

# Low Awareness of Oral and Injectable PrEP Among High-risk Adolescent Girls and Young Women in Kampala, Uganda

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## Research article

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# Abstract

**Background:** Adolescent girls and young women (AGYW) account for a disproportionate number of new HIV infections worldwide, including Uganda. Although pre-exposure prophylaxis (PrEP) is a highly effective biomedical HIV prevention method, awareness of PrEP among AGYW in Uganda has not been studied systematically. We aimed to assess awareness of PrEP and factors associated with awareness of PrEP among AGYW.

**Methods:** We conducted a cross-sectional study among 14-24-year old AGYW at high risk of HIV infection in Kampala, Uganda from January to October 2019. Data on socio-demographics, behavioral and sexual risks were collected by interview. Awareness of oral or injectable PrEP, the latter of which is currently in late-stage trials, was defined as whether an individual had heard about PrEP as an HIV prevention method. Multivariable robust poisson regression model was used to assess factors associated with oral PrEP awareness.

**Results:** We enrolled 285 participants of whom 39.3% were under 20 years old, 54.7% had completed secondary education, 68.8% had multiple sex partners in the past 3 months, 8.8% were screened as high risk drinkers/ alcohol dependent (AUDIT tool) and 21.0% reported sex work as main occupation. Only 23.2% were aware of oral PrEP and 3.9% had heard about injectable PrEP. The prevalence of oral PrEP awareness was significantly higher among volunteers screened as alcohol dependents (aPR 1.89, 95% CI 1.08-3.29) and those with multiple sexual partners (aPR 1.84, 95% CI 1.01-3.35), but was lower among those who reported consistent condom use with recent sexual partners (aPR 0.58, 95% CI 0.37-0.91).

**Conclusions:** Majority of AGYW were not aware of any kind of PrEP. Those with higher risk behavior, i.e. alcohol dependents or multiple sexual partners, were more aware of oral PrEP. Interventions to increase awareness among female youth are needed. Improving PrEP awareness is critical to increasing PrEP uptake among high-risk AGYW in Uganda.

## Background

Although various HIV prevention interventions (biomedical, behavioral and structural) have mitigated the spread of HIV (1), the number of new cases among AGYW remains unacceptably high (2, 3). In 2019, an estimated 1.7 million adolescents aged 10–19 years were living with HIV across the globe of whom 10% were newly infected (4). In sub-Saharan Africa, AGYW account for 24% of new HIV infections (5) with an estimated HIV prevalence four times higher than their male peers (4, 5). Additionally, about 5,000 AGYW aged 15–24 years are newly infected with HIV every week (5, 6). In Eastern and Southern Africa alone, AGYW accounted for 26% of new infections in 2019 (5). Most of these are involved in high-risk sexual behavior including sex work and having multiple partners, which has accelerated the spread of HIV in this age group.

The World Health Organization (WHO) recommends the use of oral pre-exposure prophylaxis (PrEP) to reduce the number of new HIV infections among high-risk populations (7), and many national programs have adopted this biomedical HIV prevention strategy (8). Recent long-acting injectable PrEP findings have shown that it is safe and highly effective (9). Additionally there many products in the pipeline that are being evaluated for example the PrEP Implant (10). It is essential that awareness of these methods are built early at the population level. In 2018, of the 3 million people at substantial risk of HIV (11), only 381,580 people were taking oral PrEP worldwide. Of these, only 27% were from sub-Saharan Africa with a majority of these PrEP users being AGYW (12). By July 2020, an estimated 31,000–32,000 people were using PrEP in Uganda, which was lower than the Ministry of Health target of 90,000 people at risk (13).

