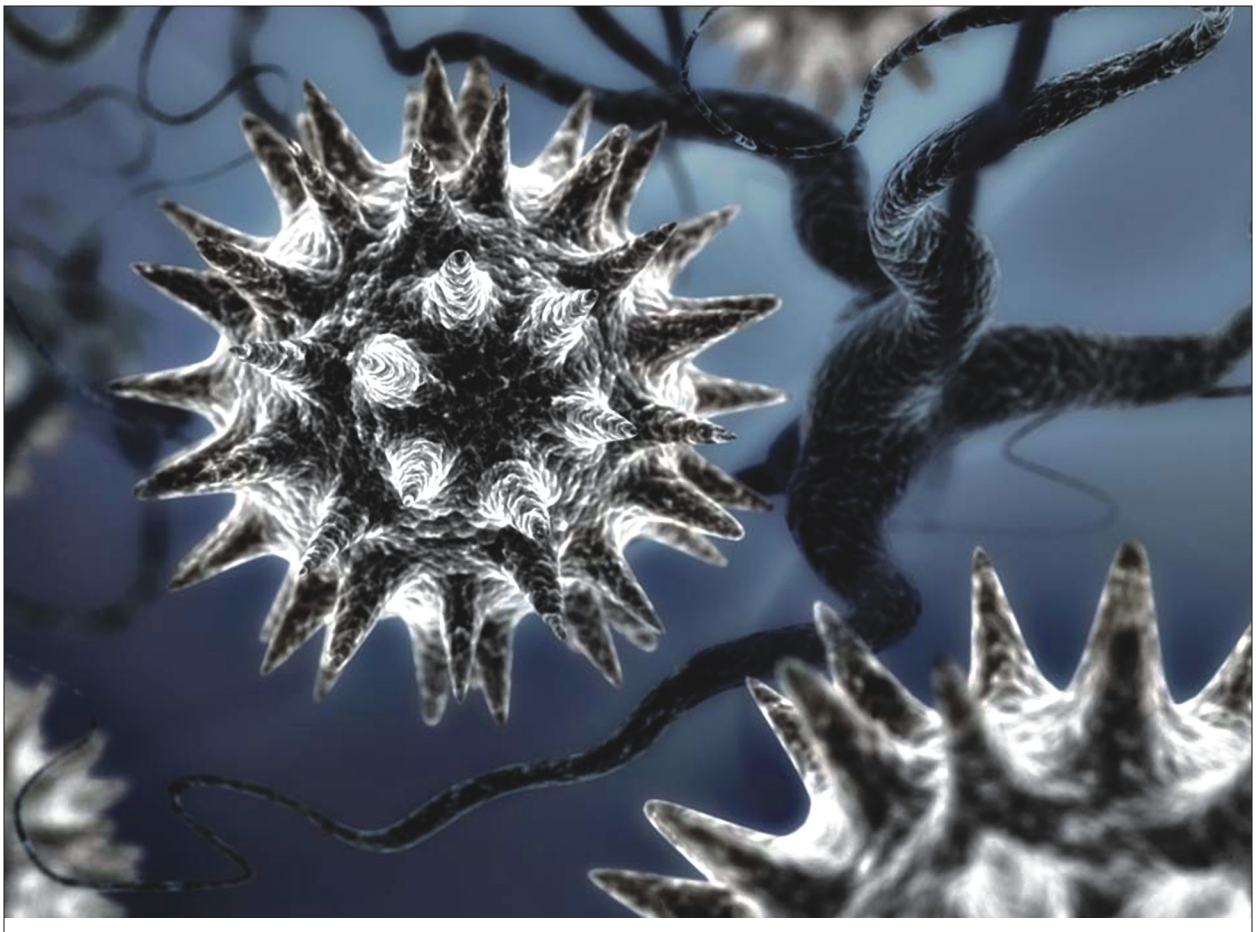

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Research Article
Sero-Epidemiology of HIV and Syphilis and Associated Factors among Drug Users in Burkina Faso, West Africa

