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Prevalence and factors associated with illicit non-injecting drug use among individuals at high risk of HIV infection in rural southwestern Uganda

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Abstract

Background

Illicit drug use is an emerging public health concern in sub-Saharan Africa and may exacerbate vulnerability to HIV infection, particularly in HIV high-risk population. This study aimed to determine the prevalence of illicit drug use and its associated factors among adults at high risk of HIV acquisition in rural southwestern Uganda to inform targeted prevention strategies.

Methods

We analysed baseline data from 940 adults aged 18–45 years at high risk of HIV infection who were enrolled in a longitudinal HIV vaccine preparedness cohort between July 2018 and December 2022. Data on socio-demographic characteristics, HIV risk behaviour, and illicit drug use were collected using interviewer-administered questionnaires. All participants received HIV counselling and testing. Logistic regression models were used to estimate crude and adjusted odds ratios (ORs) for factors associated with illicit drug use.

Results

Of the 940 participants, 18.3% [95%CI: 16.9–20.9] reported illicit drug use. Prevalence was highest among males (21.7%), sex workers (30.1%), and individuals aged 25–34 years. In adjusted analyses, females had significantly lower odds of reporting illicit drug use (aOR = 0.16; 95% CI: 0.09–0.20). Participants with at least secondary education were less likely to report illicit drug use (aOR = 0.62; 95% CI: 0.43–0.90). Higher odds of illicit drug use were observed among sex workers (aOR = 3.15; 95% CI: 1.68–5.89), individuals with sexual partners ≥ 10 years older (aOR = 2.51; 95% CI: 1.56–4.03), those reporting sex with a long-distance truck driver or miner (aOR = 2.70; 95% CI: 1.71–4.25), and those engaging in condomless sex with a partner of unknown HIV status (aOR = 4.12; 95% CI: 1.45–11.70).

Conclusion

Illicit drug use is relatively common among adults at high risk of HIV infection in rural southwestern Uganda. These findings underscore the need for HIV prevention programs to integrate targeted substance abuse interventions that address underlying demographic and behavioural drivers of risk.

Trial registration

Not applicable

Background

Illicit drug use remains a significant global public health challenge, with a particularly growing burden in sub-Saharan Africa (SSA) (1, 2, 3). In 2016, drug use and dependence accounted for nearly 20 million Disability-Adjusted Life Years (DALYs) worldwide (4). A substantial body of evidence has demonstrated that illicit drug use negatively affects HIV/AIDS prevention and care by contributing to increased engagement in high-risk sexual behaviours that facilitate HIV transmission, reduced adherence to antiretroviral therapy (ART), and poor treatment outcomes (5, 6, 7, 8, 9). Additionally, individuals who use illicit drugs often face reduced access to HIV prevention and care services (10, 11, 12).

In SSA, both injecting and non-injecting drug use are increasing (5), with Uganda experiencing a notable rise (13, 14). In 2016, Uganda reported 147.8 DALYs per 100,000 population attributable to illicit drug use (4). Among youth aged 15–24 years in fishing communities, the prevalence of drug use has been estimated at 5.2%, rising to 13.8% among high-risk adult populations in the same settings (13, 15). Commonly used substances include heroin, cannabis, cocaine, and miraa (khat) (1).

Illicit drug use is disproportionately higher among specific occupational and socially vulnerable groups, including sex workers, truck drivers, and uniformed personnel (13, 16). Other contributing factors include gender dynamics, family separation, peer influence, and limited economic opportunities (16, 17). While much of the existing research on HIV risk and interventions has focused on people who inject drugs, comparatively little attention has been given to non-injecting drug users. However, emerging evidence suggests that non-injecting drug users are also at elevated risk of HIV acquisition and may experience challenges with ART adherence (11, 18, 19).

Despite this, there remains limited evidence on the prevalence and socio-behavioural correlates of non-injecting drug use and its contribution to HIV risk in Uganda, particularly in rural populations. Therefore, this study aimed to determine the prevalence of non-injecting drug use and identify associated socio-behavioural factors among adults at high risk of HIV infection in rural southwestern Uganda, to inform targeted interventions and strengthen HIV prevention efforts.

