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Factors associated with HIV infection among Adolescent Girls and Young Women aged 15-24 years enrolled in Adolescent Girls and Young Women program in Southern Province, Rwanda, 2025

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Abstract

Introduction: HIV remains a significant global public health challenge, with adolescent girls and young women (AGYW) aged 15–24 years disproportionately affected, particularly in sub-Saharan Africa. In Rwanda, the Southern Province has the second-highest HIV prevalence (3%) among AGYW in 2022/2023, yet limited research exists on the factors associated with that infection. This study aims to investigate factors associated with HIV infection among AGYW in the Southern Province, Rwanda.

Methods**:** A cross-sectional study design was used, with a sample of 1275 participants. From a total of 129 health centers, 35 health centers were selected randomly using Excel software, and the participants were selected systematically among the AGYW who attended the AGYW routine program. Data were collected through structured questionnaires and analyzed using Stata software version 17. Descriptive statistics were used to summarize the characteristics of participants. Bivariate and multivariable analyses were conducted to identify factors associated with HIV infection among AGYW. Results are presented as odds ratios (OR) and adjusted odds ratios (aOR) with 95% confidence intervals (CI).

Results**:** A total of 1275 of the total AGYW enrolled in the AGYW program participated in this study; of whom 199 (15.6%)were living with HIV. The majority of respondents were single, 1092 (85.65%), while (994) 77.97% were aged 20-24 years. The identified factors associated with HIV infection among AGYW were: orphanhood (aOR=2.17,95% CI[1.09- 4.33]), sexual violence experience (aOR = 2.95, 95% CI [1.42- 6.14]), inconsistent condom use with primary partners (aOR = 6.97,95% CI [4.51-19.34]), history of use of injectable drugs (aOR = 4.45, 95% CI [1.39- 14.27]), and disagreement with refusing sex without a condom (aOR = 4.50, 95%CI [2.08- 9.75]).

Conclusion: The findings support the need for interventions to provide psychosocial support at the community level, increase access to PEP for GBV cases, conduct awareness on condom use, strengthen the youth-friendly corner, and empower HIV education and prevention to reduce HIV infection among AGYW.

Keywords: Adolescent girls and young women, Southern Province, HIV infection, cross-sectional study, Associated factor

Background

Globally, human immunodeficiency virus (HIV) remains a public health concern, with approximately 39 million people living with HIV (1). Women and girls account for 46% of all people living with HIV globally, including 1.9 million adolescent girls and young women (AGYW) aged 15–24 years(2). In 2023, an estimated 4,000 AGYW in this age group were newly infected with HIV every week, with around 77% of these new infections occurring in sub-Saharan Africa(3). One-third of all people living with HIV live in Africa, even though the epidemic's burden varies greatly between nations and regions(4). Sub-Saharan Africa is reported to have the highest burden of HIV in the world, with 21 million people living with HIV in 2019 (5).

The national HIV prevalence rate is estimated to be 2.7% in 2025(6). AGYW are classified among higher-risk groups for HIV infection, with their prevalence among AGYW aged 15-24 estimated to be higher(7). The Southern Province is classified as the second province with a higher HIV infection rate of 3% after Kigali, which had 5% among AGYW in 2022/2023 (8).

High risk behaviors AGYW including three or more lifetime sexual partners and early sexual debut experienced before 18 years old, are associated with new HIV infection among this group (9). Exchanging sex for money or other benefits is also associated with HIV acquisition among women(10). Peer and social networks likewise have a significant influence on sexual behavior; in particular, AGYW are more likely to acquire HIV if they belong to social groups that encourage risky sexual conduct (9). According to the Rwanda National Institute of Statistics Report 2021, the HIV infection rate among individuals seeking HIV testing and counseling (HTC) services in the Southern Province was estimated at 0.2% (11). However, early sexual debut was reported at 6.3% before age 15 among AGYW, which may be another contributing factor not fully captured by these national statistics (12). Still, there is limited information on the underlying factors associated with HIV infection among AGYW in the Southern Province of Rwanda**.** We conducted this study to determine the proportion of HIV infection and associated factors among adolescent AGYW aged 15-24 years in the Southern Province of Rwanda.

METHODS

Study design and setting

This study used a cross-sectional design to determine the proportion of HIV infection and associated factors among AGYW aged 15–24 years enrolled in the AGYW program at selected health centers in the Southern Province of Rwanda. This province was selected as the study setting due to its relatively high HIV infection rate among AGYW in 2022/2023, as well as its wide coverage and active implementation of the AGYW program across all districts. The program is implemented at the health center level, offering services such as HIV testing and counseling, sexual and reproductive health education, psychosocial support, life skills training, economic empowerment, and referral to care and treatment services.

Study population

The study focused on AGYW aged 15 to 24 years residing in the Southern Province and enrolled in the AGYW program in the same province. Although Rwanda's AGYW program targets girls and women aged 10–24 years, this study excluded those aged 10–14 years, as they are generally not sexually active, have limited exposure to many HIV-related behavioral risk factors, and require parental or guardian consent to participate.

