

# Seroprevalence of HIV Infection and Associated Factors Among Newly Incarcerated Prisoners in Abidjan, Ivory Coast

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**Abstract:** Poor socio-economic condition of prisoners and practices at risk of getting transmissible diseases in most prisons contribute to the spread of Human Immunodeficiency Virus (HIV) infection. The objectives of this study were to determine HIV seroprevalence among newly incarcerated persons, to describe their risk behaviors, and to identify factors associated with HIV infection. We conducted a cross-sectional study from January 2014 to February 2014 at the biggest prison of Abidjan called "House of Judgement and Correction of Abidjan" (HJCA). Study population included newly incarcerated persons aged more than 18 years. Overall, 370 people were included after an informed consent. Findings showed that 13% of inmates used drug; 8.3% of them using injectable drugs. The vast majority of respondents (97.3%) experienced sexual intercourse and 31.9% had multiple sexual partners. More than half (50.6%) of respondents did not use condom, and among those who use it, 73.6% used it irregularly. During their last sexual intercourse, 71.8% of respondents did not use condom. Overall, 7.9% of respondents were HIV positive. Factors associated with HIV positive status were history of herpes zoster (adj. OR=16.66, 95% CI: 2.66-104.08, p=0.003), history of STIs (adj. OR=8.82, 95% CI: 3.25-23.95, p<0.001), history of tuberculosis (adj. OR=6.49, 95% CI: 1.06-39.79, p=0.043), and having had more than one sexual partner over the last 12 months (adj. OR=8.11, 95% CI: 1.75-37.51, p=0.007). Promoting safer behaviors, routine HIV screening among prisoners, care for HIV-positive people, and improved living conditions in prisons are needed measures to control HIV / AIDS in prison environment in Ivory Coast.

**Keywords:** Prison Environment, HIV/AIDS, Associated Factors, Ivory Coast

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## 1. Introduction

In many countries, HIV infection is a serious health problem for prison populations and a major challenge for prison services, public health services and governments. The generally accepted principle that prisons and detainees are

part of the wider community means that the threat posed by HIV to prisons also has an impact outside the prisons and therefore calls for some coordinated action [1]. Prisons around the world are being seriously hit by the HIV

epidemic. HIV infection rates and the number of confirmed AIDS cases are very high in prisons. Indeed, HIV prevalence is 4 to 50 times higher among inmates than in adult population out of prisons [2]. Given the unhealthy environment in most prisons, which contributes to the spread of many infectious diseases including HIV, it seems important to know HIV status and risk behaviors of prisoners upon admission in order to identify and implement appropriate strategies to effectively control this scourge in prisons.

In Ivory Coast, living conditions in prisons are very difficult. Indeed, there is a strong promiscuity with recurrent sexual violence, precarious hygiene and undernourishment [3]. Several epidemics occurred in prisons, including cholera epidemic, shigellosis epidemic and the beriberi epidemic which occurred in 2002 and 2003 at Abidjan main prison, called "House of Judgement and Correction of Abidjan" (HJCA). These outbreaks are the consequence of the poor living conditions in this prison.

Very few studies about Sexually Transmitted Infections (STIs) including HIV have been conducted in prisons in Ivory Coast. Therefore, we conducted this study about HIV seroprevalence among new detainees at the HJCA. The purpose of this study is to contribute to HIV control in prisons in Ivory Coast. The objectives of this study were to determine the HIV seroprevalence among new detainees, to describe their behaviors at risk of getting HIV infection, and to identify the factors associated with HIV infection among new prisoners.

## 2. Methodology

### 2.1. Study Site

It was a cross-sectional study conducted at the HJCA, the main prison of Abidjan. This prison has been built in 1970 and is the biggest and main prison in Ivory Coast. In 2010, 5 300 people were detained at the HJCA which was built to accommodate 1 500 individuals. The monthly number of incarcerated people and released individuals is estimated to 600. In order to provide medical care to detainees, the prison clinic works in collaboration with a Non-Governmental Organization (NGO) called "*Ensemble pour une Solidarité Thérapeutique Hospitalière en Réseau*" (ESTHER). ESTHER is a French public organization involved in capacity building, in care and treatment for HIV/AIDS patients in 18 countries.

At the prison clinic, any new detainee goes through HIV counseling and then a HIV test is proposed to this new detainee. Most of the time, more than three quarters of new prisoners accept the proposed HIV test.

### 2.2. Type of Study

It was a cross sectional study, conducted during a period of 2 months, from January to February 2014.

### 2.3. Study Population

This study included new detainees aged more than 18, with HIV-positive test, who gave their consent to participate in the study. Eligible individuals were included in the study upon their arrival at the entrance of the HJCA.