Methods

Study aim

To determine the prevalence of non-injecting drug use and identify associated socio-behavioural factors among adults at high risk of HIV infection in rural southwestern Uganda

Study design and setting

This analysis is based on baseline data from the PrEPVacc registration cohort collected between 2018 and 2022. Data were obtained using the sociodemographic case report form (CRF), the eligibility

questionnaire, and the HIV risk and risk-reduction CRF. All CRFs/questionnaires were developed specifically for the PrEPVacc registration cohort study. An English-language version of the questionnaires has been provided as Supplementary Material. The cohort was established to estimate HIV incidence among adults at high risk of HIV infection and to assess the feasibility of recruiting them into a Phase IIb HIV vaccine efficacy trial.

The study was conducted across four African countries: Mozambique, South Africa, Tanzania, and Uganda. In Uganda, data were collected at the MRC/UVRI and LSHTM Uganda Research Unit, Masaka research site, located approximately 120 km southwest of Kampala, the capital. Participants were recruited from trading centres along the trans-African highway and from fishing communities along the shores of Lake Victoria within 80 km radius of Masaka city.

Characteristics of participants

Eligible participants were adults aged 18 to 45 years, who were HIV-negative at enrolment, willing to provide locator information, and available for follow-up. Participants were required to be at risk of HIV acquisition, defined by any of the following: suspected or confirmed sexually transmitted infection (STI); unprotected sexual intercourse with two or more partners or with a new partner in the past 3 months; or engagement in sex in exchange for money or goods in the past month. A total 940 participants were enrolled in the cohort, all of whom were included in the current analysis.

Study procedures

A detailed description of the cohort has been published previously (20, 21). Briefly, potential participants were identified through HIV counselling and Testing (HCT) within the study communities. HIV testing was conducted using rapid antibody tests in accordance with the national testing algorithm. Individuals who tested HIV negative were provided with brief information about the study and those who expressed interested were invited to the research clinic.

Screening and enrolment visits were conducted on the same day. Potential participants were provided with detailed study information and gave written informed consent before undergoing HCT and eligibility assessment. Individuals who met the eligibility criteria were enrolled into the study.

After enrolment, trained study staff collected participant locator information and administered standardised questionnaires to obtain socio-demographic characteristics and HIV risk behaviour data. Information collected included gender, age, marital status, education level, religion, occupation, residence, history of transactional sex, engagement in anonymous or casual sexual partnerships, history of STI diagnosis or treatment, having a sexual partner at least 10 years older, having unprotected sex with a long-distance trucker driver or miner, number of sexual partners and history of unprotected sexual intercourse.

Data were also collected on illicit drug use, the frequency of use, and engagement in sexual activity after use. To facilitate reporting, study staff provided a list of commonly used non-injecting recreational drugs in the study area, including Kuber (smokeless tobacco), cannabis (marijuana), cocaine, and Khat.

Statistical Analysis

Data were double entered into OpenClinica (community edition version 3.13, USA) and analysed using Stata version 15.0 (StataCorp, College Station, TX, USA). Categorical variables were summarised using frequencies and percentages, while age was summarised using the median and interquartile range.

Illicit drug use was defined as, the self-reported use of any recreational drug, excluding alcohol, for non-medical reasons in the 3 months preceding the interview. The prevalence of illicit drug use was calculated as the proportion of participants reporting use divided by the total number of participants, expressed as a percentage. Prevalence was further stratified by baseline participant characteristics.

To identify factors associated with illicit drug use, logistic regression models were fitted at both univariable and multivariable levels. Variables with a likelihood ratio test p-value < 0.10 at univariable analysis were considered for inclusion in the multivariable model. Multicollinearity was assessed among candidate variables, and in cases of high collinearity, the variable with the stronger association (based on p-value) was retained, except for age and sex, which were considered *a priori*. In the final multivariable model, variables with a likelihood ratio test p-value < 0.05 were retained.

Results

Baseline sociodemographic and sexual risk characteristics

Of the 940 cohort participants, 595 (63.3%) were female, 516 (54.9%) were single, 703 (74.8%) were of Christian faith, and 744 (79.1%) resided in non-fishing communities. The median age was 23 [Interquartile range (IQR) 20–28] years. Sexual risk behaviours were common. In the past month, most participants reported engaging in transactional sex (799; 85.0%) and having anonymous or casual sexual partners (904; 96.2%). Additionally, 852 (90.6%) reported not using a condom during sex with a partner of unknown HIV status in the past 3 months.