Participants were eligible for inclusion if they were AGYW aged 15 to 24 years who attended the AGYW program at a selected health facility between May 19th and June 19th, 2025, resided in the Southern Province, were enrolled in the AGYW program in the Southern Province, and provided consent to participate.

We excluded participants who did not reside in the Southern Province or were not enrolled in the AGYW program there.

Sampling Techniques

A multi- stage sampling techniques was used to select health facilities and participants.in the first stage, thirty-five health centers were selected randomly using Excel software from Health centers implementing AGYW program in southern province. In the second stage, participants from selected health centers were selected using systematic random sampling. At each selected health center, the sampling interval (k) was calculated by dividing the facility's AGYW population by the required sample size at that facility, and a random starting point between 1 and k was generated. Every kth AGYW who visited the health center thereafter was selected to participate in the study.

Sampling and sample size calculation

The formula of Cochran related to a cross-sectional study was used to determine the sample size.

Step 1: Sample size calculation for the required number of AGYW:

$$n = Z^2 \frac{P(1-P)}{e^2}$$

Where:

- n = required minimum sample size
- Z= Z-score for 95%confidence level (1.96).
- p = estimated prevalence of HIV among AGYW in Southern Province is 0.03.
- e= margin of error (1.5% or 0.015).

$$n = Z^2 \frac{P(1-P)}{e^2} = 1.96^2 \frac{0.03(1-0.03)}{0.015^2} \approx 497$$

Step 2: A design effect of 2.0 was applied due to cluster sampling, and an additional 10% was added to account for possible non-response or missing data

- Adjusted sample size=497×2.0 =994
- Sample size + sample size×0.10n adjusted= 994+ (994×0.10) = 1093.4
- Adjusted sample size =1093

Step 3**:** Based on the budget & data collection timeline limitations, 30 health facilities were visited in the Southern Province

1093 AGYW/30 health facilities = number of AGYW to be interviewed at each health facility = 36.4 ≈ 37

Step 4**:** Adjust the number of health facilities to select by including 5 additional health centers to increase the number of participating facilities and improve geographical coverage of the study.

- Add 5 health facilities
- Total number of health facilities to visit is 35 facilities, and the final sample size = 35 facilities × 37 AGYW = 1295
- The sample became less than this after removing records with incomplete information**.**

The sampling procedures used to determine the study sample and select participating health facilities is illustrated in Figure 1 shown below.

