

Prevalence of Human Immunodeficiency Virus Infection among Prison Inmates in Borno State Nigeria

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Abstract: Prevalence and possible risk factors of Human immunodeficiency virus (HIV) among prison inmates in Borno State, Nigeria was investigated. The study was conducted using ELISA tests and a structured questionnaire in 2012. Blood samples were collected from 300 inmates in the three prisons (maximum security prison and two medium security prisons) in Borno State and analysed for HIV antibodies. A structured questionnaire was also administered to the same inmates. Out of the 300 subjects tested, 7(2.3%) tested positive for HIV antibodies, with those aged ≥ 50 years (5.9%) and the male subjects (2.6%) having significantly ($p < 0.05$) higher HIV infection rates. The result further revealed significantly ($p < 0.05$) higher infectivity among the subjects who have acquired higher education. Other factors found to be associated with the infection in this study were those of using sharp objects, practice of homosexuality and knowledge of HIV transmission. This study therefore underscores the need for prison authorities to focus more on intervention initiatives among the prisoners in the study area.

Keywords: Human, immunodeficiency, virus, prisons, Enzyme immunosorbent

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I. Introduction

Human immunodeficiency virus (HIV) is an RNA virus that belongs to the genus lentivirus in the family retroviridae. The viruses in this family, including HIV, possess a reverse transcriptase (RT) enzyme that converts the viral RNA template into DNA, which gets integrated into the cellular DNA to cause persistent infection (Kudesia and Wreghitt, 2009). Human immunodeficiency virus is a scourge, progressing and causing devastation to lives and the healthcare systems worldwide (Carpenter *et al.*, 2000). The major routes of HIV transmission are unprotected sexual intercourse, use of sharp objects contaminated with blood, semen, vaginal fluid and pre-ejaculate, breast milk, and transmission from an infected mother to her baby at birth (vertical transmission) (Olokoba *et al.*, 2010). Acquired Immunodeficiency Syndrome (AIDS) is the end-stage manifestation of human immunodeficiency virus (HIV) infection. Infection with HIV is characterised by an asymptomatic early phase that is preceded by persistent and generalized lymphadenopathy (Haaheim *et al.*, 2002). Human immunodeficiency virus (HIV) infection gives rise to whole array of clinical problems that will culminate into full blown AIDS and then death (Akamu and Okany, 2004; Mohammed and Olumide, 2004). The HIV epidemic in Nigeria is complex and varies widely by region and driven mainly by high-risk behaviours (Country profile, 2008). There are limited published data on HIV infections among prison inmates in Nigeria despite the fact that prisoners are at high risk of contracting the virus, especially those who engage in high-risk behaviours such as intravenous drug use, sharing of nail cutters, clippers and or homosexual activities. In this study, a cross-sectional survey was carried out in correctional facilities in Borno State, Nigeria, to determine, the seroprevalence of HIV and possible risk factors associated with the infection.

II. Methodology

Study area

The study was conducted in correctional facilities located in Maiduguri, Biu and Bama areas of Borno State, Nigeria in 2014. Borno State lies between latitude 10°N and 13°N and longitude 12°E and 15°E . The state has an area of about 69,436 sq km (Nigeria on line, 2007). The state is located in the North eastern part of Nigeria, and has an estimated population of 4.2 million people (NPC, 2006). Borno state has a hot climate with average peak daily temperature ranging between 34°C and 40°C especially from April to June though milder in the southern part. The rainy season lasts from June to September in the North which has a Sahelian vegetation and May to October in the South with Sudan vegetation (Musa and Pindar, 2005).

Study Population and Sample size Determination

Three hundred prison inmates were employed for this study from the three prisons in Borno state. The sample size was obtained using the formula propounded by Naing (2003) for Sample Size = $n / (1 - (n / \text{population size}))$, where $n = Z^2 pq / d^2$; n=number of participants required in the survey, Z= normal standard deviation at 1.96 (which corresponds to 95% confidence interval, P=prevalence of Human immunodeficiency virus from previous study; q = 1-p and d= degree of accuracy/precision expected set at 0.05.