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Abstract

Background and Objective: Drug users (DU) are considered a high-risk population for sexually transmitted diseases including HIV and syphilis. In Burkina Faso, there is limited data on HIV and syphilis infections among drug users. The aim of this study was to estimate the seroprevalence of HIV and syphilis among drug users. **Materials and Methods:** This was a cross-sectional, biological and behavioral study conducted between June and July, 2022, among drug users in Ouagadougou and Bobo-Dioulasso, the two main cities of Burkina Faso. The respondent-driven sampling (RDS) method was used to recruit participants. A behavioral questionnaire was administered to each participant, followed by a blood sampling for HIV and syphilis testing. Statistical analysis was conducted taking into account the respondent-based sampling procedure. **Results:** A total of 323 drug users were recruited. The participants were predominantly male (97.5%). The average age of the participants was 32.7±10.96 years. The 132 participants (40.9%) used the drug for the first time before the age of 18. The majority of DUs have used cannabis (80.5%), followed by heroin (51.7%), cocaine and crack (41.8%). Inhaling and smoking were the most common modes of drug consumption. Only one person (0.6%) used heroin by injection. The adjusted prevalence of HIV and syphilis were 0.45 and 3.54%, respectively. Exposure to HIV program interventions like the free distribution of condoms and water-based lubricant gel was significantly associated with a low prevalence of syphilis infection ($p<0.05$). **Conclusion:** These findings showed that the prevalence of HIV among DUs of Ouagadougou and Bobo-Dioulasso is low, however, the prevalence of syphilis is high compared to national data. Awareness and intervention efforts must be made within this population in order to control the spread of these infections.

Key words: Sero-epidemiology, HIV, syphilis, associated factors drug users, Burkina Faso

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Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

The spread of sexually transmitted infections represents a public health concern in the world[1]. The HIV and syphilis infections contribute significantly to the burden of morbidity and mortality worldwide[2]. Recent research indicates a synergy between bacterial Sexually Transmitted Infections (STIs) and HIV transmission among high-risk groups like men who have sex with men (MSM), transgender people (TG), people who inject drugs (UDI) and female sex workers (FSW)[1].

The drug users (DUs) have been associated with epidemics of STIs[3]. The association between intravenous drug use and HIV infection and other sexually transmitted diseases has been documented[4,5]. However, the drug most associated with Sexually Transmitted Diseases (STDs) is smokable freebase (crack) cocaine[4]. Exchanging drugs for sex and sex for drugs was also associated with having STDs[4]. Studies have attributed the high prevalence of HIV infection, syphilis and genital ulcer disease to unprotected sex[6-8].

Drug use is poorly documented in West Africa[9]. The HIV transmission linked to the sharing of injection equipment is only documented in a few African countries[9-11]. A study conducted in Togo in West Africa shows that the main mode of drug consumption was "smoking or inhaling"[12]. In Burkina Faso, drug use is clandestine and Injecting drug use remains very rare. Studies on STIs like HIV and syphilis in DUs are still rare. The HIV prevention and care program efforts are currently focus on key populations, including drug users who are hidden and unreached. The present study aimed to estimate HIV and syphilis seroprevalence and related risk factors among drug users in Burkina Faso, West Africa country.

MATERIALS AND METHODS

Ethics approval: This study was approved by the Ethics Committee for Health Research of Burkina Faso with "deliberation number: 2020-02-029". All 323 participants provided written informed consent. All staff working with participants were trained on the importance of maintaining confidentiality and signed confidentiality agreements prior to involvement in the study. The anonymity of the participants was respected by the use of a unique identification code throughout the study process. Participants received pre- and post-test counseling for HIV and syphilis. Participants who tested positive for HIV and were not on antiretroviral treatment were referred to health care facilities for HIV treatment. Participants testing positive for syphilis received syphilis standard treatment. All participants received condoms and water-based lubricants.

Study design and location: This was a cross-sectional biological and behavioral survey conducted between June and July, 2022, among drug users in Ouagadougou and Bobo-Dioulasso, the two main cities of Burkina Faso.

