥ 2)		P
	n	%	n	%		n	%	n	%		n	%	n	%	
Gender															
Male	33	51.6	31	48.4	0.692	30	46.9	34	53.1	0.953	24	47.1	27	52.9	0.190
Female	68	48.6	72	51.4		65	46.4	75	53.6		47	58.8	33	41.3	
Age															
≤ 18 years	50	49.0	52	51.0	0.889	52	51.0	50	49.0	0.207	41	62.1	25	37.9	0.067
≥ 19 years	51	50.0	51	50.0		43	42.2	59	57.8		30	46.2	35	53.8	
Religion															
Catholic/Christian	72	51.1	69	48.9	0.642	63	44.7	78	55.3	0.563	49	53.3	43	46.7	0.604
Muslim	28	47.5	31	52.5		29	49.2	30	50.8		21	58.3	15	41.7	
Major															
Sciences	44	46.8	50	53.2	0.475	52	55.3	42	44.7	0.020	37	57.8	27	42.2	0.329
Art or other (commercial, etc.)	56	51.9	52	48.1		42	38.9	66	61.1		32	49.2	33	50.8	
Mother's educational status															
\leq Primary school completed	35	64.8	19	35.2	0.006	25	46.3	29	53.7	0.854	24	66.7	12	33.3	0.073
\geq Secondary school completed	53	42.4	72	57.6		56	44.8	69	55.2		39	48.8	41	51.2	
Current living conditions															
Dormitory/boarding school	43	54.4	36	45.6	0.260	45	57.0	34	43.0	0.023	27	57.4	20	42.6	0.732
Out of dormitory	56	46.3	65	53.7		49	40.5	72	59.5		44	54.3	37	45.7	
Currently have a partner															
No	47	51.6	44	48.4	0.662	48	52.7	43	47.3	0.031	32	54.2	27	45.8	0.947
Yes	47	48.5	50	51.5		36	37.1	61	62.9		34	54.8	28	45.2	
Experience with sexual intercourse															
No	57	51.8	53	48.2	0.336	58	52.7	52	47.3	0.011	44	64.7	24	35.3	0.019
Yes	33	44.6	41	55.4		25	33.8	49	66.2		23	43.4	30	56.6	
Information sources (range: 0-9)															
Few (≤ 4)	71	75.5	23	24.5	<0.001	44	46.8	50	53.2	0.991	26	46.4	30	53.6	0.085
Many (≥ 5)	28	26.2	79	73.8		50	46.7	57	53.3		45	61.6	28	38.4	

χ^2 test was performed. Other/do not know/no response were excluded from calculations. HIV: human immunodeficiency virus; AIDS: acquired immunodeficiency syndrome.

tion reported inappropriate use¹⁶). A study from Tanzania also reported that most female undergraduate students had knowledge of contraception, however the prevalence of the actual use of contraception was not high among sexually active students¹⁷). It is clear that the promotion of contraceptive methods and the prevention of HIV infection among AYA should be continued¹⁸), although knowledge cannot be the only factor to motivate individuals to use contraception and methods for HIV prevention. Despite the low evidence of effective educational program curricula and provision methods, school-based approaches are recommended for AYA¹⁹). The findings of this study indicate that teachers were the second most common source of information regarding sexual and reproductive health, following television. Although the information provided by health professionals to AYA

is reliable, AYA may not have access to health facilities. Teachers can play an important role in providing accurate information and knowledge related to sexual and reproductive health for AYA who are still at school.

The findings from this study illustrate that the factors associated with awareness of contraceptive methods, the understanding of HIV/AIDS prevention and the perceptions of HIV/AIDS risk were not consistent. Having a partner and being sexually experienced did not contribute to an awareness of contraceptive methods and the perception of HIV/AIDS risk in this study, although being sexually experienced was associated with an understanding of HIV/AIDS prevention. If there are no specific characteristics of vulnerable groups who require appropriate information and knowledge provision regarding sexual and reproductive health for AYA such

Table 7 Factors associated with the awareness of contraceptive methods, an understanding of HIV/AIDS prevention, and the perception of HIV/AIDS risk among high school students in Tanzania

	High level of awareness of contraceptive methods (N=143)		High level of understanding of HIV/AIDS prevention (N=143)		High level of perception of HIV/AIDS risk (N=94)	
	AOR	95% CI	AOR	95% CI	AOR	95% CI
Gender (ref: Male)						
Female	1.616	0.642, 4.072	1.151	0.480, 2.760	0.964	0.351, 2.644
Age (ref: ≤18 years)						
≥19 years	0.641	0.286, 1.435	1.207	0.560, 2.602	1.519	0.580, 3.979
Religion (ref: Catholic/Christian)						
Muslim	1.937	0.773, 4.856	0.601	0.256, 1.408	0.709	0.254, 1.984
Major (ref: Sciences)						
Art or other	0.833	0.366, 1.898	2.556	1.130, 5.781	0.773	0.293, 2.044
Mother's educational status (ref: ≤Primary school completed)						
≥Secondary school completed	3.129	1.324, 7.398	1.277	0.567, 2.878	2.449	0.917, 6.545
Current living conditions (ref: Dormitory)						
Out of dormitory	1.412	0.614, 3.252	3.782	1.650, 8.671	1.127	0.426, 2.985
Currently have a partner (ref: No)						
Yes	1.005	0.417, 2.420	3.616	1.486, 8.800	1.004	0.359, 2.808
Experience with sexual intercourse (ref: No)						
Yes	2.369	0.924, 6.069	1.394	0.580, 3.352	2.031	0.717, 5.755
Number of information sources (ref: few)						
Many	7.023	3.166, 15.579	0.959	0.450, 2.043	0.293	0.115, 0.747