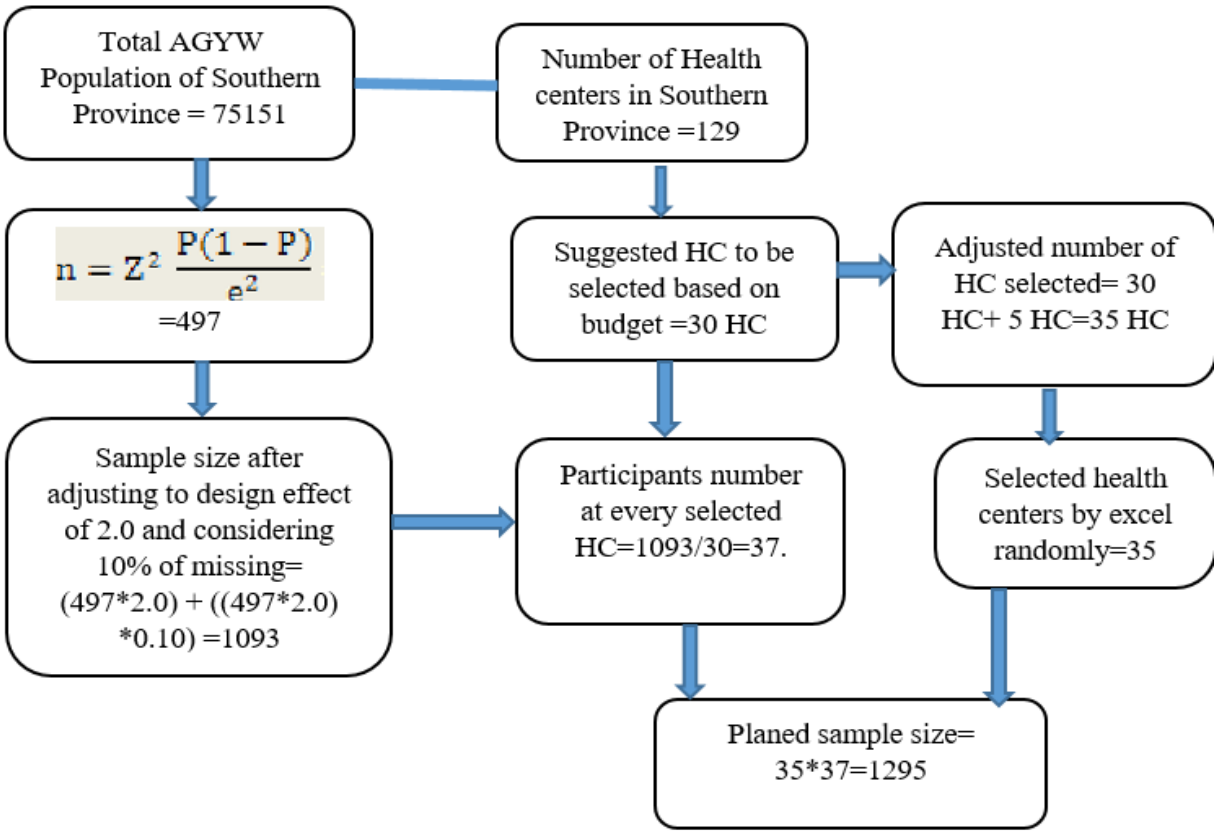

Figure 1: Flow diagram of study population and participant sampling

Data collection method

Data were collected using a structured questionnaire developed for this study based on the study objectives and variables of interest and we conducted a review of published literature on HIV infection associated factors among AGYW (13). This questionnaire also adapted to the context of Rwanda, before data collection, data collectors working within the AGYW program at the selected health centers received training on the study objectives, questionnaire administration, participant recruitment, informed consent procedures, and data collection using KoboToolbox. The questionnaire was pilot-tested among AGYW in an area outside the study sites to assess the clarity, relevance, and comprehensibility of the questions and to identify potential logistical and procedural challenges. Feedback from the pilot test was used to revise the questionnaire and improve the data collection procedures before the main study.

The tool was adapted to the Rwandan context, and pilot-tested in an area outside the study setting to refine its content and structure. The pilot helped identify and address potential problems such as unclear questionnaire items, logistical difficulties, or procedural issues before data collection began, and feedback from the pilot was used to make necessary adjustments to the questionnaire and data collection procedures. The recruitment of participants among AGYW who sought AGYW program services during the data collection period.

Variables

The questionnaire covered four sections: social demographic characteristics, socioeconomic factors, sexual and behavioral factors, and knowledge and perception related to HIV infection.

Dependent Variable**:** The outcome variable of this study was HIV infection status, which was categorized into a binary variable: HIV-positive or HIV-negative, coded as 1 for HIV positive and 0 for HIV-negative results. This variable was confirmed through a medical records review (AGYW register).

Independent Variables: Demographic factors, Socio-economic factors, Proximate factors, and Health care system factors

Data management

The completed questionnaires collected via the KoboToolbox were imported into Excel for validation, identifying out-of-range values, outliers, inconsistencies, missing values, and discrepancies, and cleaning. The questionnaire had four parts; the first part was for the purpose of collecting demographic and general information regarding the AGYW. The next three parts collected data on socio-economic factors, sexual behavioral health system, and knowledge of HIV/. Each of these questions in the last three parts is composed of closed-ended questions. Then the data was exported to STATA software version 17 for cleaning, coding, and analysis.

Data analysis procedure

STATA software version 17 was used for analysis. Descriptive statistics were used to summarize the characteristics of participants. Bivariate analysis was used to assess the association between each dependent variable and the likelihood of HIV infection among AGYW (15–24 years). The variables

with a p-value <0.2 in bivariate analysis were used in multivariable logistic regression to identify factors associated with HIV infection among AGYW. The statistical tests were performed at a 95% confidence level, with a p-value <0.05 considered statistically significant. The results were presented in table form to facilitate interpretation and dissemination.

RESULTS

HIV Proportion Among AGYW enrolled in AGYW program in Southern Province

A total of 1275 AGYW participated in this study after removing 20 records with incomplete information, of whom 199 (15.6%) were living with HIV infection, and 1076 (84.4%) AGYW were HIV negative. This corresponds to an HIV proportion of 15.6% among AGYW enrolled in the program.

Descriptive statistics of demographic characteristics of participants

As shown in Table 1, this study, the majority of AGYW were single or unmarried (85.65%). The most of participants were Christians (79.61%) and were aged between 20 and 24 years(77.97%) , the mean age was 21.46 years, while the minimum age of respondents was 15 years and the maximum age was 24 years. Among of AGYW participated in the study 31.92% reported a history of sexual violence, whereas 56.00% of those with GBV reported sexual violence. Furthermore, the majority of respondents completed secondary school or higher (43.06%), among of them (16.76%) were living with HIV. However, 72.71% were unemployed, and 16.87% of those unemployed were living with HIV.