Study population: The study involved 323 drug users aged 18 years or older. The inclusion criteria were: (i) Having used drugs in the past six months, (ii) Living in the target city at least the past 3 months, (iii) Provided written and informed consent, (iv) Had a valid peer recruitment coupon and (v) Agreed to complete a behavioral survey and HIV and syphilis testing. Individuals who visibly intoxicated were excluded, or those with severe mental illness preventing participation in informed consent procedures.

Sample size calculation: The sample size calculation was based on the following formula used to determine the sample size using a cross-sectional approach as proposed by Cornfield[13]:

$$n = Deff * \frac{P_a(1 - P_a)}{SE(P_a)^2}$$

With:

n = Sample size
Deff = Cluster effect
P_a = Level of main indicator
SE = Standard P_a error

In order to allow robust comparisons by locality, the sample size is calculated for each locality. The baseline value of the indicator (HIV prevalence) was reported from a biobehavioral cross-sectional study conducted among DU in Burkina Faso in 2017. A SE of 1.7% was considered for both cities with a previous HIV prevalence of 1.1% in Ouagadougou (capital of the country) and 0.9% in Bobo-Dioulasso. The cluster effect, as recommended by the authors, should be greater than 2. In this study, we considered a cluster effect of 4 as recommended by Wejnert *et al.*[14] with a 10% non-response rate. The minimum sample size was 166 DU to be recruited at Ouagadougou and 136 at Bobo-Dioulasso. Participants were recruited using RDS, a non-probability sampling approach used to sample individuals whose behavior or identity may be stigmatized or even criminalized but who are well-networked[15,16].

Sampling and recruitment process: Respondent-driven sampling (RDS) was used to recruit drug users. Three initial

drug users were recruited as seeds in Ouagadougou and three others seeds in Bobo-Dioulasso. After giving informed consent, seeds were required to complete the survey and have their blood sampled. Three coded coupons were given to each seed in order to recruit three new participants. The coded coupon was valid for 2 weeks. The seeds were encouraged to recruit up to three other drug users from their individual social network. Each additional participant was also asked to recruit up to three different individuals from their own social network with coded study coupons. This process continued until we reached sample size in each city. Each participant received 3,000 CFA francs (equivalent to $6) for time and transport expenses and 2,000 CFA francs (equivalent to $4) for each peer, they recruited for the study.

Data collection tools and procedures: The behavioral survey was conducted by face-to-face interview in a private room. Participant information was anonymized and identified with a unique code number to protect confidentiality. The questionnaire was digitized and data were collected on tablets using CSPro version 7.4 application. The questionnaire was administered in French or in local language (Mooré, Dioula) depending on the language spoken by the participant. After providing written informed consent, participants completed questionnaire. The topics of the questionnaire were: Sociodemographic characteristics; drug use habits; sexual behavior; exposure to interventions and knowledge about HIV.

Biological specimen collection and testing: After completing the behavioral survey, participants were offered HIV and Syphilis testing. For this, venous blood was drawn by a trained lab technician. After centrifugation of the blood sample, plasma was used for the different tests.

The HIV testing was carried out at the study site. All samples were tested using the Determine® HIV Ab rapid test kit (Alere, Yavne, Israel). Non-reactive samples were considered negative for HIV. Reactive samples were then tested with a confirmatory test with ImmunoFlow HIV 1/2® kit (Core Diagnostics, Birmingham, United Kingdom) to confirm HIV seropositivity. When there were discordant results between the two tests, participants were referred to a laboratory where their samples were tested using a Western blot assay. Participants received counseling before and after the HIV test.

For syphilis test, a treponemal rapid diagnostic test (RDT) First Response® Syphilis Anti-TP Card Test (Premier Medical Corporation Private Limited, Sarigam, India) was used on site followed by a Rapid Plasma Reagin test performed later in the Health Sciences Research Institute Laboratory in Ouagadougou. The choice was made for the rapid test in order to be able to give the results to the participants and to give treatment to the positive cases. Participants with a positive syphilis test were treated *in situ* with one intramuscular dose of benzathine benzylpenicillin G 2.4 MUI if there was no contraindication. In case of contraindication to penicillin G, another antibiotic is used.

