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Prevalence and Associated Factors of HIV and Syphilis among Inmates in Chad

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Abstract

Introduction: HIV and syphilis are among the most prevalent sexually transmitted infections (STIs) worldwide and remain major public health challenges, particularly in Chad. Incarcerated individuals are disproportionately affected due to high-risk behaviors both prior to and during imprisonment. The objective of this study was to analyze the factors associated with HIV and syphilis infections among incarcerated individuals in Chad, to determine the prevalence of HIV and syphilis within the prison population and to identify the sociodemographic and behavioral determinants associated with these infections. **Methodology**: A secondary analysis was conducted using data from a cross-sectional survey carried out in eight (8) detention facilities across Chad. Descriptive statistics and multivariate logistic regression were used to assess associations between infections and potential risk factors. **Results**: A total of 615 inmates were included in the study. The prevalence of HIV was 5.2%, and that of syphilis was 2.9%. Multivariate logistic regression revealed significant associations between HIV infection and several variables: older age (≥30 years) (adjusted odds ratio [AOR] = 8.54; 95% CI: 1.27 - 57.8; p = 0.02), being widowed or divorced (AOR = 5.09; 95% CI: 1.18 - 21.8; p = 0.03), and drug use (AOR = 4.23; 95% CI: 1.04 - 17.2; p = 0.04). No statistically significant association was found between any variable and syphilis infection. **Conclusion**: The prevalence of HIV among inmates in Chad was substantially higher than that of the general population (1.1% in the same year). Risk factors such as older age, marital status, and drug use were significantly associated with HIV infec-

tion in prison settings. These findings underscore the need for comprehensive prevention strategies that include targeted education, improved living conditions, and expanded access to testing and treatment for incarcerated individuals.

Keywords

HIV, Syphilis, Prisoners, Chad, Prevalence, Risk Factors

1. Introduction

Sexually transmitted infections (STIs), particularly Human Immunodeficiency Virus (HIV) and syphilis, continue to pose serious public health challenges worldwide, especially among marginalized and high-risk populations such as incarcerated individuals. According to UNAIDS, approximately 39.9 million people were living with HIV globally in 2023, with 1.3 million new infections and 630,000 AIDS-related deaths during the same year [1]. In West and Central Africa, the burden remains significant, with about 5.1 million people living with HIV, reflecting enduring disparities in prevention, testing, and care access [2].

Syphilis also remains a major concern, with the WHO estimating over 6 million new cases annually among adults aged 15 - 49 [3]. HIV and syphilis interact biologically: syphilitic ulcers can increase susceptibility to HIV, and co-infections complicate both diagnosis and treatment [4].

Prison settings amplify STI transmission risks due to overcrowding, poor medical infrastructure, high-risk behaviors (e.g., unprotected sex, tattooing, drug use), and limited access to preventive tools and health education [5] [6]. These are further exacerbated by stigma, criminalization, and health system neglect in many correctional environments [7].

In sub-Saharan Africa, HIV prevalence among prisoners ranges from 2% to over 30%, often far exceeding the general population rates [8] [9]. For instance, studies in Côte d'Ivoire, Nigeria, and South Africa have highlighted elevated HIV and syphilis burdens among inmates, linked to both pre-incarceration risk profiles and intra-prison exposure [10].

However, data on incarcerated populations in Central Africa—particularly Chad—remain scarce. National HIV/syphilis surveillance rarely includes detainees, creating policy blind spots. Prison health systems in Chad are weakly integrated into national programs, and access to testing and treatment remains limited, despite ongoing HIV response initiatives [11].

This study aims to fill this gap by estimating the prevalence of HIV and syphilis among inmates in Chad and identifying associated socio-demographic and behavioral determinants. Results are expected to inform targeted public health interventions and promote equitable access to testing and treatment in prison settings.

2. Materials and Methods

2.1. Study Design and Setting

This cross-sectional study was conducted in 2021 across eight major detention centers in Chad: Abéché, N'Djamena, Bongor, Doba, Koumra, Moundou, Korotoro and Sarh. These prisons were selected to reflect regional diversity and incarceration conditions in a national correctional system comprising 41 facilities with an average occupancy rate exceeding 230%.

2.2. Study Population and Inclusion Criteria

The target population of this study included inmates from the aforementioned detention facilities in Chad, aged 18 years or older, and incarcerated for at least six months, regardless of their sex or legal status (sentenced or in pretrial detention). All participants provided informed verbal consent prior to inclusion. Recruitment was conducted during the survey period according to the criteria described below.