Table 1: descriptive analysis of socio-demographic and economic characteristics of AGYW and their HIV status

Variables	HIV Positive n(%)	Total n(%)
Age group n=1275		
15-19years	69(24.56)	281(22.04)
20-24 years	130(13.08)	994(77.96)
Marital status n=1275		
Cohabitated/married	19(10.38)	183(14.35)
Single/unmarried	180(16.48)	1092(85.65)
Orphanhood n=1275		
Yes	134(23.84)	562(44)
No	65(9.12)	713(55.92)
GBV Case n=1275		
Yes	122(29.98)	407(31.92)
No	77(8.87)	868(68.08)
Type of GBV experienced n=350		
Sexual violence	48(24.12)	197(48.40)
Physical violence	17(8.54)	153(37.59)
Other	57(28.64)	57(14.00)
Education level n=1275		
None	34(15.81)	215(17)
Primary	73(14.29)	511(40.08)
Secondary or higher	92(16.76)	549(43.06)
Occupation n=1275		
unemployed	156(16.83)	927(72.71)
employed	43(12.36)	348(27.29)

Sexual behavior characteristics of participants

As shown in table 2, Around 33% reported having their first sexual experience before 15 years, of whom 19.44% were living with HIV. While individuals with more than one sexual partner accounted for 96.86% of respondents and of whom 15.63% living with HIV. Regarding the condom use, 78.510% of respondents reported irregular use of condoms with a primary partner, and 18.68% were living with HIV. Among the total respondents, commercial sex work was reported by 20.63%, with the higher rate of HIV infection of 23.19%. A total of 38.51% had history of STIs, while 18.33% of them were living with HIV infection.

Table 2: Descriptive analysis of sexual behaviors of AGYW with their HIV status, in Southern Province, Rwanda

Variables	HIV Positive	Total
	n(%)	n(%)
Age of first sex n=1275		
Under 15 years	83(19.44)	427(33)
15 years and more	116(13.68)	848(67)
Number of sexual partners n=1275		
one partner	6(15.00)	40(3.14)
more than one partner	193(15.63)	1235(96.86)
Regular use of condom with the primary partner =1275		
Always	12(4.38)	274(21.49)
Sometimes/never	187(18.68)	1001(78.51)
Regular use of condoms with casual partners n= 1275		
Always	5(5.56)	90(7.06)
Sometimes/never	194(16.37)	1185(92.94)
History of commercial sex worker n=1275		
Yes	61(23.19)	263(20.63)
No	138(13.64)	1012(79.37)
Use of drug injection n=1275		
Yes	21(26.92)	78(6.12)
No	178(14.87)	1197(93.88)
History of STIs n=1275		
Yes	90(18.33)	491(38.51)
No	109(13.90)	784(61.49)
PreP drugs use n=1275		
Yes	83(20.19)	411(32.24)
No	116(13.43)	864(67.76)

Descriptive analysis of health system and HIV knowledge Characteristics

Table 3 in the annex summarizes the results of descriptive analysis of health system and HIV knowledge perception among 1275 AGYW. The majority of AGYW 55.61% reported living within a distance of more than 60 minutes walking distance from a health center on foot, of whom 16.36% were living with HIV. The Majority of participants (88.78%) had health insurance, and 16.43% of them were living with HIV infection. Furthermore, 56.94% used to attend ASRH services. Regarding to HIV knowledge and perceptions 6.82% of participants reported that they believed that HIV can

be cured, of whom 40.23% were living with HIV infection. Although the Majority (64.71%) of the AGYW disagreed with the statement that HIV is a punishment for misconduct, 17.33% of those who disagreed with that statement were living with HIV infection. Furthermore, regarding the negotiation of engaging in sex without a condom, more than half (52.86%) were unable to refuse sex without a condom, while 21.66% of them were living with HIV infection.

Bivariate Analysis of socio-demographic and economic factors associated with HIV infection

Table 4 represents the bivariate analysis on socio-demographic and economic factors with the following results: The odds of HIV infection among AGYW aged 15-19 years had more than twice the odds of HIV infection (OR = 2.16; 95% CI [1.55–3.00]) compared with those aged 20-14 years. Single/unmarried AGYW had 1.70 times higher odds of HIV infection than those who cohabitating or married (OR = 1.70; 95% CI [1.03- 2.81]). Regarding orphanhood, orphans had 3.12 times higher odds of HIV infection than non-orphans (OR = 3.12; 95% CI [2.26–4.30]). AGYW who reported experiencing gender-based violence had more than four times higher odds (OR=4.39, 95% CI [3.20-6.03]) compared to their counterparts. Among of those who reportd experiencing Gender based violence, those reported sexual violence for AGYW had 2.57 times higher odds (OR = 2.57, 95% CI [1.41–4.69]) of infection than who reported other types of violence. while unemployed AGYW had 1.43 times higher odds (OR = 1.43; 95% CI [0.99–2.06]) compared to their counterpart in the employed group.