Statistical analysis: Data were entered and analyzed using Stata 17. The data cleaning has consisted of a linking of biological data and behavioral data. Participants without biological or behavioral data were excluded from the analysis. Each participant was also linked to the seeds or their recruiter in order to draw the recruitment tree and the sample weight. The sample weight was calculated using RDSAT version 7.1. Then this weight was merged with biological and behavioral data to make the analysis using Stata 17. The prevalence of HIV infection and syphilis infection was determined by calculating the ratio of positive cases of HIV or syphilis and all tested drug users. All results where weight since the recruitment was done using RDS approach. Weighted binary logistic regression was used to identify the associated factors of syphilis infection. This analysis was not used for HIV infection since the prevalence was very low. All statistical test was considered significant when $p<0.05$.

RESULTS

A total of 323 drug users were recruited including 6 seeds with 3 seeds in Ouagadougou which recruited 173 participants and 3 seeds in Bobo-Dioulasso which recruited 150 participants. Figure 1 represents drug users' recruitment RDS chains in Ouagadougou and Bobo-Dioulasso.

Sociodemographic characteristics of drug users: Current study population consisted of 315 men, i.e., 97.5% of the total. The mean age of participants was 32.7±10.96 years. The 18-25 age group accounted for 27.2%. It should be noted that noted that 83.6% of the drug users surveyed had at least a school education (educated), the majority were single (75.9%) and had a job (76.8%). The 83.6% were educated. Burkinabe nationality accounted for 97.2% of participants (Table 1).

Behavioral characteristics related to drug use patterns: The 132 participants, or 40.9%, used the drug for the first time before the age of 18. The majority of DUs used cannabis