Questionnaire Survey

Informed consent and questionnaire were made available to each of the participating inmates. The questionnaire asked about the socio-demographic characteristics of the inmate, mode of imprisonment and jail term, history of blood transfusions and intravenous drug use; history of sexual behaviour, and sexually transmitted diseases and sharing of clippers and sharp objects.

Specimen Collection

Venous blood specimens were collected from participants using a sterilize 5 ml syringe and needle after disinfecting the collection site with 70% methanol on sterilize cotton wool. The samples were collected into sterile plain vacutainer tubes and conveyed to laboratory for serum separation. The blood samples were kept at room temperature to clot. Serum samples were harvested from the clotted blood by centrifuge at 2000 revolutions per minute. The harvested sera were stored in cryotubes and kept at -20⁰C until tested.

Assay of Serum samples for HIV

Human immunodeficiency virus (HIV) test kit (KHB, Shangha Kehua Bio-engineering Co., Ltd. China) was used for screening and positive samples were re-tested with STAT-PAK (Chembio HIV 1/2 STAT-PAK™ Assay, Chembio diagnostic systems, Inc., Medford, NY, USA). Samples giving discordant results in the two tests were re-tested using tie-breaker (Uni-Gold HIV, Trinity Biotech Plc, Co. Wicklow, Ireland).

Data Analysis

Chi-square and Fisher's exact test were also used for categorical comparison and in determining significance at a 95% confidence interval. P-value less than or equal to 0.05 was considered statistically significant.

Ethical Clearance

The study was approved by the State Ministry of Health Maiduguri, Borno state, in accordance with the code of ethics for biomedical research involving human subjects. Official consent of the prisoners was obtained and also the approval of the state's comptroller of prisons was also obtained.

III. Result

The result of the survey for human immunodeficiency virus (HIV) among prison inmates in Borno state showed an overall prevalence rate of 2.3% (Table 1). The gender distribution of the HIV positive reactors indicated 7(2.6%) males and 0(0%) females. The age group ≥ 50 years had the highest infection 1(5.9%) of HIV compared to the other groups (Table 2). There was no significant ($P > 0.05$) association of human immunodeficiency virus with ethnicity, although the Hausa and Kanuri tribes showed higher percentage positivity of 2(4.3%) each (Table 3). Table 4 showed significant ($p < 0.05$) association of HIV infection in relation to educational background among the inmates. Those with higher level of education had higher percentage rate (23.5%) of HIV infection compared to those in other levels. Table 5 shows the distribution of HIV in relation to marital status, with married subjects having higher percentage positives of 4(2.6%) and the singles 3(2.1%). Figure 1 shows percentage distribution of HIV seropositives in relation to prison location with Maiduguri prison having 2.0%, followed by Biu prison with 0.3% and Bama prison was negative. The use of sharp objects, homosexual practice and the knowledge of HIV transmission were observed to be significantly ($p < 0.05$) associated with HIV infection among the inmates (Table 6).

Table 1: Distribution of HIV in relation to Sex of Prison Inmate in Borno State

Sex	Total No Tested	No (%) Positive
Male	285	7(2.6)
Female	15	0(0)
Total	300	7(2.3)

$P > 0.05$

Table 2: Distribution of HIV in Relation to Age of Prison inmates in Borno state

Age(Year)	Total No Tested	No (%) positive
18-<31	184	5(2.7)
31-<51	99	1(1.0)
>51	17	1(5.9)
Total	300	7(2.3)

P>0.05

Table 3: Distribution of HIV in relation to the ethnicity of prison inmates in Borno state