256 Table 4: Bivariate analysis of demographic factors associated with HIV among AGYW, in
257 southern province, time period

Variables	HIV Positive	OR [95% CI]	P-Value
	n(%)		
Age group			
15-19years	69(24.56)	2.16 [1.55- 3.0]	<0.001
20-24 years	130(13.08)	Ref	
Marital status			
Cohabitated/married	19(10.38)	Ref	
Single/unmarried	180(16.48)	1.70[1.03- 2.81]	0.037
Orphanhood			
Yes	134(23.84)	3.12 [2.26- 4.30]	<0.001
No	65(9.12)	Ref	
GBV Case			
Yes	122(29.98)	4.39[3.20- 6.03]	<0.001
No	77(8.87)	Ref	
Type of GBV experienced			
Sexual violence	48(24.37)	2.57 [1.41- 4.69]	0.002
Physical violence	17(11.11)	Ref	
Education level			
None	34(15.81)	0.93 [0.60- 1.43]	0.752
Primary	73(14.29)	0.82 [0.59- 1.15]	0.268
Secondary or higher	92(16.76)	Ref	
Occupation			
Unemployed	156(16.83)	1.43 [0.99-2.06]	0.05
Employed	43(12.36)	Ref	

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Bivariate Analysis of Sexual behavior factors associated with HIV infection

Table 5 represents a bivariate analysis of sexual and behavioral factors associated with HIV infection among AGYW. AGYW who reported that they started sexual activities before 15 years old had 1.52 times higher odds of HIV infection than those who started sexual activities over 15 years old (OR = 1.52, 95% CI [1.12–2.07]). Regarding commercial sex workers, those who have ever been commercial sex workers had 1.91 times higher odds of HIV infection with (OR = 1.91, 95% CI [1.36–2.68]) compared with those without such history. The inconsistent use of condoms with primary partners had 5.01 times higher odds of HIV infection (OR = 5.01, 95% CI: [2.75- 9.13]). The use of injectable drugs had 2.1 times higher odds of HIV infection (OR = 2.1, 95% CI: [1.25–3.56]) compared to those who did not use injectable drugs. Moreover, participants with a history of sexually transmitted infections (STIs) had higher odds of HIV infection compared with those without a history of STIs (OR = 1.38, 95% CI: [1.02–1.88].

Table 5: Bivariate analysis of sexual behavior factors associated with HIV, in Southern province, Rwanda,2025

Variables	HIV Positive n(%)	OR [95% CI]	P-Value
Type of sex			
Both Type	11(39.39)	Ref	
Vaginal	174(15.41)	3.55 [1.63- 7.71]	0.001
Age of first sex			
Under 15 years	83(19.44)	1.52 [1.12- 2.07]	0.008
15 years and more	116(13.68)	Ref	
Regular use of condom with primary partner			
Always	12(4.38)	Ref	
Sometimes/Never	187(14.67)	5.01[2.75- 9.13]	<0.001
Regular use of condom with casual partners			
Always	5(5.56)	Ref	
Sometimes/never	194(15.22)	3.32[1.33- 8.30]	0.010
History of commercial sex worker			
Yes	61(23.19)	1.91 [1.36- 2.68]	<0.001
No	138(13.64)	Ref	
Use of drug injection			
Yes	21(26.92)	2.1 [1.25- 3.56]	0.005
No	178(14.87)	Ref	
History of STIs			
Yes	90(18.33)	1.38 [1.02- 1.88]	0.035
No	109(13.90)	Ref	

Bivariate Analysis of Health system and HIV knowledge factors associated with HIV infection

The results presented in Table 6 show that AGYW who did not receive HIV education and knowledge from a care provider had 1.71 times higher odds of HIV infection (OR = 1.71, 95% CI: [1.25–2.34]) compared with those who received such education. Additionally, participants who agreed that HIV can be cured had more than four times higher odds of HIV infection (OR = 4.2, 95% CI: [2.65–6.65]). Furthermore, AGYW who disagreed with being able to refuse sex without a condom had 7.05 times higher odds of HIV infection compared with those who agreed that they can refuse to have sex without a condom (OR = 7.05,95% CI: [4.67–10.66]), moreover, those who were unsure also had higher odds of HIV infection compared with those who agreed that they can refuse to have sex without a condom (OR = 1.82; 95% CI: [1.26–2.65]). On the other hand, having health insurance was associated with lower odds of HIV infection compared with not having health insurance (OR = 0.5, 95% CI: [0.28–0.91]). Similarly, participants who reported not having used PrEP had lower odds of HIV infection compared with those who had used PrEP (OR = 0.61; 95% CI: 0.44–0.84]).