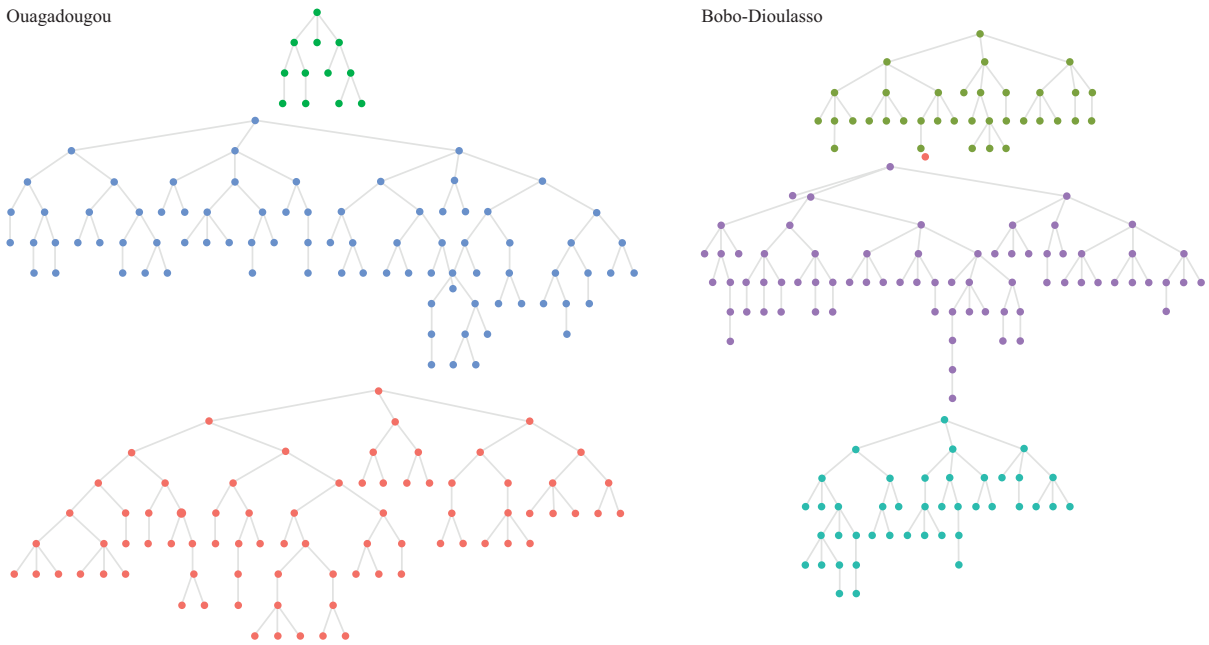

Fig. 1: Drug users' recruitment chains in Ouagadougou and Bobo-Dioulasso

Table 1: Socio-demographic characteristics of drug users (n = 323)

Variable	Effective (n)	Percentage
Sex		
Male	315	97.5
Female	8	2.5
Age		
18 to 25 years	88	27.2
≥25 years	235	72.8
Formal education		
Educated	270	83.6
Non educated	53	16.4
Marital status		
Married	78	24.2
Not married	245	75.9
Occupation		
Worker	248	76.8
Unemployed	75	23.2
Country of origin		
Burkina Faso	314	97.2
Other countries	9	2.8

(80.5%), followed by heroin (51.7%), cocaine and crack (41.8%). Only 5 DUs (1.6%) used benzodiazepines. The inhaled or smoked mode was the most used by our study population. This mode of consumption is 100% for those who use cannabis, 97.6% for heroin, 97.4% for crack, 71.2% for cocaine and 40.0% for benzodiazepines. Only one person (0.6%) injected heroin. The DUs used daily heroin in 80.8% of cases, cannabis in 67.0% of cases, crack in 44.4% of cases, cocaine in 40.7% of cases and benzodiazepines in 40.0% of cases.

Seroprevalence of HIV and syphilis: The adjusted HIV and syphilis prevalence among study participants were 0.45 and 3.54%, respectively. Table 2 shows the distribution by city with a prevalence of 0.62% in Ouagadougou and 0.0% in Bobo-Dioulasso for HIV and a prevalence of 2.83% in Ouagadougou and 5.46% in Bobo-Dioulasso for syphilis.

Factors associated with HIV and syphilis infections: Given the low number of HIV positive test among drug users, it was not possible to analyze the associated factors with HIV seropositivity.

Table 3 presented the analysis of factors associated with syphilis seropositivity.

Regarding socio-demographic characteristics, age, sex, educational level, occupation, marital status and nationality were not significantly associated with syphilis infection. But it should be noted that syphilis cases were found only in men (3.7%) and aged 25 or over (4.7%).

No sexual behaviors are significantly associated with syphilis infection. But we note a higher prevalence among those who had their first sexual intercourse before the age of 15 (6.2%).

As for exposure to interventions, free distribution of condoms and lubricating gels was significantly associated with low syphilis infection ($p<0.05$). In contrast, free STI screening was not significantly associated with syphilis infection. Finally, knowledge of at least two modes of HIV

Table 2: Seroprevalence of HIV and syphilis in Ouagadougou and Bobo-Dioulasso

		HIV positive			Active syphilis		
Residence	Drug users (N)	n	Adjusted (%)	95 % CI	n	Adjusted (%)	95 % CI
Ouagadougou	173	3	0.62	0.19-1.99	3	2.83	0.65-11.43
Bobo-Dioulasso	150	0	0.0	-	4	5.46	2.02-13.89
Total	323	3	0.45	0.13-1.45	7	3.54	1.38-8.80

Table 3: Factors associated with syphilis in 323 drugs users in Burkina Faso (Ouagadougou and Bobo-Dioulasso pooled data)