### 2.4. Study Sample

Study sample has been determined using the following formula:

$$n = c \times \frac{\varepsilon_{\alpha}^2}{i^2} \times p(1 - p) \quad (1)$$

c: corrector coefficient = 4

$\varepsilon_{\alpha}$ : is the standard normal variate at the risk  $\alpha$  (type 1 error) of 5%= 1.96

i: precision of the estimate = 0.05

p: HIV prevalence among new detainees at HJCA from November 2008 to March 2010 = 5.4% [3].

$$q = 1 - p$$

Overall, 370 people were included in this study.

### 2.5. Data Collection

Data were collected using a questionnaire during a face-to-face interview. Upon arrival at the HJCA, all new prisoners attended HIV counselling session. Questionnaire was only administered to individuals who accepted HIV test after the counselling session. Variables included in the questionnaire were grouped into four categories.

- Category 1 refers to "sociodemographic characteristics" including age, sex, education level, marital status, citizenship, and number of incarceration.
- Category 2 refers to "sexual and other behaviour at risk of getting HIV" including drug consumption, method of drug consumption, number of sexual partners over the last twelve months, type of sexual partners, sexual intercourse with prostitutes, condom use during sexual intercourses, and frequency of condom use.
- Category 3 refers to "medical history" included STIs, herpes zoster, and tuberculosis.
- Category 4 refers to "HIV status" included HIV-positive, and HIV-negative.

### 2.6. Data Analysis

Data were analysed using Epi-info 3.5.1 and SPSS 16. Dependent variable was "HIV status". Independent variables included age, sex, education level, marital status, citizenship, number of incarceration, drug consumption, method of drug consumption, number of sexual partners over the last twelve months, type of sexual partners, sexual intercourse with prostitutes, condom use during sexual intercourses, frequency of condom use, history of STIs, history of herpes zoster, and history of tuberculosis.

For quantitative variables, means and standard deviation were computed; for qualitative variables, proportions were

computed.

Univariate analysis was run using Chi square test in order to determine a link between the dependent variable and independent variables. In addition, multivariate analysis was run using Fisher method in order to identify factors associated with HIV-positive status. The measure of association was the adjusted Odds Ratio (adj. OR) with 95% confident interval (95% CI).

### 2.7. Ethical Considerations

Prior to the beginning of the study, agreements were obtained both from the director of Eastern Yopougon health district and from the director of the HJCA, this prison being included in the health district of Eastern Yopougon. Verbal informed consent was also obtained from each participant of the study. The anonymity of respondents was respected.

## 3. Results

### 3.1. Sociodemographic Characteristics of Respondents

Sociodemographic characteristics of 370 respondents are presented in table 1. The mean age of respondents was 30 years and the standard deviation was 8.6 years. The vast majority of respondents aged 20 to 39 years; 79.7% of them were singles, and 75.6% of them were males. Overall, 35.9% of respondents were unschooled and 96.2% of them were at their first incarceration.

**Table 1.** Distribution of detainees by sociodemographic characteristics, HJCA, 2014.

Sociodemographic characteristics	Number	Percentage
<i>Age (years)</i>		
< 20	21	5.6
20 – 29	178	48.1
30 – 39	127	34.3
40 – 49	32	8.6
≥ 50	12	3.2
<i>Sex</i>		
Male	280	75.6
Female	90	24.3
<i>Citizenship</i>		
Ivorian	288	77.8
Non-ivorian	82	22.2
<i>Education</i>		
Unschooled	133	35.9
Primary	79	21.3
Secondary	129	34.9
High	29	7.8
<i>Marital status</i>		
Married	75	20.3
Single	295	79.7
<i>Number of incarcerations</i>		
1	356	96.2
> 1	14	3.8

### 3.2. Behaviour at Risk of Getting HIV and Medical History

Overall, 13% of respondents were drug consumers and 8.3 of them used injectable drugs. The vast majority of study participants (97.3%) had experienced sexual intercourse and 99.7% were heterosexuals. Over the last twelve months before the survey, 31.9% of detainees had had more than one sexual partner and 50.6% did not use condom. Among respondents who used condom, 73.6% used it irregularly. During their last sexual intercourse, 71.8% of respondents did not use condom as shown in table 2. Overall, 22.2%, 2.2% and 3% of respondents had history of STIs, herpes zoster and tuberculosis respectively.

**Table 2.** Distribution of detainees by Sexual behavior, HJCA, 2014.

Sexuality and use of condoms	Number	Percentage
<i>Number of sexual partners over the last 12 months</i>		
No	15	4.2
One	230	63.9
Two and more	115	31.9
<i>Type of sexual partner</i>		
Regular	254	70.6
Occasional	18	5
Regular and occasional	88	24.4
<i>Sexual relations with sex workers</i>		
Yes	21	5.8
No	339	94.2
<i>Condom use during sexual intercourse</i>		
Yes	178	49.4
No	182	50.6
<i>Condom use</i>		
Regular	47	26.4
Irregular	131	73.6
<i>Condom use during the last sexual intercourse</i>		
Yes	126	71.8
No		

### 3.3. HIV Status

More than half of respondents (58.1%) did not know their HIV status before incarceration. Overall, 7.9% of study participants were HIV-positive and 96.6% of them had type 2 HIV.