Table 6: Bivariate analysis of sexual behaviors factors associated with HIV, Southern province, Rwanda,2025

Variables	HIV Positive n(%)	OR [95% CI]	P-Value
Having health insurance			
Yes	186(16.43)	Ref	
No	13(9.09)	0.50 [0.28- 0 .91]	0.025
Ever used PreP drugs			
Yes	83(20.19)	Ref	
No	116(13.43)	0.61 [0.44- 0.835]	0.002
Received HIV education from care provider			
Yes	70(11.90)	Ref	
No	129(18.78)	1.71 [1.25- 2.34]	0.001
HIV Can be cured			
Agree	35(40.23)	4.20 [2.65- 6.65]	<0.001
disagree	164(13.80)	Ref	
Refusal to have sex without condom			
Agree	53(8.82)	Ref	
disagree	71(40.57)	7.05 [4.67- 10.66]	<0.001
unsure	75(15.03)	1.82 [1.26- 2.65]	0.002

Multivariable Analysis/Factors associated with the outcome variable

Regarding to the Table 7 represents multivariable analysis factors associated with HIV infection among AGYW. Orphans AGYW had more than two times higher odds of HIV compared with those who were non orphans (aOR = 2.17, 95% CI [1.09- 4.33]) . Regarding gender-based violence (GBV),

thse who experience GBV had significantly associated with higher odd of HIV infection compared with those who did not report GBV (aOR = 4.78; 95% CI: [3.22–7.09]). However, AGYW reported to be experience sexual violence had more than two times higher odds of HIV infection compared with those who reported physical violence or other (aOR = 2.95,95% CI [1.42- 6.14]). Moreover, the odds of AGYW who used condoms inconsistently or no condom use with their primary partners was strongly associated with HIV infection (aOR = 6.97, 95% CI [2.51-19.34]) than those who always used them with primary partners. Furthermore, the odds of HIV infection of use of injectable drugs had 4.45 times higher odds of HIV infection (aOR = 4.45, 95% CI [1.39- 14.27]) compared to those who did not report injectable drug use. The odds of HIV infection of belief that HIV can be cured were 4.69 times higher odd of HIV infection (aOR = 4.69, 95% CI [1.56-14.07]) compared with those who disagreed that HIV can be cured. However, the odds of HIV infection for AGYW who disagreed to refused sex without a condom were 4.50 times higher odd of HIV infection compare with could refuse sex without a condom (aOR = 4.50, 95% CI [2.08- 9.75]), (see the table 7 the annex of this document).

DISCUSSION

This study, conducted among AGYW enrolled in the AGYW program in Southern Province Rwanda, found that the proportion of HIV infection among AGYW was 15.6%. The findings of this study were aligned with a study conducted in Rwanda a (2019) among female sex workers, which revealed that the HIV prevalence among female sex workers was 34%. Those levels of HIV prevalence may be caused by lower access and utilization of prevention strategies(14).

The study showed that HIV infection was associated with the marital status of AGYW. The risks of HIV infection were two times higher for single/unmarried AGYW compared to the married/cohabiting group. Similar findings were also presented in Kigali (2023), which found that there is an association between HIV infection and single status among AGYW, and recommends strong awareness of HIV prevention among single AGYW. The results suggested that the single AGYW had great exposure to multiple partners and less control over their partners.

Orphans are at risk of HIV infection, which could be due to economic hardship and lack of parental hood, which might lead them to engage in risky behaviors like early sexual debut or sexual exchange with money. A similar study conducted in South Africa (2022) revealed that orphans were 4 times more at risk of HIV infection than those with at least one parent (16,17), the study conducted in sub-

Saharan Africa(2022) revealed that orphans were at risk of HIV infection through forced polygamous marriage or sexual relationships (18).

AGYW who have experienced sexual violence or sexual assault were at higher risk of HIV infection compared to those who faced other types of violence or not, as sexual violence exposes the victims to unprotected sex. At the same time, the WHO report (2021) revealed that adolescent girls who experienced sexual violence were 1.5 times more likely to acquire HIV than their counterparts (19). AGYW who used to inject drugs were 2.89 times more likely to acquire HIV infection; this risk is linked to needle sharing and leads to unsafe sex. These findings align with previous research conducted in lower- and middle-income countries (2022) reported that People who used to inject drugs were at higher risk of HIV infection(20). According to the UNAIDS report of 2023, the prevalence of HIV infection is high among women injected drugs(21).

The findings of this study of factors associated with HIV infection among AGYW in Southern Province revealed that factors like education level, and ubudehe categories, were not associated with HIV infection however the study conducted in South Africa (2018) revealed that education level had no significant association between HIV infection and AGYW(7), the study conducted in 11 African countries (2024) revealed that educational level, wealth quantile of AGYW were not associated with new HIV infection (9). However the study goes in contrast with the WHO report (2019) revealed that AGYW aged 15-24 years with lower economic status which may lead to lower education level may results in missing knowledge and HIV skills of protecting themselves from HIV infection(22) and the study conducted in Uganda (2024) revealed wealth index was not associated with HIV infection among AGYW(23).