PrEP is highly effective when adherence is good (14, 15). A sub study among partners in East Africa, found that high PrEP adherence (> 80%) was associated with 100% PrEP efficacy (16). However, there is limited awareness of oral PrEP as an HIV prevention method among populations at high risk for HIV in sub-Saharan Africa despite years of science and nascent programs to provide it (17). The prevalence of PrEP awareness among AGYW remains unknown within Uganda (18) and poor uptake has been reported (17, 19). Awareness of novel HIV prevention methods among key populations remains important as it will likely motivate uptake and adherence to future prevention products. We therefore need to improve understanding of awareness of both available and future HIV prevention methods. Literature suggests that most individuals at risk support PrEP usage once provided with details on its use and efficacy (20). Additionally a study among adolescents in the US reported that many persons at risk do not know how to access oral PrEP even if they are aware that they need it (21). A recent study among AGYW in South Africa found that only 19% were aware of PrEP, and family support and discussing HIV and sexually transmitted infections with sexual partners were associated factors for PrEP awareness (2). Also, a recent study among Black and Latinx adolescents in the US residing in higher prevalence areas revealed that only 38% knew about PrEP (22).

In recent clinical trials, injectable PrEP has proven to be 89% more effective than oral PrEP (9) and will likely be available as a prevention tool soon. Raising awareness of oral or injectable PrEP is a first and necessary step to increase their use among at-risk AGYW, yet data is still limited in Uganda. At the time when the Ministry of Health in Uganda was conducting trainings for health workers and rolling out oral PrEP to key populations, we enrolled a cohort of AGYW at risk of HIV infection. The aim of our study was to determine awareness of oral and injectable PrEP, and to assess factors associated with awareness of oral PrEP among high-risk AGYW in Kampala, Uganda.

## Methods

### Study design and setting

We conducted a cross-sectional analysis of PrEP awareness and associated factors measured from baseline data for a two-year cohort study. Between January and October 2019, 14-24-year-old AGYW were recruited from commercial hotspots (i.e., where sex work is prevalent) and slums of southern and northern Kampala, and invited to enroll into a cohort of AGYW at the Good Health for Women Project (GHWP) clinic located in a peri-urban community in southern Kampala (23). The clinic offered HIV prevention and care services, free general health care and reproductive health services to eligible high-risk women including female sex workers (FSWs).

### Study population and sampling design

We consecutively enrolled participants into the parent cohort study that was assessing knowledge and preferences of biomedical HIV prevention methods, and uptake of oral PrEP among at-risk 14-to-24-year-old females in Kampala. AGYW were enrolled in the cohort if they were HIV negative, Hepatitis B immune (through prior infection or vaccination) or willing to be vaccinated if susceptible, sexually active in the past 3 months, willing to use effective contraceptive methods, undergo regular HCT, pregnancy testing, and screening for sexually transmitted infections (STIs). Participants were excluded if pregnant or planning pregnancy in the next 12 months; had known allergy to components of oral PrEP drugs, contraceptives or Hepatitis B vaccine; and reported or were diagnosed with an illness that would affect participation in the study.

### Data collection

Trained research assistants collected data using standardized paper questionnaires administered face-to-face. We collected data on socio-demographic and risk behavior (i.e.: number of sexual partners; transactional, anal, group or forced sex; condom use with sexual partners; knowledge of sexual partners' HIV status; and having STIs). Data were double entered into an Open Clinica database by trained data entrants. Discrepancies were resolved by referring back to the source documents.

## Study variables

### Primary outcome:

Awareness of Oral PrEP was the primary outcome in this study and was measured as a binary variable (Yes/No). As a secondary outcome, awareness of injectable PrEP (a hypothetical product still in clinical trials at the time of this study) was also measured as a binary variable (Yes/No).

Volunteers were also assessed on; 1) their knowledge about of oral and injectable PrEP (Pills were demonstrated using samples at site), 2) the primary source of information for those who reported prior knowledge about these methods and 3) willingness to use these methods after explaining their benefits and frequency of use.

Independent variables included the following: socio-demographics factors included age, highest level of education (below or above primary level), marital status (married, separated, widowed, or single) and main occupation (sex work, no job, other).