Variable	Effective (N)	Syphilis (%)	95 % CI	p-value
Socio-demographic characteristics				
Sex				
Male	315	3.7	1.43-9.07	0.736
Female	8	0	-	
Age				
18 to 25 years	88	0	-	0.204
≥25 years	235	4.7	1.85-11.61	
Formal education				
Educated	270	3.4	1.14-9.8	0.797
Non educated	53	4.3	0.93-18.0	
Marital status				
Married	59	5.7	1.64-17.83	0.485
Not married	264	3.2	0.96-9.89	
Occupation				
Workers	248	5.0	1.96-12.29	0.158
Unemployed	75	0	-	
Country of origin				
Burkina Faso	314	3.7	1.43-9.07	0.702
Other countries	9	0	-	
Drug use habits				
Age at first drug use				
<18 years	132	3.1	0.1-9.5	0.82
≥18 years	191	3.8	1.1-12.4	
Types of drugs				
Heroin				
Yes	167	3.2	0.95-15.86	0.763
Non	156	4.2	1.1-7.89	
Cocaine/crack				
Yes	135	4.1	0.95-15.86	0.722
No	188	2.9	1.1-7.89	
Cannabis				
Yes	260	3.9	1.41-10.64	0.508
No	63	1.9	0.26-12.67	
Benzodiazepine				
Yes	5	0	-	0.773
No	318	3.7	-	
Sexual behavior				
Has ever had sex				
Yes	320	3.6	1.39-8.84	0.784
No	3	0	-	
Age at first sexual intercourse				
<15 years	47	6.2	1.4-23.55	0.494
≥15 years	273	3.3	1.11-9.56	
Regular sex partner				
0 regular sex partner	135	4.2	0.97-16.19	0.739
1 Regular sex partner	145	3.5	1.26-9.18	
≥2 Regular sex partners	43	0	-	
Paying sex partner				
0 paying sex partner	293	3.8	1.46-9.32	0.676
1 Paying sex partner	7	0	-	
≥2 Paying sex partners	23	0	-	

Table 3: Continued

Variable	Effective (N)	Syphilis (%)	95 % CI	p-value
Man, who had sex with another man				
Yes	4	0	-	0.830
No	311	3.7	1.43-9.13	
Condom use at last sexual intercourse				
Yes	116	2.8	0.83-8.87	0.6880
No	207	3.9	1.19-11.97	
Exposure to interventions				
Have received free condoms in the past 3 months?				
Yes	66	2.2	0.52-8.66	0.005
Yes, but more than 3 months	161	0.8	0.11-5.29	
No	96	9.9	3.11-27.12	
Have benefited from free lubricating gels for sex in the last 3 months?				
Yes	60	2.4	0.57-9.54	0.040
Yes, but more than 3 months	120	0.9	0.12-6.07	
No	143	7.5	2.34-21.41	
Have been screened for STIs in the last 3 months?				
Yes	23	0	-	0.1600
Yes, but more than 3 months	114	7.5	2.2-22.7	
No	186	1.7	0.5-5.5	
Knowledge about HIV				
Knows at least two modes of transmission and rejects false beliefs				
Yes	98	0	-	0.1120
No	225	5.4	2.12-13.19	

transmission and rejection of false beliefs were not significantly associated with syphilis infection.

DISCUSSION

The purpose of this study was to estimate the seroprevalence of HIV and syphilis among DU in Burkina Faso. The overall seroprevalence of HIV among the DUs in this study, which concerned the two main cities of the country (Ouagadougou and Bobo-Dioulasso) was relatively low, around 0.45%. Only one person in the current study population injects heroin (0.6%). The injectable route being the most at risk of HIV contamination and very little encountered in this study could explain this result. A similar study conducted in Dakar in 2015 found an HIV seroprevalence of 5.2%[17]. The proportion of IDUs was 27.7% and could explain the high HIV seroprevalence in this study[17]. The study conducted in Mauritius in 2009 corroborates these assertions with an HIV prevalence of 47.4% among IDUs while the national prevalence was 1.8%[18]. However, other studies have also found high HIV prevalence among non-injecting drug users. Ekouevi *et al.*[12] in 2012 in Togo, found an HIV seroprevalence of 5.5% among drug users (DU). This was higher than the national average of 3.2% at the time of the study. Studies have shown that the risk is related to unprotected sex resulting from the effects of the drug[6,7] which implies that HIV transmission was sexual rather than through unsafe injecting[8,19]. A study in Dar-es-Salaam (Tanzania) conducted by Likindikoki *et al.*[20] in 2020 found among non-injectors drug users an HIV seroprevalence of 6.8 and 41.2%, respectively among men and women. Women who inject drugs may have additional risks related to unsafe sexual practices such as exchanging sex for money was associated with HIV infection[21]. In current study, very few women participated and none of them tested positive. However, awareness-raising efforts will have to be made to maintain this low prevalence within DUs. Hence the need to expand control actions in favor of drug users, in order to anticipate a possible spread of the disease among them. Given the low seroprevalence of HIV among drug users, it was not possible to perform risk factor analyzes.

