

# Original Research Article

## SEROPREVALENCE OF HIV, HBV and HCV AMONG PRISONERS IN SOKOTO, NIGERIA

### ABSTRACT

Prisoners are at exceptional risk of viral infection because of the numerous high risk activities associated with incarceration. Prisons are incubators for infectious disease, yet are not readily accessible for screening and intervention. They provide a high-yield opportunity for early prison employees, but also family members and the general population.

**Aim:** The aim of this study was to determine the prevalence of HIV, HBV and HCV among prisoners in Sokoto State central prison, Sokoto State, Nigeria.

**Study Design:** This was a cross sectional study involving male prisoners because of certain religious reasons we were not allowed access to female prisoners

**Duration:** The study lasted for three months between April to June of what Year?

**Methodology:** A total of 99 male prisoners from Sokoto State central prison had their blood samples collected and screened for antibodies against Human Immunodeficiency Virus (HIV), hepatitis B Virus (HBV) and Hepatitis C Virus (HCV) using the principle of lateral flow chromatographic immunoassay. HBV screening test carried out using Onsite HBs Ag rapid test Dip-strip (plasma) by Nantong Economy and Technology Development Zone, China. While HCV screening was done using HCV Ab plus rapid test strip (plasma) by Nantong Economy and Technology Development Zone, China. And HIV screening carried out using onsite HIV 1/2 Ab plus Combo Rapid Test by CTK Biotech, Inc. United State of America.

22 **Results:** The sero-prevalence of HIV, HBV and HCV was 1.0%, 11.1%, and 4.0% respectively of  
23 the 99 prisoners screened. None of the prisoners practice homosexuality. The age 18-35 years  
24 were mostly affected. Seroprevalence of HBV among the prisoners (11.1%) was high.

25 **Conclusion:** This study indicates a high prevalence of seroprevalence of HIV, HBV, and HCV  
26 among prisoners. There is need for prison-focused intervention initiatives in Nigeria including  
27 awareness programmes about these infections. Resources for testing and treatment of  
28 prisoners should be provided. Care providers for prisoners should be empowered to protect the  
29 privacy and confidential health care information about prisoners to prevent stigmatization.

30

31 **Keywords:** Seroprevalence, HIV, HBV, HCV, Prisoners, Sokoto, Nigeria

32

### 33 **Introduction**

34 Prisons are incubators for infectious diseases, yet are readily accessible for screening and  
35 intervention (1). They provide a high-yield opportunity for early disease detection, intervention,  
36 and treatment, which would benefit not only prisoners and prison employees, but also family  
37 members and the general population due to the high turnover of prisoners (1, 2). About 9.25  
38 million people are held in prisons worldwide, with 30 million inmates moving from prison to the  
39 community and/or back again each year (3). Prisons are typically overcrowded, offer limited  
40 access to health care, and harbor high rates of airborne and blood-borne diseases (1, 4).  
41 Inmates often come from marginalized populations, such as injecting drug users (IDUs) and  
42 persons with high-risk sexual behaviors (including sex workers), who are already at an increased  
43 risk for these infections (4).

44 Available global data suggest a high prevalence and transmission of infectious diseases, such as  
45 human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV) and  
46 **Tuberculosis** in prisons (5, 6, 7, 8, 9, 10, 11, 12)

47 HIV is a lentivirus (slowly replicating retrovirus) that causes Acquired Immune Deficiency  
48 Syndrome (AIDS)(13), a condition in humans in which there is progressive failure of the immune  
49 system allowing life threatening opportunistic infection and cancers to thrive. Infection with  
50 HIV occurs by the transfer of blood, semen, vaginal fluid, pre-ejaculate, or breast milk. Within  
51 these bodily fluids, HIV is present as both free virus particles and virus within infected immune  
52 cells. In prison infection with this virus can occur as a result of homosexual practice by some  
53 prisoners and sharing of drug injection needle and shaving blade (14).HIV infected vital cells in  
54 the human immune system such as helper T cells (specifically CD4+ T cells), Macrophages and  
55 dendritic cells(15), HIV infection leads to low levels of CD4+ T cells through a number of  
56 mechanism including; apoptosis of uninfected bystander cells (16), direct viral killing of infected  
57 cells and killing of infected CD4+ T cells by CD8 cytotoxic lymphocyte that recognize infected  
58 cells. When CD4+ T cell numbers decline below a critical level, cell-mediated immunity is lost,  
59 and the body becomes progressively more susceptible to opportunistic infections (17).