Behavioural risk factors included alcohol consumption risk level and drug use. Drug use was defined as use of any illicit drugs in the past 1 month. Alcohol consumption risk level was based on the score of the Alcohol use disorders identification test (AUDIT) questionnaire (24). Participants were categorised as low risk (AUDIT score <8), moderate risk/hazardous (AUDIT score 8-19), and high risk/ dependent (AUDIT score  $\geq 20$ ).

Sexual risk factors included age at first sex, number of sexual partners in the past 3 months, consistent condom use with sexual partners in the past 3 months, transactional sex (receiving and/ or giving money and goods for sex), history of STI symptoms (abnormal discharge and/ or genital ulcer), frequent traveling away from home in the past 3 months and current contraceptive use.

## Statistical analysis

We analysed data using Stata version 15 (StataCorp, College Station, TX, USA). Baseline characteristics of the participants were summarised using frequencies and proportions. Chi-square and Fisher's exact tests were used to assess associations with awareness of oral PrEP. Univariable robust poisson regression was used to estimate crude prevalence ratios (PR) and 95% confidence intervals (CIs). Variables significant at  $p < 0.1$  and those hypothesized to be associated with the outcome based on prior knowledge (i.e., condom use, age and level of education) were selected for inclusion in a multivariable robust poisson regression model. We also tested for collinearity and for the variables that were found to be highly correlated with each other only one of these was selected and included in the final model. Tests for interactions between variables were conducted using the Wald test. The final model was selected based on variables that were found to be independently associated ( $P < 0.05$ ) with the outcome. After fitting the final model, adjusted prevalence ratios (aPR) and 95% CIs were obtained and reported.

# Ethical considerations

Ethical approval was obtained from the Uganda Virus Research Institute Research Ethics Committee (GC/127/18/06/658) and Uganda National Council for Science and Technology (HS2435). Participants gave written informed consent before being enrolled.

## Results

### Baseline characteristics

A total of 285 AGYW were enrolled and we included all in our current analysis. The mean age was 19.9 (SD±2.24) years; 39.3% (112) were younger than 20 years old (Table 1); 54.7% had completed secondary education or greater; 57.2% were single and 21.0% reported sex work as their main occupation. The proportion of participants that were alcohol dependent based on the audit score, reported illicit drug use in the past one month, and reported frequent travelling away from home during the last 3 months were 8.8%, 84.6%, and 40.0%, respectively. Additionally, 80.0% of the participants had their first sexual encounter before the age of 18 years; 68.8% had multiple sexual partners and 73.3% reported consistent condom use in the last 3 months.

Table 1

Socio-demographic characteristics of adolescent girls and young women, Kampala, Uganda (Jan-Oct 2019)

| Variables (N=285)                                    | n                  | Col. % |
|--|--------------------|--------|
| Age at enrollment, mean (SD)                         | 19.9 ( $\pm$ 2.24) |        |
| Age group  |                    |        |
| 14-19  | 112                | 39.3   |
| 20-24  | 173                | 60.7   |
| Level of Education                                   |                    |        |
| None/Primary   | 129                | 45.3   |
| Secondary/Tertiary                                   | 156                | 54.7   |
| Marital Status                                       |                    |        |
| Married  | 84                 | 29.5   |
| Separated/Divorced                                   | 38                 | 13.3   |
| Single (never married)                               | 163                | 57.2   |
| Occupation   |                    |        |
| Sex work   | 60                 | 21.0   |
| Other  | 157                | 55.1   |
| No job   | 68                 | 23.9   |
| Alcohol consumption risk level                       |                    |        |
| Low risk drinking                                    | 196                | 68.8   |
| Moderate risk/ hazardous                             | 64                 | 22.5   |
| High risk/ Alcohol dependent                         | 25                 | 8.80   |
| Illicit drug use in the last one month               |                    |        |
| Yes  | 241                | 84.6   |
| No   | 44                 | 15.4   |
| Frequently stayed away from home in the last 3months |                    |        |
| Yes  | 114                | 40.0   |
| No   | 171                | 60.0   |
| Age at first sex                                     |                    |        |
| 9-17   | 228                | 80.0   |
| $\geq$ 18  | 57                 | 20.0   |
| Number of sexual partners in the last 3months        |                    |        |
| 1  | 89                 | 31.2   |
| $\geq$ 2   | 196                | 68.8   |