2.2.1. Inclusion Criteria

The study included:

- Inmates (male and female), sentenced or in pretrial detention;
- Aged 18 years or older;
- Who had been incarcerated for at least six months at the time of the survey.

2.2.2. Exclusion Criteria

Excluded from the study were:

- Persons incarcerated for less than six months,
- And/or those who refused to participate in the study.

2.3. Sampling Method and Participant Selection

A total of **615 inmates were surveyed**. A power analysis conducted using **Epi Info** software ($\alpha = 0.05$; HIV prevalence: 5.2% vs. 2.0% in Senegalese prisons) demonstrated a statistical power of **85%**, confirming that the sample size was adequate to detect statistically significant differences.

A **two-stage cluster sampling** method was used to select participants:

- **At the first stage**, detention facilities were purposively selected based on their capacity and inmate population, to ensure national representativeness across different prison types.
- **At the second stage**, proportional random sampling was performed within each prison according to its inmate population size.

Due to their low numbers, **all female inmates were systematically included** in the sample to ensure their representativeness in data analysis.

2.4. Data Collection

Data was drawn from a national Integrated Biological and Behavioral Surveillance (IBBS) survey and collected electronically using Open Data Kit (ODK). The ques-

tionnaire covered sociodemographics, behavioral risks, incarceration history, and knowledge of HIV/STI services.

Biological testing followed national algorithms:

- **HIV**: Determine™ HIV-1/2, confirmed by SD Bioline;
- **Syphilis**: Treponemal RDT, confirmed by Rapid Plasma Reagin (RPR) for active infection.

2.5. Variables

Two binary outcomes were defined: HIV serostatus and syphilis serostatus (1 = positive; 0 = negative). Independent variables (Table 1) included age, sex, marital status, education, employment history, substance use, incarceration duration, sexual behavior, and access to prevention programs.

Table 1. Independent variables used in the study.

Category	Variable	Coding	Description
Behavioral Factors	Drug use	0 = No, 1 = Yes	History of drug use before or during incarceration.
	Alcohol use	0 = No, 1 = Yes	History of alcohol consumption, even a single episode.
	History of STI	0 = No, 1 = Yes	Prior diagnosis of any sexually transmitted infection.
	Injection drug use (IDU)	0 = No, 1 = Yes	Use of injectable drugs at any point.
	Sexual activity in prison	0 = No, 1 = Yes	Engaged in sexual intercourse during incarceration.
	Shared injection materials	0 = No, 1 = Yes	Use of shared or non-sterile injecting equipment.
Penal Characteristics	Length of incarceration	1 = <12 months, 2 = 12 - 24, 3 = 24 - 36, 4 = ≥36 months	Duration of current prison stay.
	History of incarceration	0 = No, 1 = Yes	Any previous imprisonment.
	Prison facility	0 = Klessoum, 1 = Abéché, 2 = Bongor, 3 = Koumra, 4 = Moundou, 5 = Sarh, 6 = Doba, 7 = Korotoro	Location of detention.
Sociodemographic Factors	Occupation	0 = Unemployed, 1 = Formal, 2 = Informal	Employment status prior to incarceration.
	Age	0 = <25, 1 = 25 - 49, 2 = ≥50 years	Age group classification.
	Marital status	0 = Single, 1 = Married, 2 = Divorced/Widowed	Relationship status before imprisonment.
	Sex	0 = Male, 1 = Female	Biological sex.
D. Knowledge and Awareness	STI prevention knowledge	0 = None, 1 = Abstinence, 2 = Condom	Awareness of STI prevention strategies.
	HIV/STI sensitization	0 = No, 1 = Yes	Participation in awareness or education programs during detention.

2.6. Statistical Analysis

Data were analyzed using STATA v16.1. Descriptive statistics were used to estimate prevalence. A multivariate analysis was conducted to identify factors associated with HIV and syphilis, with a significance level set at a probability less than 0.05.

2.7. Ethical Considerations

The primary study was designed to ensure that participants were protected from any form of stigma, discrimination, or harm. **Data collection** was conducted in accordance with ethical standards, ensuring **confidentiality** and **informed consent**.

The study received approval from the **National Health Research Ethics Committee of Chad**, through the **National Council for the Fight against AIDS (CNLS)**.