Prevalence of illicit drug use

A total of 172 participants reported illicit drug use, yielding a prevalence of 18.3% (95% CI: 16.9%-20.9%]. Prevalence was highest among participants aged 25–34 years (21.2%), compared with those aged ≤ 24 years (17.3%) and ≥ 35 years (10.9%). Illicit drug use was more common among males (21.7%) than females (16.3%). Higher prevalence was also observed among sex workers (30.1%) and among individuals who were divorced or separated (21.5%), compared with those who were married or cohabiting (14.9%) Table 1.

Factors associated with illicit drug use

In univariable analysis, illicit drug use was more common among males, individuals with lower education levels, and those engaged in high-risk occupations, particularly sex work. It was also associated with several sexual risk behaviours, including transactional sex, having multiple sexual partners, age-disparate relationships, unprotected sex with high-risk partners such as truck drivers or miners, and inconsistent condom use. In multivariable analysis, females had lower odds of illicit drug use than males (aOR = 0.16; 95% CI: 0.09–0.28). Participants with at least secondary level education were less likely to report illicit drug use compared with those with primary level education or less (aOR = 0.62; 95% CI: 0.43–0.90). Sex workers were significantly more likely to report illicit drug use compared with individuals in the other occupations (aOR = 3.15; 95% CI: 1.56–8.27). Having a sexual partner who was ≥ 10 years older was associated with higher odds of illicit drug use (aOR = 2.51; 95% CI: 1.56–4.03). Participants who reported unprotected sex with a long-distance truck driver or a miner in the past six months were more likely to report illicit drug (aOR = 2.70; 95% CI: 1.71–4.25). Additionally, those who reported condomless sex with a partner of unknown HIV status in the past three months had substantially higher odds of illicit drug use (aOR = 4.12; 95% CI: 1.45–11.70) (Table 1).

Table 1
Factors associated with illicit drug use among adults at high risk of HIV infection in Masaka, Uganda (N = 940)

Variable	Category	n (%)[1]	Illicit drug use (%)[2]	Crude OR (95% CI)[3]	aOR (95% CI)
Age (years)	≤ 24	550 (58.5)	95 (17.3)	1 (ref)	1 (ref)
	25–34	335 (35.6)	71 (21.2)	1.29 (0.91, 1.81)	1.14 (0.79, 1.66)
	≥ 35	55 (5.9)	6 (10.9)	0.59 (0.24, 1.41)	0.55 (0.22, 1.37)
Sex	Male	345 (36.7)	75 (21.7)	1 (ref)	1 (ref)
	Female	595 (63.3)	97 (16.3)	0.70 (0.50, 0.98)	0.16 (0.09, 0.28)[4]
Marital status	Single	516 (54.9)	98 (19.0)	1 (ref)	
	Married/Cohabiting/Relationship	261 (27.8)	39 (14.9)	0.75 (0.50, 1.12)	
	Divorced /separated	163 (17.3)	35 (21.5)	1.17 (0.76, 1.70)	
Education Level	≤Primary	541 (57.6)	112 (20.7)	1 (ref)	1 (ref)
	≥Secondary	399 (42.5)	60 (15.0)	0.68 (0.48, 0.96)	0.62 (0.43, 0.90)[4]
Religion	Christian	703 (74.8)	126 (17.9)	1 (ref)	

[1]Column percentage; [2]Row percentage; OR= Odds Ratio; CI = Confidence Interval; [3]Variables included in multivariable analysis were selected based on p < 0.10 in univariable analysis, except age and sex, which were included a priori; aOR = Adjusted Odds Ratio; Ref = Reference category; [4]p < 0.05; [5]Includes street food vendor, disc jockey, motorcycle mechanic, motorcycle taxi operator, waiter/waitress; [6]data missing for one participant