|   |     |      |
|---|-----|------|
| Reported consistent condom use in last 3 months |     |      |
| Yes   | 209 | 73.3 |
| No  | 76  | 26.7 |
| Transactional sex                               |     |      |
| Yes   | 264 | 92.6 |
| No  | 21  | 7.40 |
| STI test results (Chlamydia and Gonorrhea)      |     |      |
| Negative  | 210 | 74.7 |
| Positive  | 71  | 25.3 |
| Contraceptive use                               |     |      |
| Yes   | 158 | 55.4 |
| No  | 127 | 44.6 |
| Willingness to use oral PrEP                    |     |      |
| Yes   | 256 | 89.8 |
| No  | 29  | 10.2 |
| Willingness to use injectable PrEP              |     |      |
| Yes   | 255 | 89.5 |
| No  | 30  | 10.5 |

## Awareness of PrEP

The prevalence of oral PrEP awareness was 23.2% overall. The sources of this information for oral PrEP included peers or friends (54.6%), health workers (42.4%), media (7.6%), other (3.0%) and community leaders (1.5%). The proportion of participants with injectable PrEP awareness was much lower, at 3.9% (n=11), 6 of whom had also heard of oral PrEP. At the time of this writing, injectable PrEP was a hypothetical new prevention technology currently in phase III trials (including sites in fishing villages around neighboring Entebbe). For those who had heard about Injectable PrEP, 8 (72.7%) obtained this information from their peers, 3 (27.3%) from health workers and 1 (9.1%) from the media (Due to small numbers, we did not assess for factors associated with awareness of injectable PrEP, therefore the data for injectable PrEP are not presented in tables).

## Willingness to use oral PrEP

Following an explanation of the details of PrEP and its potential benefits, majority of the participants 256 (89.8%) and 255 (89.5%) were willing to use either oral or injectable PrEP respectively. The high pill burden was the main reason for non-willingness to use oral PrEP (22, 75.9%), whereas non-willingness for injectable PrEP usage was majorly explained by the fear of potential side effects (12, 40.0%).

## Factors associated with awareness of oral PrEP

Oral PrEP awareness was significantly higher among participants with more than one sexual partner compared to those with only one sexual partner (27.6% vs 13.5%;  $p=0.009$ ). Additionally, alcohol dependents were more aware about PrEP compared to the low risk drinkers. (48.0% vs 19.4%;  $p=0.006$ ) (Table 2).

#### Tables 2

Chi-square analysis for demographic and behavioral correlates of oral PrEP awareness among adolescent girls and young women, Kampala, Uganda (Jan-Oct 2019), N=285.

|  | Heard of oral PREP |         |
|--|--------------------|---------|
|  | n (row%)           | P-value |
| Overall  | 66 (23.2)          |         |
| Age group  |                    |         |
| 14-19  | 26 (23.2)          |         |
| 20-24  | 40 (23.1)          | 0.986   |
| Level of Education                                   |                    |         |
| None/Primary   | 31 (24.0)          |         |
| Secondary/Tertiary                                   | 35 (22.4)          | 0.751   |
| Marital Status                                       |                    |         |
| Married  | 14 (16.7)          |         |
| Separated/Divorced                                   | 10 (26.3)          |         |
| Single(never married)                                | 42 (25.8)          | 0.243   |
| Occupation   |                    |         |
| Sex work   | 20 (33.3)          |         |
| Other  | 34 (21.7)          |         |
| No job   | 12 (17.7)          | 0.088   |
| Alcohol consumption risk level                       |                    |         |
| Low risk drinking                                    | 38 (19.4)          |         |
| Moderate/Hazardous                                   | 16 (25.0)          |         |
| Alcohol dependent                                    | 12 (48.0)          | 0.006   |
| Illicit drug use in the last one month               |                    |         |
| Yes  | 15 (21.2)          |         |
| No   | 51 (34.1)          | 0.062   |
| Age at first sex                                     |                    |         |
| 9-17   | 58 (25.4)          |         |
| ≥18  | 8 (14.0)           | 0.068   |
| Number of sexual Partners in the last 3months        |                    |         |
| One  | 12 (13.5)          |         |
| ≥2   | 54 (27.6)          | 0.009   |
| Frequently stayed away from home in the last 3months |                    |         |
| Yes  | 33 (28.9)          |         |