For the present secondary analysis, **authorization to use the data** was formally obtained from the CNLS, under the reference number **0101/PT/CNLS/SEN/24**.

3. Results

3.1. Characteristics of the Study Population and Prevalence of HIV and Syphilis

Table 2. Sociodemographic and behavioral characteristics of detainees.

Variable	Category	n	%
Prevalence	**HIV**		**5.2**
	Syphilis		**2.9**
Sex	Male	565	91.87
	Female	50	8.13
Age group	<25 years	131	21.30
	25 - 49 years	461	74.96
	≥50 years	23	3.74
Marital Status	Single	129	20.98
	Married	431	70.10
	Widowed/Divorced	55	8.94
Education level	Primary	151	43.39
	Secondary	179	51.44
	Tertiary	18	5.17
Occupation (Pre-incarceration)	Informal sector	341	55.45
	Unemployed	259	42.11
Alcohol use	Yes	352	57.00
Drug use	Yes	105	17.00
Injection drug use (IDU)	Yes	5	0.81
Sexual activity in prison	Yes	4	0.67
Awareness session participation	Yes	328	53.33

This study included a total of 615 detainees from eight correctional facilities across Chad, exceeding the projected sample size of 564 and resulting in a participation rate of 109%. The population was predominantly male (91.87%), with the majority aged between 25 and 49 years (74.96%) and a mean age of 31 years (range: 18 - 66 years). In terms of marital status, 70.1% were married, 20.98% single, and 8.94% widowed or divorced.

Participants were primarily drawn from the Klessoum (14.96%) and Korotoro (14.63%) prisons. Educational attainment was generally low, with 51.44% having reached secondary school and 43.39% limited to primary education. Before incarceration, 55.45% of participants worked in the informal sector, while 42.11% were unemployed.

Regarding incarceration history, over half (53.35%) had been detained for more than 36 months. Sexual activity during incarceration was rarely reported (0.67%). Alcohol use was common (57.00%), followed by drug use (17.00%), while injection drug use was negligible (0.81%). Slightly more than half (53.33%) of inmates had participated in HIV/STI awareness sessions.

Biological testing revealed an HIV prevalence of 5.2% and a syphilis prevalence of 2.9% among the surveyed population. Among the 24 individuals who tested positive for HIV, 2 (8.33%) were not receiving antiretroviral therapy (ART), and only 4 (18.18%) of those on ART had undergone viral load monitoring, indicating gaps in the continuum of care within the prison health system. (Table 2)

3.2. Factors Associated with HIV Infection

Multivariate analysis identified three variables significantly associated with HIV infection in the prison population. First, individuals aged 50 years and older exhibited a significantly higher likelihood of HIV infection compared to younger age groups (adjusted Odds Ratio [aOR] = 8.54; 95% Confidence Interval [CI]: 1.27 - 57.0; p = 0.027). Second, inmates who were widowed or divorced were also at increased risk (aOR = 5.09; 95% CI: 1.18 - 21.8; p = 0.029), suggesting that marital disruption may be a proxy for past exposure to high-risk behaviors or social vulnerability. Finally, drug use was found to be significantly associated with HIV seropositivity (aOR = 4.23; 95% CI: 1.04 - 17.2; p = 0.043), highlighting the role of substance use in increasing vulnerability to HIV transmission within the prison environment (Table 3).

Table 3. Multivariate analysis of determinants of HIV infection.

Variable	aOR	95% CI	P-value
Age ≥50 years	8.54	1.27 - 57.00	0.027
Widowed/Divorced	5.09	1.18 - 21.80	0.029
Drug use	4.23	1.04 - 17.20	0.043
Informal sector (vs unemployed)	0.47	0.22 - 1.00	0.051

3.3. Factors Associated with Syphilis Infection

No statistically significant associations were observed between syphilis and the independent variables studied. All adjusted p-values exceeded the 0.05 threshold. Although widowed/divorced inmates (aOR = 2.28) and drug users (aOR = 1.37) showed elevated odds of infection, these associations were not statistically significant due to wide confidence intervals and limited sample size. Participation in awareness sessions appeared protective (aOR = 0.61), but this effect also lacked statistical significance (Table 4).

Table 4. Multivariate analysis of determinants of syphilis infection.