60 Hepatitis B is an inflammatory illness of the liver caused by hepatitis B virus (HBV) that affect  
61 hominoid, including humans. Originally known as “serum hepatitis (18). The disease has caused  
62 epidemics in parts of Asia and Africa, and it is endemic status in china (19). About a third of the  
63 world population has been infected at one point in their life (20).

64 Numerous activities known to occur among prisoners pose a risk for hepatitis B infection. Use  
65 of contaminated cutting or piercing instruments has been shown to be a high behavior for  
66 transmitting HBV in prisons particularly in the case of sharing needles for IV drug use (21 )  
67 The prison population is at high risk of HIV, HBV and HCV infections though they are most often  
68 neglected risk group in the area of prevention and management. Since a prisoner can transmit  
69 these infections during and after his or her stay in the prison, transmission can contribute to  
70 over-wide pool of infections in the population. The economic costs of the failure to control the  
71 transmission of these infections include increased requirement for medical care, high level of  
72 dependency and loss of productive labor force, placing heavy burdens on already overstretched  
73 health and social services and on the natural economy. Factors contributing to a high rate of  
74 transmission of these infections in the prison include overcrowding, poor nutrition, poor  
75 hygiene, inadequate medical care and long prison sentences (22). It should therefore be  
76 mandatory that a prisoner is screened for these infections before and after prison sentence.  
77 The socio-demographic characteristics of prisoners associated with HIV, HBV and HCV in central  
78 prison is not known. A research of this nature has never been reported. Data generated from  
79 this study may spur or stimulate planning, management, prevention and control strategies in  
80 Nigerian prisons. The aim of this study is to investigate the seroprevalence of HIV, HBV and HCV  
81 among prisoners in Sokoto, North Western, Nigeria

## 82 **Methodology**

### 83 **Study area**

84 The study area for this research is Sokoto State. The state is located on longitude 11 30'' to 13  
85 to 50'' east and latitude 4° to 6° north. It has a land area of about 28,232.37SQ kilometers and

86 stand at an altitude of 272 m above sea level near to the confluence of the Sokoto River and  
87 Rima River.

88 Sokoto state is at the extremely northwest of Nigeria forming boarder with Niger republic. The  
89 state is in dry Sahel surrounded by sandy terrain and isolated hills with an average annual  
90 temperature of 28.3°C (82.9°).

91 Sokoto state has a population of 4.2 million as at 2006 census, the metropolis is estimated to  
92 have a population of 427,760 made of up Hausa and Fulani majority and minority of  
93 Zabarmawa and other non-indigenous settlers. There are two major languages in this state are  
94 Hausa and fulfulde spoken among the Fulani. The main occupation of the people is grain  
95 production and animal husbandry (24).

#### 96 **Study Setting.**

97 The study was conducted in the Faculty of Medical Laboratory Science of Usmanu Danfodiyo  
98 University in collaboration with the Medical unit of Sokoto State Central Prison.

#### 99 **Study Subjects**

100 The test subjects are male prisoners of Sokoto state central prison. The prisoners within the age  
101 range of 18-75 years.

#### 102 **Inclusion Criteria**

103 All the male inmates of Sokoto state central prison within the age range of 18-75 years that are  
104 serving their jail term in Sokoto state central prison for the presence of possible prison acquired  
105 infections

#### 106 **Exclusion Criteria**

107 All individual < 18 or > 75 who are not prisoners in Sokoto state central prison and the female  
108 prisoners

### 109 **Calculation of Sample Size**

110 Using  $n = Z^2 pq / d^2$

111 Where n- sample size, Z-standard normal deviate, P-prevalence in secondary data, q-complement of  
112 P, d-tolerable Margin of error

113  $Z = 95\% = 1.96$

114  $p = 7\% = 0.07$  (28)

115  $q = 1 - 0.07 = 0.93$

116  $d = 0.05$

117  $n = (1.96)^2 \times 0.07 \times 0.93 / (0.05)^2$

118  $n = 3.8416 \times 0.07 \times 0.93 / 0.0025$

119  $n = 100.04$

120  $n = 100$  prisoners

121 The study included ninety nine (99) male prisoners of Sokoto state central prison within age  
122 range of 18-75 range years. This is because of the prison population. We could not get the 100  
123 inmates as planned.

### 124 **Informed Consent**

125 Written informed consent was obtained from the prisoners who participated in the study.

126

127 **Questionnaire**

128 Questionnaire was used to obtain the socio-demographic and risk factors of the participants.

129

130 **Sample Collection**

131 About 3 millimeters of whole blood were collected using syringe and needle into EDTA anti-  
132 coagulated tube to be used for HBsAg rapid screening test, for HCV Ab plus rapid test and for  
133 HIV 1/2 rapid test.