Inconsistency or no use of condoms for primary partners was more likely to lead to acquiring an HIV infection via unprotected sex with different partners. This finding is align with the study findings conducted in Tanzania (2021) which revealed that the AGYW who engaged in sex without condom with their partners were 1.12 times higher odds of HIV infection(24) while the study conducted in south Africa(2021), revealed that AGYW reported the partners hit them when they request them to use condom which expose them to be at risk of HIV infection(25), according to the study conducted among GYWs in 11 countries of Africa (2024) revealed that Lower condom use and multiple partners increased the risk of HIV infection among AGYW(9). Additionally having ever engaged in commercial sex work or sex for money exchange leading to having sex with more partners, lacking power of condom negotiation for use with partners was more risk of HIV infection, this study reveal

similar finding with the study conducted in Rwanda/Kigali city (2023) revealed that AGYW who had ever engaged in commercial sex work were 2.04 time more likely to acquire HIV new infection than their counterpart(15).

The study revealed that AGYW who did not receive HIV education were more likely to lack awareness, but causality cannot be confirmed, as it may reduce the individual's ability to access, understand, and act upon HIV health information. As a result, individuals with lower HIV health educational attainment may be less likely to use HIV prevention strategies, increasing their vulnerability to infection. This finding aligns with study findings conducted in Rwanda/Kigali city (2023), which revealed that one of the strong strategies for reducing HIV infection among AGYW is to reinforce HIV awareness through health education(15)

The study revealed that, in bivariate logistic regression, no barrier to accessing health centers was associated with HIV infection; this may be due to the government project to construct health facilities near people in every sector. However, these findings go in contrast with the UNAIDS report of HIV(2014), which reported that limited access to health care and education limits AGYW from protecting HIV infection themselves against HIV infection(26). The study also revealed that AGYW who believe that HIV can be cured were associated with HIV infection, this may be due to the fact that AGYW may not engage in self-protection, adherence to ART, or other prevention measures as they believe that HIV is a simple and cured diseases that lead them to exposure to HIV infection.

limitations

- As a cross-sectional study, establish an association between independent variables rather than causality.
- Self-reported data on behavioral characteristics, including drug usage and sexual behaviors, may have recall bias.
- The results may not apply to all AGYW in Rwanda because the study was limited to districts in the Southern Province.
- AGYW were recruited from selected health centers, which limits the findings to represent AGYW who didn't enroll in AGYW program.

Strengths

- High proportion of HIV infection among AGYW in Southern Province offers valuable insight for targeted interventions

- By adjusting for potential confounders trough multivariable analysis, the study provides more accurate estimates of independent associations between risk factors and HIV infection among AGYW
- The inclusion of large sample size enhances the statistical power and precision of the findings
- Findings can inform national HIV prevention strategies targeting AGYW in Rwanda, especially around education, sexual health, and access to services like PrEP.

Conclusion

In the Southern Province of Rwanda, the proportion of HIV among AGYW was 15.6%. This study found a substantial burden of HIV infection among adolescent girls and young women (AGYW) aged 15–24 years enrolled in the AGYW programme in Southern Province, Rwanda. HIV infection was significantly associated with inconsistent condom use (aOR=6.97), gender-based violence (aOR=4.78), belief that HIV can be cured (aOR=4.69), injectable drug use (aOR=4.45), sexual violence (aOR=2.95), and orphanhood (aOR=2.17). These findings highlight that HIV vulnerability among AGYW is influenced by interconnected behavioral, social, and structural factors. Therefore, HIV prevention programmes should strengthen combination prevention approaches that promote consistent condom use, accurate HIV knowledge, HIV testing and appropriate biomedical prevention options such as PrEP, while integrating gender-based violence prevention, early identification and referral services, and targeted interventions for AGYW experiencing social vulnerabilities. Addressing these factors through integrated, adolescent-friendly and context-specific interventions is essential to reduce HIV vulnerability and new HIV infections among AGYW in Rwanda.

LIST OF ACRONYMNS AND ABBREVIATIONS

DHS: Demographic and Health Survey

AGYW: Adolescent Girls and Young Women

WHO: World Health Organization

HMIS: Health Management Information System

HC: Health centers

HIV: human immunodeficiency virus

CI: Confidence interval

OR: Odds Ratio

AOR: Adjusted Odds Ratio

MOH: Ministry of Health

AIDS: Acquired immunodeficiency syndrome

RPHIA: Rwanda Population-based HIV Impact Assessment

ASRH: Adolescent Sexual and Reproductive Health

GBV: Gender based Violence

PrEP: pre-exposure prophylaxis

STIs: sexual transmitted infection

PEP: Post exposure prophylaxis

DECLARATION

I, Alice Musabyeyezu, hereby declare that this dissertation entitled "Factors associated with HIV infection among adolescent girls and young women aged 15-24 years in selected facilities in Southern Province, Rwanda, 2025" is my original work and has not been submitted for any degree or qualification at any other university or institution of higher learning.