Variable	Category	n (%)[1]	Illicit drug use (%)[2]	Crude OR (95% CI)[3]	aOR (95% CI)
	Muslim/other	237 (25.2)	46 (19.4)	1.10 (0.76, 1.60)	
Occupation	Other[5]	292 (31.1)	48 (16.4)	1 (ref)	1 (ref)
	Sex worker	176 (18.7)	53 (30.1)	2.19 (1.40, 3.42)	3.15 (1.68, 5.89)[4]
	Salon/lodge/bar/market/street vendor	192 (20.4)	19 (9.9)	0.56 (0.32, 0.98)	1.01 (0.53, 1.95)
	Subsistence fisheries worker	79 (8.4)	15 (19.0)	1.19 (0.63, 2.26)	0.88 (0.45, 1.73)
	Multiple occupations	201 (21.4)	37 (18.4)	1.15 (0.72, 1.84)	1.70 (0.98, 2.94)
Residence	Non-Fishing	744 (79.2)	138 (18.5)		
	Fishing	196 (20.9)	34 (17.3)	0.92 (0.61, 1.4)	
Transactional sex (past 3 months)	No	141 (15.0)	17 (12.1)	1 (ref)	
	Yes	799 (85.0)	155 (19.4)	1.76 (1.03, 3.00)	
Anonymous/casual sexual partners	No	36 (3.8)	5 (13.9)	1 (ref)	
	Yes	904 (96.2)	167 (18.5)	1.40 (0.54, 3.67)	

[1]Column percentage; [2]Row percentage; OR= Odds Ratio; CI = Confidence Interval; [3]Variables included in multivariable analysis were selected based on $p < 0.10$ in univariable analysis, except age and sex, which were included a priori; aOR = Adjusted Odds Ratio; Ref = Reference category; [4]$p < 0.05$; [5]Includes street food vendor, disc jockey, motorcycle mechanic, motorcycle taxi operator, waiter/waitress; [6]data missing for one participant

Variable	Category	n (%)[1]	Illicit drug use (%)[2]	Crude OR (95% CI)[3]	aOR (95% CI)
Diagnosed with/treated for an STI in the past 3 months	No	563 (59.9)	97 (17.2)	1 (ref)	
	Yes	365 (38.8)	71 (19.5)	1.16 (0.83, 1.63)	
	Don't know/Not sure	12(1.3)	4 (33.3)	2.40 (0.71, 8.14)	
Partner older by ≥ 10 years	No	359 (38.2)	46 (12.8)	1 (ref)	1 (ref)
	Yes	553 (58.8)	123 (22.2)	1.95 (1.35, 2.81)	2.51 (1.56, 4.03)[4]
	Not sure	28 (3.0)	3 (10.7)	0.81 (0.24, 2.81)	1.18 (0.32, 4.32)
Number of partners (past 3 months)	≤ 7 Partners	493 (52.5)	60 (12.2)	1 (ref)	
	≥ 8 Partners	447 (47.6)	112 (25.1)	2.41 (1.71, 3.40)	
Unprotected sex with truck driver/miner (past 6 months)[6]	No	713 (75.9)	109 (15.3)	1 (ref)	1 (ref)
	Yes	226 (24.0)	63 (27.9)	2.14 (1.50, 3.06)	2.70 (1.71, 4.25)[4]
Condom use with unknown HIV status partner (past 3 months)[6]	Always	88 (9.4)	4 (4.5)	1 (ref)	1 (ref)
	Sometimes/None	851 (90.6)	168 (19.7)	5.16 (1.87, 14.26)	4.12 (1.45, 11.70)[4]

[1]Column percentage; [2]Row percentage; OR= Odds Ratio; CI = Confidence Interval; [3]Variables included in multivariable analysis were selected based on $p < 0.10$ in univariable analysis, except age and sex, which were included a priori; aOR = Adjusted Odds Ratio; Ref = Reference category; [4]$p < 0.05$; [5]Includes street food vendor, disc jockey, motorcycle mechanic, motorcycle taxi operator, waiter/waitress; [6]data missing for one participant

Discussion

Our study found a high prevalence of illicit drug use (18%) among individuals at elevated risk of HIV acquisition in rural southwestern Uganda. The prevalence is higher than previous estimates of 5–11% among similar populations in East Africa (1, 22), highlighting a growing public health concern within HIV vulnerable population.