Tribe	Total No Tested	No(%) positive
Kanuri	46	2(4.3)
Hausa	46	2(4.3)
Shuwa Arab	19	0(0)
Marghi	25	0(0)
Gwoza	6	0(0)
Babur	49	1(2.0)
Michika	5	0(0)
Kanakuru	5	0(0)
Fulani	44	1(2.3)
Others	55	1(1.8)
Total	300	7(2.3)

p>0.05

Table 4: Distribution of HIV in relation to the Educational Background of Prison Inmates in Borno state

Level	Total No Tested	No(%) positive
Tsangaya	70	0(0)
Primary school	47	0(0)
Secondary school	82	2(2.4)
Higher institution	17	4(23.5)
None	84	1(1.2)
Total	300	7(2.3)

P<0.05

Table 5: Distribution of HIV in relation to marital status of prison inmates in Borno state

Status	Total No Tested	No (%) positive
Single	152	4(2.6)
Married	145	3(2.1)
Divorcee	0	0
Separated	3	0
Widow	0	0
Total	300	7(2.3)

p>0.05

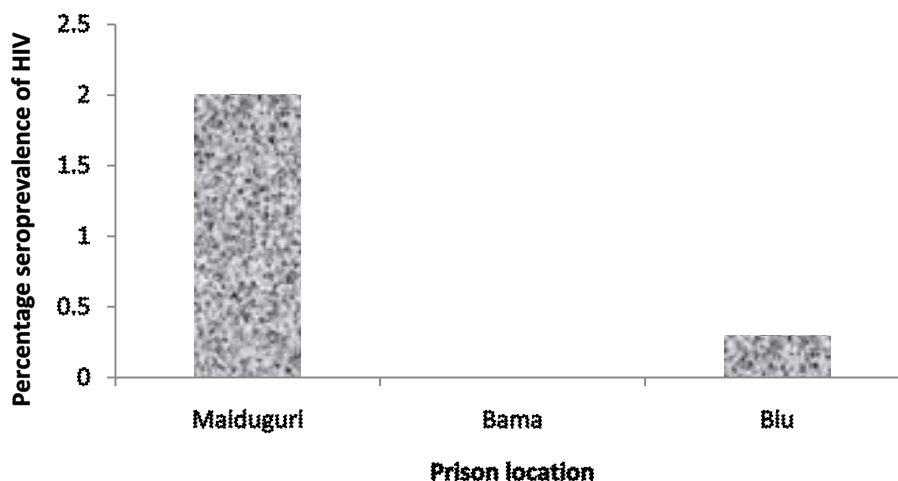
Table 6: Seroprevalence of HIV among prison inmates and possible associated risk factors in Borno state

Risk factor	No Tested	No(%) positive	RR	95% C.I	X ²	p-value
Blood Transfusion						
Yes	16	1(6.3)	2.958	0.3783-23.135		**
No	284	6(2.1)				
Intravenous drug use						
Yes	63	2(3.2)	1.505	0.2988-7.577		**
No	237	5(2.1)				
Use of sharp objects						
Yes	261	4(1.5)	0.1992	0.04632-0.8570		*
No	39	3(7.7)				
Homosexuality						
Yes	97	5(5.2)	5.232	1.033-26.498		*
No	203	2(1.0)				
No of sex partner						
1	55	1(1.8)	07424	0.9117-6.046		**
≥2	245	6(2.4)				
Transmission mode's knowledge						
Yes	11	2(18.2)	10.509	2.285-48.323		*
No	289	5(1.7)				
Sexual transmission infections						
Yes	200	7(3.5)				**
No	100	0(0)				
Duration of stay in prison						
0-2yr	207	3(1.4)	0.3370	0.07692-1.473		**
≥2	93	4(4.3)				

* = P<0.05

**=P>0.05

Figure 1: Distribution of HIV Serpositives among prison inmates in Borno State Nigeria in relation to Prison location



IV. Discussion

A prison is a correctional facility that harbours individuals with different attitudinal behaviours. The prison environment also predisposes them to risky practices as there are inherent structural conditions in prisons which expose inmates to high risk of HIV infection. These coupled with the attitudinal factors of inmates make them a peculiar group among the vulnerable groups (Orubuloye *et al.*, 1995). Our study was aimed at determining the seroprevalence of HIV infection among prison inmates in Borno state.