Variable	aOR	95% CI	P-value
Widowed/Divorced	2.28	0.49 - 10.60	0.290
Female	1.17	0.30 - 4.54	0.820
Drug use	1.37	0.36 - 5.14	0.640
Awareness sessions	0.61	0.23 - 1.58	0.310

4. Discussion

The findings of this study reveal an HIV prevalence of 5.2% and a syphilis prevalence of 2.9% among incarcerated individuals in Chadian prisons—rates significantly higher than the national HIV estimate of approximately 1.0% [1]. These results confirm the heightened vulnerability of prison populations, consistent with data from other African contexts. For instance, a study conducted at the Abidjan Remand and Correctional Facility (MACA) in Ivory Coast reported an HIV prevalence of 5.9% [12], while even higher rates have been documented in Iran, with HIV at 14.5% and syphilis at 22.1% [13].

These elevated rates can be explained by systemic factors inherent to incarceration. Prisons are often overcrowded, unsanitary, and under-resourced in terms of healthcare. High-risk behaviors such as unprotected sex, injecting drug use, and tattooing with non-sterile equipment are common [5] [6]. In low-resource prison settings, the lack of structured screening programs and persistent HIV-related stigma further delay diagnosis and care, facilitating silent transmission in these closed environments [7] [14] [15].

Multivariate analysis identified three significant predictors of HIV infection. The first was age: individuals aged ≥50 years were eight times more likely to be HIV-positive (aOR = 8.54). This finding aligns with studies in Brazil (aOR = 13.3) [16] and in North Carolina, USA [17]. Several mechanisms may explain this association, including immune senescence, cumulative lifetime sexual exposure, reduced access to or engagement in prevention strategies, and the masking effects of comorbidities common among older prisoners [2].

The second determinant was marital status. Widowed or divorced inmates had a five-fold higher risk of HIV compared to their married counterparts (aOR = 5.09). This is consistent with research from sub-Saharan Africa where marital dis-

ruption is often associated with emotional distress, economic vulnerability, and increased risk behaviors such as transactional sex or exposure to traditional practices like widow inheritance (levirate marriage) [18] [19].

Drug use emerged as the third key factor, significantly associated with HIV infection (aOR = 4.23). This confirms a well-established global trend: drug use—whether injectable or non-injectable—is a strong predictor of HIV in correctional settings [5] [20]. Behavioral clustering, including multiple sexual partners, low condom use, and unsafe tattooing, may contribute to the elevated risk observed among drug users. In this study, injecting drug use was rarely reported, likely due to underreporting driven by stigma.

Unlike some studies, biological sex was not significantly associated with HIV infection in this population (aOR = 0.86). In other contexts, particularly where women represent a larger share of the prison population, female inmates often experience a higher HIV burden due to previous exposure to sexual violence, transactional sex, and limited access to prevention [21]. In Chad, women represent less than 10% of the prison population, which may limit the statistical power to detect sex-based disparities.

For syphilis, no variable showed a statistically significant association in the multivariate model. Although widowed/divorced status (aOR = 2.28) and drug use (aOR = 1.37) suggested elevated odds, confidence intervals were wide and p-values were non-significant. This may be attributed to limited sample size and low overall prevalence (<3%), reducing the statistical power of the model. Similar challenges in identifying syphilis-related risk factors have been documented in prison studies from Ethiopia and Nigeria, where underreporting and diagnostic limitations hinder accurate assessment [22] [23].

Several study limitations warrant mention. First, the cross-sectional design precludes conclusions about causality—whether infections were acquired before or during incarceration remains uncertain. Second, the use of secondary data led to considerable missingness for key behavioral variables, such as alcohol and tobacco use. Moreover, social desirability bias may have resulted in underreporting of stigmatized behaviors like same-sex activity or injecting drug use. Finally, syphilis testing was based on rapid diagnostics without confirmatory RPR titers, which may compromise diagnostic sensitivity and specificity.

5. Conclusions

Prisons in Chad pose heightened risks for HIV and syphilis transmission due to overcrowding, insufficient healthcare services, and the prevalence of high-risk behaviors among inmates. This study identified older age, widowed or divorced marital status, and drug use as significant predictors of HIV infection. While no statistically significant factors were associated with syphilis, its prevalence remains a public health concern.

Addressing these gaps requires targeted screening, harm reduction strategies, and structural reforms. Improving prison health is essential not only for the rights

of detainees but also for protecting public health beyond prison walls.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] UNAIDS (2023) Global HIV & AIDS Statistics—Fact Sheet. https://www.unaids.org/en/resources/fact-sheet

[2] UNAIDS (2023) West and Central Africa. https://www.unaids.org

[3] World Health Organization (2022) Global Health Sector Strategy on Sexually Transmitted Infections 2022-2030.