Several interrelated behavioural, demographic and social economic factors were associated with illicit drug use. Consistent with previous studies, males had higher odds of reporting illicit drug use compared to females (22, 23). Evidence from Uganda suggests that motivations for drug use among men include enhancing work productivity, seeking pleasure, coping with stress, and peer influence, reflecting broader gendered norms around risk-taking behaviours (1). Qualitative evidence further indicates that drug use among men may also be shaped by identity and social belonging. (24)

Illicit drug use was more among participants with Lower education attainment. This finding is consistent with prior research showing that individuals with limited education are more vulnerable to illicit drug use (22). This may reflect reduced access to health information, fewer economic opportunities, and limited engagement with health-promoting resources, suggesting that education may serve as protective factor (25, 26).

Illicit drug use was strongly associated with high-risk sexual behaviours, including transactional sex, age-disparate relationships (≥ 10 years), and condomless sex with high-risk partners such as long-distance truck drivers or partners of unknown HIV status. These associations likely reflect multiple pathways. Individuals engaged in transactional sex may use drugs as a coping mechanism or may experience coercion from clients (27). Conversely, drug use may impair judgement and increase susceptibility to risky sexual practices. Age-disparate relationships may also reflect power imbalances that limit autonomy in decision making, including substance use and safe sex negotiation. These findings are consistent with previous research linking illicit drug use with multiple sexual partnerships and increased STI risk (25) (22, 23, 28).

The co-occurrence of illicit drug use and high-risk sexual behaviour highlights a critical intersection for HIV prevention. Integrating substance use counselling into HIV prevention programs may enhance their effectiveness. Interventions should prioritise high-risk groups, particularly men, individuals with lower education attainment, and those engaged in high-risk sexual behaviours. In addition, community-level strategies addressing underlying sociocultural drivers, such as, gender norms, economic vulnerability, and social marginalisation, are essential for sustainable risk reduction.

A key strength of this study is the relatively large sample size, which enhances the precision of the estimates. However, several limitations should be noted. Illicit drug use and sexual behaviours were self-reported and not validated using standardised screening tools or biological measures, introducing the potential for misclassification, recall, and social desirability bias. In addition, the cross-sectional design limits the ability to infer causality between identified factors and illicit drug use. The findings may

also have limited generalisability beyond similar high-risk populations, as participants were recruited from specific communities in rural southwestern Uganda. Finally, residual confounding from unmeasured or imperfectly measured variables cannot be ruled out.

Despite these limitations, the study provides important insights on the prevalence and correlates of illicit drug use among adults at high risk of HIV infection in rural southwestern Uganda and highlights key areas for targeted intervention and future research.

Conclusions

Illicit drug use is highly prevalent among adults at high risk of HIV acquisition in rural southwestern Uganda and is strongly associated with male gender, lower educational attainment, and engagement in high-risk sexual behaviours. These findings highlight the need for integrated HIV prevention strategies that incorporate substance use interventions and prioritise high-risk subgroups. Addressing the underlying socio-cultural and structural drivers of illicit drug use will be essential for reducing both substance use harms and HIV risk. Further research should examine the causal pathways linking illicit drug use and HIV outcomes to inform more targeted and effective prevention strategies.

Declarations

Ethical approval and Consent to Participate

The study protocol was approved by the Uganda Virus Research Institute Research Ethics Committee (UVRI-REC; ref: GC/127/1803/637) and the Uganda National Council of Science and Technology (UNCST; ref: HS 2392)**.** Written informed consent was obtained from all participants prior to enrolment. Participants who tested HIV-positive were referred for care in accordance with the national guidelines, while those at elevated risk were counselled and linked to HIV prevention services, including PrEP. Pregnant participants were referred for antenatal care. All Participants received counselling on the risks of illicit drug use and were referred for additional support where needed.

Consent for publication

Not applicable

Availability of data and materials

The dataset used and/or analysed during the current study is 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

Conceptualisation, BNK, AA,SK, ER; Methodology, BNK, AA, PO and ER; Formal analysis, AA and PO; Investigations, SK, GM, BNK, PO, GM and ER; Data curation, validation and supervision, ER, SK,BNK, AA, AK PO, GM and SK; Writing original draft manuscript, BNK, AA, PO, UB, SK, AK, GM, PK, ER; Review and editing of manuscript, BNK, AA, PO, UB, SK, AK, GM, PK and ER; Project administration, SK and BNK; Funding acquisition, PK. All authors had full access to the study data, commented on the manuscript and accepted responsibility for submitting for publication

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