### 3.4. Factors Associated with HIV-positive Status

Proportion of HIV-positive respondents was higher among those aged 30 years and greater compared to participants less than 30 years ( $p=0.01$ ). Proportion of HIV-positive was also higher among married compared to single respondents ( $p=0.04$ ). Proportion of HIV-positive was high among respondents with history of STIs ( $p<0.001$ ), herpes zoster ( $p=0.001$ ), and tuberculosis ( $p=0.007$ ). HIV infection was prevalent among respondents who had had more than one sexual partner over the last twelve months before the survey compared to those who did not ( $p<0.001$ ). HIV infection was also

common among study participants who had occasional sexual partners compared to those who had a regular sexual partner ( $p < 0.001$ ) as shown in table 3.

**Table 3.** Distribution of HIV status by detainees' characteristics, HJCA, 2014.

	HIV status		p value
	Positive n (%)	Negative n (%)	
<b>Sociodemographic characteristics</b>			
<i>Age (Years)</i>			
< 30	9 (4.5)	190 (95.5)	0.0104
≥ 30	20 (11.7)	151 (83.3)	
<i>Sex</i>			
Male	20 (7.1)	260 (92.9)	0.3803
Female	9 (10.0)	81 (90.0)	
<i>Marital status</i>			
Married	10 (13.3)	65 (86.7)	0.047
Single	19 (6.4)	276 (93.6)	
<i>Citizenship</i>			
Ivorian	25 (8.6)	263 (91.4)	0.2583
Non-ivorian	4 (4.8)	78 (95.2)	
<i>Instruction level</i>			
Uneducated	11 (8.3)	122 (91.7)	0.8164
Educated	18 (7.6)	219 (92.4)	
<i>History</i>			
<i>IST</i>			
Yes	21 (26.5)	58 (73.5)	< 0.001
No	8 (2.7)	283 (97.3)	
<i>Herpes Zoster</i>			
Yes	5 (62.5)	3 (37.5)	< 0.001
No	24 (6.7)	338 (93.3)	
<i>Tuberculosis</i>			
Yes	4 (36.3)	7 (63.7)	0.007
No	25 (6.9)	334 (93.1)	
<i>Sexual partners</i>			
<i>Type of sexual partners</i>			
Regular	10 (3.9)	244 (96.1)	< 0.001
Occasional	19 (11.1)	87 (88.8)	
<i>Number of sexual partners over the past 12 months</i>			
0-1	6 (2.5)	239 (97.5)	< 0.001
> 1	23 (18.4)	102 (81.6)	
<i>Sexual intercourse with sex workers</i>			
Yes	2 (9.5)	19 (90.4)	0.7988
No	27 (7.9)	312 (92)	

In multivariate analysis, age (adj. OR=1.41, 95% CI: 0.48-4.14), marital status (adj. OR=1.94, 95% CI: 0.63-6.01), and the type of sexual partners (adj. OR=0.82, 95% CI: 0.20-3.29) were not associated with HIV status. However, history of herpes zoster (adj. OR=16.66, 95% CI: 2.66-104.08), history of STIs (adj. OR=8.82, 95% CI: 3.25-23.95), and history of tuberculosis (adj. OR=6.49, 95% CI: 1.06-39.79) were associated with HIV status. In addition, respondents who had had more than one sexual partner over the last twelve months before the survey had 8 times more

risk of getting HIV infection compared to those who had only one sexual partner (adj. OR=8.11, 95% CI: 1.75-37.51) as shown in table 4.

**Table 4.** Factors associated with HIV-positive status among new detainees ( $n=360$ , 29 new detainees were VIH-positive).

Variables	Adj. OR	95% CI	p
<i>History of STIs</i>			
Yes	8.826	3.251 – 23.958	<0.001
No	1	–	
<i>History of Herpes zoster</i>			
Yes	16.669	2.669 - 104.085	0.003
No	1	–	
<i>History of Tuberculosis</i>			
Yes	6.497	1.061 – 39.794	0.43
No	1	–	
<i>Number of sexual partners</i>			
0 - 1	1	–	0.007
> 1	8.114	1.755 – 37.513	

Variables included in the model: age, marital status, history of STIs, history of herpes zoster, history of tuberculosis, number of sexual partners over the past 12 months, type of sexual partners.