This study found a syphilis seroprevalence of 2.83% in Ouagadougou and 5.46% in Bobo-Dioulasso. The overall seroprevalence of syphilis among drug users was 3.54%. However, this relatively low prevalence remains higher than those found by Kirakoya-Samadoulougou *et al.*[22] in 2010 in the general population in Ouagadougou where syphilis was found in 1.2% of women and 1.8% of men. Similar studies on drug users support current study findings. Tun *et al.*[23] in Nigeria in 2013, Johnston *et al.*[18] in Mauritius in 2011 found seroprevalences of 1.9 and 2.7%, respectively. However, high prevalence of syphilis has been found by Demissie *et al.*[24] in Addis Ababa (Ethiopia) in 2015 with 5.9%. In Burkina Faso, the prevalence of syphilis among key populations in general

seems under control. Ouedraogo *et al.*[25,26] in 2013, found syphilis seroprevalences of 2.1 and 0% among MSM and 1.4 and 2.2% among sex workers in Ouagadougou and Bobo-Dioulasso, respectively. These results, lower than those found in DUs in current study, show that control strategies should take more into account the specificity of drug users. There was a significant link between syphilis and the non-distribution of free condoms ($p = 0.0046$) and lubricating gels ($p = 0.0399$). This result highlights the need to increase these interventions among drug users.

This study has some limitations. Self-declaration of risky behaviors in a clandestine context of drug use may have led to incorrect answers which are sources of bias. However, this had no impact on the prevalence of HIV and syphilis. The small number of HIV positive cases and active syphilis cases limited us in assessing risk factors. Despite these limitations, current study provides data on HIV and syphilis infections among DUs in Burkina Faso, West Africa.

CONCLUSION

Current findings showed that the prevalence of HIV among DUs of Ouagadougou and Bobo-Dioulasso is low and the prevalence of syphilis is high compared to national data. The consumption of cannabis, cocaine/crack, heroin and benzodiazepine are common practices with a preference for the non-injectable route. Measures must be taken to avoid switching to the injection route. Although, the links between sexual risk factors and HIV infection and syphilis have not been demonstrated, the poor knowledge of HIV transmission routes and the persistence of false beliefs suggest interventions to raise awareness among users of drugs taking into account their specificity in maintaining a low prevalence of HIV. A relationship between the free distribution of condoms and lubricating gels was established with syphilis in our study. Improving these types of interventions is needed to reduce the prevalence of syphilis.

SIGNIFICANCE STATEMENT

The purpose of this study was to estimate HIV and syphilis seroprevalence and related risk factors among drug users in Burkina Faso. This study shed light on the profile and behaviors of drug users. Drug users in Burkina Faso are predominantly male and the modes of consumption are "smoking and inhaling". Regarding seroprevalence, data show that the prevalence of HIV among DUs is low and the prevalence of syphilis is high compared to national data. Regarding risk factors, exposure to HIV program interventions like the free distribution of condoms and water-based lubricant gel were significantly associated with a low prevalence of syphilis These data will allow the HIV program to adapt their strategy, namely to intensify awareness, screening and distribution of condoms and gels.

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