|   |           |       |
|---|-----------|-------|
| No  | 33 (19.3) | 0.059 |
| Transactional sex                               |           |       |
| Yes   | 63 (23.9) |       |
| No  | 3 (14.3)  | 0.425 |
| Reported consistent condom use in last 3 months |           |       |
| Yes   | 44 (21.1) |       |
| No  | 22 (28.9) | 0.162 |
| STI test results (chlamydia and gonorrhoea)     |           |       |
| Negative  | 46 (21.9) |       |
| Positive  | 19 (26.8) | 0.402 |
| Contraceptive use                               |           |       |
| Yes   | 35 (22.2) |       |
| No  | 31 (24.4) | 0.653 |

In the adjusted analysis (Table 3), the prevalence of oral PrEP awareness was higher among participants who screened as alcohol dependent based on the AUDIT tool compared to those who were not (aPR 1.89, 95% CI 1.08-3.29). Also, the prevalence ratio comparing participants who reported multiple sexual partners to those with only one sexual partner was 1.84 (aPR 1.84, 95% CI 1.01-3.35). The prevalence of oral PrEP awareness was lower among participants who reported consistent condom use compared to those who did not use condoms with sexual partners in the past 3 months (aPR 0.58, 95% CI 0.37-0.91).

Table 3

Factors associated with awareness of oral pre-exposure prophylaxis among adolescent girls and young women, Kampala, Uganda (Jan-Oct 2019), N=285.

|   | uPR (95% CI)     | P-value | aPR (95% CI)     | P-value |
|---|------------------|---------|------------------|---------|
| Age group (Age at enrolment)                          |                  |         |                  |         |
| 14-19   | ref              |         |                  |         |
| 20-24   | 0.99 (0.64-1.53) | 0.986   | 0.93 (0.61-1.42) | 0.759   |
| Level of Education                                    |                  |         |                  |         |
| None/primary  | ref              |         |                  |         |
| Secondary/Tertiary                                    | 0.93 (0.61-1.42) | 0.751   | 1.02 (0.68-1.55) | 0.910   |
| Marital status  |                  |         |                  |         |
| Married   | ref              |         |                  |         |
| Separated/Divorced                                    | 1.58 (0.77-3.23) | 0.212   |                  |         |
| Single(never married)                                 | 1.54 (0.89-2.66) | 0.118   |                  |         |
| Occupation  |                  |         |                  |         |
| No job  | ref              |         |                  |         |
| Sex work  | 1.88 (1.01-3.53) | 0.047   | 1.53 (0.80-2.94) | 0.194   |
| Other*  | 1.22 (0.67-2.22) | 0.500   | 1.15 (0.64-2.09) | 0.621   |
| Alcohol consumption risk level                        |                  |         |                  |         |
| Low risk drinking                                     | ref              |         |                  |         |
| Moderate/Hazardous                                    | 1.28 (0.77-2.15) |         | 1.11 (0.65-1.90) | 0.677   |
| Alcohol dependent                                     | 2.47 (1.50-4.07) | 0.000   | 1.89 (1.08-3.29) | 0.024§  |
| Illicit drug use in the last one month                |                  |         |                  |         |
| No  | ref              |         |                  |         |
| Yes   | 1.61 (0.99-2.59) | 0.051   |                  |         |
| Age at first sex                                      |                  |         |                  |         |
| 9-17  | ref              |         |                  |         |
| ≥18   | 0.55 (0.27-1.09) | 0.087   |                  |         |
| Number of sexual partners in the last 3months         |                  |         |                  |         |
| One   | ref              |         |                  |         |
| ≥2  | 2.04 (1.15-3.62) | 0.015   | 1.84 (1.01-3.35) | 0.047§  |
| Frequently stayed away from home in the last 3 months |                  |         |                  |         |
| No  | ref              |         |                  |         |
| Yes   | 1.50 (0.98-2.28) | 0.059   |                  |         |
| Reported consistent condom use in last 3 months       |                  |         |                  |         |
| No  | ref              |         |                  |         |