[4] Hook, E.W. (2021) Syphilis and HIV: A Dangerous Duo. *The Journal of Infectious Diseases*, **224**, S24-S29.

[5] Dolan, K., Wirtz, A.L., Moazen, B., Ndeffo-mbah, M., Galvani, A., Kinner, S.A., *et al.* (2016) Global Burden of HIV, Viral Hepatitis, and Tuberculosis in Prisoners and Detainees. *The Lancet*, **388**, 1089-1102. https://doi.org/10.1016/s0140-6736(16)30466-4

[6] World Health Organization (2022) Prisons and Health.

[7] Jürgens, R., Nowak, M. and Day, M. (2011) HIV and Incarceration: Prisons and Detention. *Journal of the International AIDS Society*, **14**, 26-26. https://doi.org/10.1186/1758-2652-14-26

[8] Telisinghe, L., Charalambous, S., Topp, S.M., Herce, M.E., Hoffmann, C.J., Barron, P., *et al.* (2016) HIV and Tuberculosis in Prisons in Sub-Saharan Africa. *The Lancet*, **388**, 1215-1227. https://doi.org/10.1016/s0140-6736(16)30578-5

[9] Zuma, T., Shisana, O., Rehle, T.M., *et al.* (2018) Prevalence of HIV in South African Prisons: A National Survey. *South African Medical Journal*, **8**, 655-660.

[10] Nwokedi, E.E., Gbonjubola, I., *et al.* (2020) HIV and Syphilis Seroprevalence among Nigerian Prisoners. *African Health Sciences*, **20**, 1721-1729.

[11] Comité National de Lutte contre le Sida (CNLS) (2022) Plan stratégique national de lutte contre le VIH/SIDA 2022–2026. Ministère de la Santé Publique et de la Prévention.

[12] Kadio, A., Ekra, D., Konan, D., *et al.* (2018) HIV Prevalence in MACA Prison, Côte d'Ivoire. *Journal of the International AIDS Society*, **21**, e25116.

[13] Rahimzadeh, M., Ramezani, A., Yaghmaei, B., *et al.* (2021) HIV and Syphilis Seroprevalence in Iranian Prisons. *Harm Reduction Journal*, **18**, 1-8.

[14] United Nations Office on Drugs and Crime (UNODC) (2022) HIV Prevention, Treatment, Care and Support in Prison Settings.

[15] Jürgens, R. (2007) Human Rights and HIV/AIDS in Prisons. WHO/UNODC/UNAIDS.

[16] Passos, S.R.L., Ribeiro, A. and de Carvalho, M. (2022) HIV Prevalence in Aging Brazilian Prisoners. *Revista de Saúde Pública*, **56**, 1-9.

[17] Rosen, D.L., Schoenbach, V.J., Wohl, D.A., White, B.L., Stewart, P.W. and Golin, C.E. (2009) Characteristics and Behaviors Associated with HIV Infection among Inmates in the North Carolina Prison System. *American Journal of Public Health*, **99**, 1123-1130. https://doi.org/10.2105/ajph.2007.133389

[18] Kwaghe, A.V., Adebayo, S.B., *et al.* (2020) Risky Sexual Behavior among Widows in Northeastern Nigeria. *BMC Public Health*, **20**, 1-10.

[19] Kourouma, M., Doumbia, D., *et al.* (2021) Marital Status and HIV Risk in Côte d'Ivoire. *African Journal of AIDS Research*, **20**, 237-244.

[20] UNODC (2022) World Drug Report. https://www.unodc.org/unodc/en/data-and-analysis/world-drug-report-2022.html

[21] Strathdee, S.A., West, B.S., *et al.* (2015) Substance Use and HIV among Female Prisoners. *The Lancet*, **386**, 1727-1729.

[22] Mekonnen, Z., Gebre-Selassie, S. and Feleke, M. (2022) Seroprevalence of Syphilis in Ethiopian Prisoners. *BMC Research Notes*, **15**, 1-6.

[23] Adebayo, S.B., Idowu, A., Bamidele, J.O., *et al.* (2021) Syphilis in Nigerian Correctional Institutions. *African Journal of Reproductive Health*, **25**, 75-83.