Ethical Approval

Ethical approval for the study was granted by the Institutional Review Board (IRB) of the College of Medicine and Health Sciences, University of Rwanda, with reference number CMHS/IRB/190/2025. The ethical clearance was obtained prior to the study. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. The intended participants were given information about the study and asked to formally sign a consent form (written in both English and Kinyarwanda) indicating their voluntary participation, the written

consent form contained full information about the purpose, procedures, risks, benefits and their right to withdraw from the study at any time to inform the participants. The written consent form was obtained from the participants aged 16-24 years old. For participants younger than 16 years, written informed consent was obtained from their parents or legal guardians before their daughters participated in the study and assent was obtained from the adolescent participants after the study had been explained to them in an age-appropriate manner. Participants were assured of their privacy and the explicit choice to discontinue the study at any time if desired. The participants were not asked about their names or any other type of identification. And their collected information was kept in a password-protected computer and accessed by only authorized persons.

Consent for Publication

Not applicable for this study

Data Availability and Materials

The data set collected in this study is not available to the public due to the data protection policies of the Rwanda Biomedical Center, but it is available from the author for reasonable requests and with RBC permission.

Competing Interest statement

The authors declare that there is no competing interest in this study

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Author contributions

A.M**:** Conceptualization of the study; developed the study methodology; conducted the literature review, data acquisition, and data analysis; drafted the manuscript; and reviewed the manuscript.

J.K.M and E.N**:** Conceptualization of the study, supporting the data analysis, reviewing and editing the manuscript, and co-supervision

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Annex

Table 3: descriptive analysis of health system and HIV knowledge characteristics of AGYW and their HIV status, in Southern province, time period

Variables	**HIV Positive**	**total**
	n(%)	n(%)
Distance to health center =1275		
Above 60 minutes	116(16.36)	709(55.61)
Between 30 and 60 min	65(14.61)	445(34.9)
Less than 30minute	18(14.88)	121(9.49)
Health insurance n=1275		
Yes	186(16.43)	1132(88.78)
No	13(9.09)	143(11.22)

Attendance of ASRH n=1275		
Yes	105(14.46)	726(56.94)
No	94(17.12)	549(43)
Barriers of accessing health services n=1275		
cost	61(18.60)	328(25.73)
Distance	49(14.16)	346(27.14)
None	42(14.43)	291(22.82)
stigma	47(15.16)	310(24.31)
Received HIV education from care provider n=1275		
Yes	70(11.90)	588(46.12)
No	129(18.78)	687(53.88)
Belief that HIV is a punishment for misconduct n=1275		
Agree	50(13.37)	374(29.33)
disagree	143(17.33)	825(64.71)
unsure	6(7.89)	76(5.96)
HIV Can be cured n=1275		
Agree	35(40.23)	87(6.82)
disagree	164(13.80)	1188(93.18)
Refusal to have sex without condom n=1275		
Agree	53(8.82)	601(47.14)
disagree	71(21.66)	674(52.86)

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593 Table 7**:** Multivariable analysis of factors associated with HIV among AGYW in Southern
594 Province, Rwanda

Variables	OR [95% CI]	P-Value	aOR[95% CI]	P-Value
Marital status				
Cohabitated/married	Ref			
Single/unmarried	1.70[1.03- 2.81]	0.037	2.29[1.03-10.47]	0.044
Age group				
15-19years	2.16 [1.55- 3.0]	<0.001	1.84 [0.88- 3.81]	0.100
20-24 years	Ref			
Orphanhood				
Yes	3.12 [2.26- 4.30]	<0.001	2.17 [1.09- 4.33]	0.027
No	Ref			
GBV Case				
Yes	4.39 [3.20- 6.03]	<0.001	4.78 [3.22- 7.09]	<0.001
No	Ref			
Specify the type of GBV you have experienced				
Sexual violence	2.57 [1.41- 4.69]	0.002	2.95[1.42- 6.14]	0.004
Physical violence	Ref			
Age of first sex				
Under 15 years	1.52 [1.12- 2.07]	0.008	1.52[0.78- 2.98]	0.217
15 years or more	Ref			
Regular use of condom with primary partner				
Always	Ref			
Sometimes/never	5.01[2.75- 9.13]	<0.001	6.97[2.51-19.34]	<0.001
History of commercial sex worker				
Yes	1.91 [1.36- 2.68]	<0.001	2.09 [0.94- 4.65]	0.069
No	Ref			
Use of injectable drugs				

Yes	2.1 [1.25- 3.56]	0.005	4.45[1.39- 14.27]	0.012
No	Ref			
Received HIV education from care provider				
Yes	Ref			
No	1.71 [1.25- 2.34]	0.001	1.35 [0.67- 2.71]	0.398
HIV Can be cured				
Agree	4.20 [2.65- 6.65]	<0.001	4.69[1.56-14.07]	0.006
disagree	Ref			
Refusal to have sex without condom				
Agree	Ref			
disagree	2.85[2.04- 4.00]	<0.001	4.50[2.08- 9.75]	<0.001

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Supplementary Files

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- ThesisAGYWsStructuredQuestionnaireenglishversion.docx