Logistic regression analysis was performed. Other/do not know/no response were excluded from calculations. AOR: adjusted odds ratio; CI: confidence interval; HIV: human immunodeficiency virus; AIDS: acquired immunodeficiency syndrome.

as lesbian, gay, bisexual and transgender populations, integrated educational programs about contraception and HIV/AIDS prevention will be required regardless of sociodemographic characteristics. Comprehensive sexual educational programs have been implemented in low- and middle-income countries, however these programs have encountered several challenges with regard to their management and multisectoral coordination^{20, 21}. With increased accessibility and use of the Internet and/or social media, e-health could be a useful tool for information/knowledge provision; the Internet was the most useful information source in this study. Educational programs and interventions related to sexual and reproductive health for AYA have been implemented, including information provision and guidance through the Internet and mass media²⁰. Studies of mHealth interventions, such as Mobile for Reproductive Health introduced in Tanzania, report that contraceptive methods are one of major types of information accessed²². Educational programs that use game-based learning and gamification can also improve sexual health conditions among adolescent students²³. The findings from this study indicate that students with a greater number of information sources had better awareness of contraceptive methods, but they had an adverse level of perception of HIV/AIDS risk. The number and variation of

information sources can increase simple information and knowledge. However, obtaining appropriate understanding and/or perception may require high-quality information and knowledge, and a large amount of unnecessary and/or inappropriate information/knowledge may affect AYA's understanding and perception. The use of e-health can have positive effects nevertheless careful implementation of e-health programs is required to prevent confusion about finding and selecting appropriate information.

Secondary school students reported that their teachers were the most frequently used source for sexual and reproductive health information²⁴. Mass media were the most frequent sources of reproductive health information among 7th-grade primary school adolescents, although the credibility of the information from mass media was low, and parents and health workers were considered as credible sources of information²⁵. Contraceptive information from medical health professionals was associated with a greater accuracy in knowledge about contraceptive use and efficacy compared to all other sources^{26, 27}. Although the provision of sexual and reproductive health information through the Internet and/or social media has become popular, the role of medical-health professionals and schoolteachers is important for the promotion of a healthy sexual and reproductive

life among AYA because the credibility of the information obtained and its impact on their behavior are high. AYA also prefer individual and customized approaches provided by medical-health professionals and schoolteachers for their decision-making and actions related to sexual and reproductive health²⁷). It is also important to mitigate the negative impact of information and knowledge obtained from the Internet and/or social media on the information and knowledge provided by health professionals and teachers.

In addition, parents play a key role in protecting the sexual and reproductive health of AYA because parental support is a reliable and easily available source for AYA^{27–29}). Despite controversial views, a majority of the parents of AYA appreciated school-based comprehensive sexuality education³⁰). This study also demonstrated that higher maternal educational status contributed to better awareness of contraceptive methods and perceptions of HIV/AIDS risk. Additionally, living with family members contributed to a greater understanding of HIV/AIDS prevention. A study from Ethiopia reported that AYA who discussed sexual and reproductive health with their parents were more likely to have utilized sexual and reproductive health services³¹). The study also demonstrated that AYA living with their mothers, regardless of whether the father was present, were more likely to have utilized sexual and reproductive health services than AYA living with just their fathers³¹). A study from Uganda also reported that although AYA did not frequently talk with either parent about sexual and reproductive health issues, they conversed more with their mothers than they did with their fathers about these issues. In addition, female AYA were more likely to talk about sexual and reproductive health than were male AYA³²). Therefore, it is important to train medical-health professionals and schoolteachers and to provide educational opportunities for parents regarding the provision of accurate information on sexual and reproductive health to their children and in the community.

This study has several limitations. First, the validity and reliability of the survey tool used in this study were not tested prior to conducting the survey, although the questionnaire was prepared based on a demographic health survey and other related previous studies. Cronbach's α for the scores of understanding of HIV/AIDS prevention was not sufficiently high, while Cronbach's α for the scores in the understanding of HIV/AIDS prevention, and number of information sources were high. In addition, the Spearman's rank correlation coefficient between the scores was not high or statistically

significant. Second, the respondents of this study may not be representatives of AYA in urban and rural areas because the influences of social norms and traditional culture in urban and rural areas may differ. The accessibility and availability of sexual and reproductive health information may also be different from other areas of Tanzania. Third, AYA in and out of school may display different characteristics regarding their health literacy level and sociocultural conditions³³). AYA who are not in school might have more risky sexual behaviors than AYA who are in school³⁴). This study only addressed AYA in Tanzanian schools; therefore, it is not appropriate to generalize the findings from this study to all AYA regardless of school enrollment. Fourth, self-reported data might be under- or over-estimated compared with the actual situation. Fifth, the data collection of this study was performed 2 years prior to the writing of the manuscript. The presence and frequency of the utilization of devices for Internet access and social media has most likely changed during these years. Thus, the distribution of the most useful information sources among AYA currently differs from the time of data collection, and the Internet and/or social media may have become more dominant than the situation stated in this study. Although this study had several limitations, it is important to continue to monitor and report the perceptions and behaviors of AYA related to sexual and reproductive health because the dissemination of information and knowledge by reliable influencers should be ensured.

Conclusion

The factors associated with the awareness of contraceptive methods, the understanding of HIV/AIDS prevention, and the perceptions of HIV/AIDS risk were not consistent among secondary school students in Tanzania. To improve the sexual and reproductive health, including the awareness of contraceptive methods, an understanding of HIV/AIDS prevention, and perceptions of HIV/AIDS risk among AYA (including secondary school students), sexual and reproductive health educational programs should be integrated and holistically provided under supportive conditions.

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