## 4. Discussion

It is important to show limitations of this study about HIV seroprevalence and associated factors among new detainees. Indeed, given that it was a behavioral study, response biases may have occurred. In addition, for a better representativeness of the new prisoners, all newly incarcerated people at HJCA should be included in the study and not only those who presented themselves at the entrance of the prison. Despite these limitations, this study keeps its originality and found important factors which should be taken into account to control HIV infection in Ivory Coast.

In this study, 31.9% of respondents had multiple sexual partners. This percentage is close to proportions found in previous studies. Indeed, in 2002, a study conducted by Touré about STIs in Ivory Coast found that 40.1% of participants had multiple sexual partners [4]. Also, Adefuye [5] and Kalina [6] found in their studies respectively 40% and 27% of respondents (students) who had more than one sexual partners. Sexuality with multiple partners is a major risk factor of getting STIs and the risk increases with the number of partners. Indeed, each partner participates in the increase of the infection transmission risk [7]. Concerning condom use, only 49.4% of respondents, in our study, said they used it during sexual intercourse and 29.2% stated that they used condom during their last sexual intercourse. In Touré's [4] and Kalina's [6] studies, proportion of condom utilization during respondents' last sexual intercourse were 37.1% and 25.3% respectively. While condoms are now well recognized as an effective mean of protecting against HIV / AIDS and STIs, it is not always used in certain practices that are wrongly considered safe. According to Benoit F, the use of the condom during

intercourse needs to be studied taking into account the context of its use. Indeed, it is not the number or percentage of use that is the most important, but with which partner the condom is utilized [8]. In sum, the new inmates had risk behaviors identical to the general population. More than half of the respondents (58.1%) were unaware of their HIV status at the time of their incarceration. However, knowledge of serological status would allow the early implementation of therapeutic or prophylactic interventions and would promote the adoption of prevention behaviors.

According to UNAIDS, many HIV-positive inmates have contracted the infection out of the prison. Many detainees come from communities where HIV prevalence is higher than the mean prevalence in the general population [9].

In this study, HIV seroprevalence among new inmates was 7.9%. Considering the national seroprevalence which is 3.7% [10], it appears that new prisoners included in this study constitute a group at high risk of HIV infection. HIV prevalence found in this study is greater than the prevalence found by ESTHER in 2011 in the same prison (5.6%) [3]. Simooya, in 2001, found HIV prevalence of 27% in Zambia three main prisons [11]. In Togo, a survey conducted between 2011 and 2012 among individuals incarcerated for more than three months showed a HIV prevalence of 4.3% [12]. A systematic review of HIV in prisons in low and middle-income countries found that HIV prevalence was greater than 10% in 20 out of 75 countries [13]. This serious problem of HIV in prison requires vigorous and effective measures.

In this study, findings showed that HIV infection was more prevalent among married detainees as compare to single inmates ( $p=0.04$ ). This situation could be explained by the fact that unprotected sex is not limited to the usual partner among married individuals. In addition, the high proportion of HIV-positive individuals among respondents who had sex with occasional partners compared to those who did not ( $p<0.001$ ), and the great number of HIV-positive people among new detainees who had sex with more than one partner compared to those who did not ( $p<0.001$ ) support our argumentation that married respondents did not limit unprotected sex to the usual partner, and point out that the risk of getting HIV increases with the number of sexual partners [9]. HIV was also prevalent among respondents aged 30 years and greater. This situation could be explained by a sexual hyperactivity with risky sexual practices of people in this age group.

In our study, history of herpes zoster, tuberculosis, and STIs were associated with HIV status. Previous studies also found an association between HIV status and these diseases [15-17]. STIs play a major role in the sexual transmission of HIV. In fact, STIs, especially ulcerative STIs create genital lesions that facilitate the penetration of HIV into the body. Similarly, HIV infection aggravates the clinical signs of STIs and complicates their treatment [18]. Concerning tuberculosis, HIV infection promotes the reactivation of a latent infection of mycobacterium tuberculosis, whereas mycobacterium tuberculosis promotes HIV replication and thus accelerates the natural course of HIV infection towards an immunosuppression [19]. Tuberculosis is the leading cause of

opportunistic infections and deaths among people living with HIV in sub-Saharan Africa [13] and an HIV-infected person is at high risk of developing active tuberculosis in a country with a high incidence of tuberculosis [19]. Concerning shingles, it is a very frequent manifestation of HIV infection which can occur at all stages, but often it happens at a stage of severe immunosuppression [19].

## 5. Conclusion

This study revealed a high prevalence of HIV among new inmates, most of them having high-risk behaviors. These findings challenge us to reinforce the promotion of safer behaviors, the systematic screening of HIV among prisoners, both newer and older ones, and the treatment of HIV-positive individuals. To be more effective, all these measures should be associated with improvement of living conditions in prisons.

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