The overall prevalence rate (2.3%) of HIV infection observed in this study tallied with the report by Muhammed *et al.* (2012), but lower than the 6% and 12% reported by Mohammed *et al.* (2010) and Joshua and Ogboi (2008) respectively in prisons in other parts of Nigeria. The HIV infection recorded in this study could have occurred either outside the prison before incarceration or inside within the walls of the prison. This result is also lower than those reported from other parts of the world like in Brazil (15 %), Cote d'Ivoire (27.5 %), South Africa (15 %), Zambia (26.7 %), Spain (16.4 %) (Hardings, 1990; Hardings and Schaller 1992; Hernandez *et*

al., 1996; Hammett *et al.*, 2002; Autores *et al.*, 2002), France (13 %) and Netherlands 11 % (Jurgens, 1996). These discrepancies may be as a result of the sample size used in this study. Although the overall prevalence was lower than the national HIV prevalence of 4.1%, this may be due to population size. Seroprevalence of HIV was only observed among the males inmates. This is contrary to the findings conducted by Chimma *et al.* (2010) among inmates in Nigeria where HIV prevalence among female inmates (18.8%) was found to be higher than the prevalence among male (6.8%).

The most susceptible and risky age group was ≥ 50 years old. This is contrary to the report by Audu *et al.* (2013). This is due to the fact that they are the most sexually active age group as well as the ones most likely involved in risky sexual and non-sexual practices (Susan, 2007; Sabitu *et al.*, 2009; Audu *et al.*, 2013). Our findings revealed higher percentage rate of infection among Hausa and Kanuri ethnic group than the other ethnic group.

In addition, inmates who are students in higher institution were two times likely to be involved in risk behaviour than the other levels (primary school, secondary school) of education. This may be as a result of life in campus before incarceration. The result showed no significant association of HIV infection in relation to marital status. This contradicts the belief that unmarried single subjects are more likely to commit more crimes than married subjects (Chimma *et al.*, 2010; Atilola *et al.*, 2010). Our study observed higher seroprevalence rate of HIV in Maiduguri maximum security prison followed by the Biu prison and no prevalence was observed in the Bama prison. This may be due to congestion in the prisons which may lead the inmates to practice risky behaviours. This tallies with previous report that the higher the congestion in a prison, the higher the risk of infection. The use of sharp objects was found to be significantly associated with HIV infection. This corroborates the findings that the use of sharp objects is significantly associated with HIV infection (Rabbar *et al.*, 2004; Pourahman *et al.*, 2007). Homosexual practices and the knowledge of mode of transmission of HIV were also observed to be significantly associated with HIV infection among prison inmates in this study. This agrees with previous studies that reported the practices of same sex among prison inmates (Sabitu *et al.*, 2009; Chimma *et al.*, 2010; Audu *et al.*, 2013). Our study reveals insignificant association of intravenous drug use among prison inmates in the study, this in contrary with what Zamani *et al.* (2005) said, practice of IDU had a significant increase risk of HIV infection among inmates, this is as a result of abuse of drugs.

Since inmates are potential reservoirs of infection to the public upon release, they should be tested for possible infectious diseases and treated before continuing their normal public lives. Considering the potential of such a study to serve as the basis for better strategies towards controlling the spread of deadly viral infections, we recommend an incidence study that will involve more prisons from the remaining states of Nigeria. Although some factors identified in this study, such as use of sharp objects, homosexuality, and lack of knowledge of the modes of transmission, can be said to have contributed to infections in the prisons, we also recommend a study that focuses on identifying more intra-prison factors involved in transmission (since this study was a bit limited in that respect), because this will give a truer national picture of the alarming situation. To succeed, Nigerian treatment services and general prevention efforts, including vaccination and risk minimization measures, must include prison inmates.

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