|  |                  |       |                  |                    |
|--|------------------|-------|------------------|--------------------|
| Yes  | 0.72 (0.46-1.12) | 0.156 | 0.58 (0.37-0.91) | 0.019 <sup>§</sup> |
| Contraceptive use  |                  |       |                  |                    |
| No   | ref              |       |                  |                    |
| Yes  | 0.90 (0.59-1.38) | 0.654 |                  |                    |
| STI test results(Chlamydia and Gonorrhoea)   |                  |       |                  |                    |
| Negative   | ref              |       |                  |                    |
| Positive   | 1.22 (0.76-1.94) | 0.396 |                  |                    |
| uPR = unadjusted prevalence ratio; aPR = adjusted prevalence-ratio; 95% CI = 95% confidence interval, *Hospitality, Entertainment and any other job, <sup>§</sup> P<0.05 |                  |       |                  |                    |

## Discussion

We found only one in four AGYW participants had heard about oral PrEP, and fewer than one in twenty had ever heard about injectable PrEP, a hypothetical intervention still in clinical trials at the time of this study. We also found that most of the AGYW reported being willing to use either oral or injectable PrEP after being educated about these methods, including details on the mode of administration, frequency of use, and the fact that the drugs have been found effective in preventing HIV infection. Alcohol consumption risk, number of sexual partners and condom use were associated with Oral PrEP awareness. Our findings are consistent with other studies in sub-Saharan Africa, which have reported low oral PrEP awareness among high-risk populations (2, 17, 19, 25, 26). This finding could explain the observed low uptake of oral PrEP in the early oral PrEP implementation phase in several communities (27). Also within these diverse communities, there have been few awareness campaigns, which could also explain the low uptake (2, 28). On the other hand, low awareness of oral and injectable PrEP may be attributed to the fact that these prevention methods are new and have not been fully appreciated within these communities (29).

Participants with multiple sexual partners had a higher prevalence of oral PrEP awareness. Previous studies have reported similar findings (30, 31). Since exposure to multiple partners places individuals at higher risk of acquiring different diseases including HIV, individuals involved in such practice may be more likely to search for methods to protect themselves and this could explain the higher PrEP awareness we observe within this group in the current study. Also, it is likely that those with multiple sexual partners may have deeper social and peer-based networks, perhaps increasing their access to sources of information for health including PrEP (32).

The prevalence of oral PrEP awareness was higher among non-condom users. This is similar to results reported from a study in Kenya that assessed PrEP awareness among AGYW (33). One reason for this would be misconceptions about condom use that drives the search for alternative methods of protection other than condoms within this group of individuals (34, 35). Furthermore, it is likely that non-condom users just don't like condoms or cannot use condoms because sexual partners may control condom use in a relationship (36, 37). Non condom users may therefore be driven by the need to protect themselves from HIV to search for and learn about alternative novel methods such as oral PrEP. Oral PrEP has been identified as a more user friendly and user-controlled method for AGYW and likely a suitable alternative for those who may not have skills to negotiate condom use with sexual partners (38). Also, those who do not use condoms are likely to be more aware of PrEP in this population with a high prevalence of transactional sex. In our study setting, female sex workers are often offered higher fees by their clients in return for condomless sex (39). This

might explain why some participants prefer not to use condoms. In such circumstances, the need to protect themselves could lead them to search for or learn about more discrete methods that are not partner controlled e.g. oral PrEP (40, 41).

While our study suggests higher PrEP awareness among AGYW with alcohol dependence, other studies have reported PrEP awareness to be lower among persons with alcohol dependence compared to low risk alcohol consumers (30). The majority of volunteers (> 90%) in our study engaged in transactional sex; alcohol consumption in this context occurs within sex work venues such as bars and nightclubs often as a way of coping with sex work (42). It is possible that during the national oral PrEP roll out, the Ministry of Health and other stakeholders prioritized oral PrEP educational interventions in locations where key populations congregated, e.g., bars and nightclubs (43).

Peer influence was a key contextual factor contributing to awareness of oral PrEP. Peers with whom AGYW interacted were also potential sources of information about oral PrEP. Future HIV prevention interventions should leverage on peer to peer networks to not only increase awareness about oral PrEP but to influence uptake and adherence.

Alcohol dependent individuals tended to spend a long time away from their homes, which exposes them to meeting new people who may become sexual partners (44). This is consistent with results reported by several studies that have indicated a correlation between alcohol dependency and high-risk sexual behavior among young people (45, 46) and older populations at risk (47, 48). If aware of such risk, persons dependent upon alcohol may be more aware of the available methods that may protect them from contracting HIV.

Our study has three main limitations. First, this study focused on AGYW at risk within peri-urban areas and results may not be generalizable to at-risk AGYW found in rural areas and other regions of sub-Saharan Africa. Second, it was a cross-sectional study and so we were only able to assess the association between factors and PrEP awareness but could not establish causal directions. Last, the questionnaire assessed the source of PrEP awareness but did not collect information on whether the participant sought this knowledge for themselves or received it passively hence speculating on the reasons for the noted associations. Despite these limitations, our study was the first in Uganda to show that oral PrEP awareness remains low among this AGYW at high risk of HIV infection.

## Conclusion

Promoting awareness for new effective HIV prevention tools among high risk AGYW is critical and should be conducted in a timely manner. In addition, this needs to be scaled up to potentially impact demand, uptake and adherence.

## Abbreviations

AGYW Adolescent Girls and Young Women

PrEP pre-exposure prophylaxis

AUDIT Alcohol use disorders identification test

CI Confidence interval,

PR Prevalence ratio,

WHO World Health Organization,

HIV Human Immunodeficiency Virus,

FSW Female Sex Worker,

HCT HIV Counselling and Testing,  
STI Sexually Transmitted Disease,  
GHWP Good Health for Women Project,  
UNCST Uganda National Council for Science and Technology,  
UVRI-REC Uganda Virus Research Institute Research Ethics Committee

## **Declarations**

## **Consent for publication**

Not applicable

## **Ethics approval and consent to participate**

The study was reviewed and approved by the Uganda Virus Research Institute Research Ethics Committee (GC/127/18/06/658) and Uganda National Council for Science and Technology (HS2435). Informed consent was obtained from all individual participants included in the study.

## **Availability of data and materials**

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

## **Competing interests**

The authors declare that they have no competing interests.

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## **Authors' contributions**

JFL: Lead author and coordinated the data management, wrote the initial draft and revised versions of the manuscript, OK: contributed to study design and carried out data analysis, VMK: contributed to study design, KC: contributed to study design, MK: contributed to study design, MP: contributed to study design, YM: contributed to study design, acquired funding, led the study team and mentored the first author through the manuscript writing process. All authors

contributed to interpretation of study results and critically commented on all versions of the manuscript. They approved the final version of the manuscript. All authors attest they meet the ICMJE criteria for authorship.

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