134 **Method for screening**

135 HBV screening test carried out using Onsite HBs Ag rapid test Dip-strip (plasma) by Nantong  
136 Economy and Technology Development Zone, China. While HCV screening was done using HCV  
137 Ab plus rapid test strip (plasma) by Nantong Economy and Technology Development Zone,  
138 China. And HIV screening carried out using onsite HIV 1/2 Ab plus Combo Rapid Test by CTK  
139 Biotech, Inc. United State of America.

140 **Data Analysis**

141 The data collected was recorded on an Excel spreadsheet and later subjected to Statistical  
142 analysis using Computer data-based software SPSS version 21 to generate frequency  
143 distribution and percentage prevalence of the various parameters, Comparison was made using  
144 chi-square test. A P-value of  $\leq 0.05$  was considered statistically significant in all comparison.

145 **Results**

146 Out of the 99 study population with age ranges from 18-75, one inmate (1.0) of the study  
 147 population was HIV positive and it was found among those aged 18-35. 11 (11.0) were hepatitis  
 148 B positive and the highest prevalence of HBV (7.0) was found among those aged 18-35, while  
 149 the lowest prevalence was found within the age group 56-75. Four inmates (4.0) of the study  
 150 population are hepatitis C positive and are found among the age group of 18-35 equally.

151 Table 1 shows the prevalence of HIV, HBV and HCV as follows; 11 (11.1), 4 (4.0) and 1 (1.0)  
 152 respectively:

153 Table 2 shows Seroprevalence of HIV, HBV and HCV Infections by Risk Factors and socio-  
 154 demogrphic factors among Prison inmates of Sokoto State Central Prison. And illicit drug  
 155 injection showed association with P=0.033 while all others are not statistically significant

156 **Table 1 Prevalence of HIV, HBV and HCV among Male Prisoners in Sokoto State.**

	HIV	HBV	HCV
POSITIVE (%)	1 (1.0)	11 (11.1)	4 (4.0)
NEGATIVE (%)	98 (98.9)	88 (88.9)	95 (95.9)
TOTAL	99 (100)	99 (100)	99 (100)

157 KEY: (%)= Percentage

158 **Table 2: Seroprevalence of HIV, HBV and HCV Infections by Risk Factors and socio-demogrphic**  
 159 **factors among Prison inmates of Sokoto State Central Prison**

Risk factor	No tested	HIV Pos.	P value	HBV Pos.	P value	HCV Pos.	P value
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<b>Marital status</b>							
Married	32	0	0.487	3	0.704	3	
Single	67	1		8		1	0.062
<b>Illicit drug use</b>							
Yes	18	1	0.033	3	0.407	0	
No	81	0		8		4	0.336
<b>Needle sharing</b>							
Yes	6	0	0.798	2	0.074	0	
No	93	1		9		4	0.604
<b>Age group</b>							
18-35 years	72	1		7		2	
36-55 years	21	0	0.827	3	0.074	2	0.337
55-75 years	6	0		1		0	
<b>Length of stay</b>							
1-5 years	79	1		10		4	
6-10 years	12	0	1.000	0	0.971	0	0.958
11-15 years	2	0		0		0	
16-25 years	6	0		1		0	
<b>Education level</b>							
Formal	20	0		1		1	
Informal	51	1	0.622	8	0.319	2	0.968
Tertiary	28	0		2		1	
<b>Sexual intercourse</b>							
Yes	60	1	0.418	7	0.827	1	0.137
No	39	0		4		3	
<b>Condom use</b>							
Yes	29	0	0.518	2	0.390	0	0.189
No	70	1		9		4	

161 KEY: Pos= Positive

## 162 DISCUSSION

163 This study investigated the seroprevalence and risk factors for HIV, HBV and HCV infections  
 164 among prison inmates in Nigerian Sokoto State. Such studies have been undertaken in a good

165 number of countries, especially in Europe and America, yet reports on these infections among  
166 Nigerian prison inmates are scarce(25).The impact of HIV pandemic is enormous, robbing many  
167 countries of the world of both human and natural resources. A previous report of HIV among  
168 prison inmates in Nigeria has not yet provoked the expected government policies on care,  
169 management and prevention strategies on Nigerian prison inmate (26).

170 The 1.0% prevalence rate of HIV observed in this study does not supports previously reported  
171 cases (27). In that report a prevalence rate of 12% was obtained in Kaduna prison. The HIV  
172 antibody seroprevalence in this study was however less than the 9% seroprevalence found  
173 among prisoners in Lagos by Idigbe and colleagues (14), it is less than the prevalence of 7%  
174 found in male prison inmates in Jos prison (28), it is also less than the National prevalence of 5%  
175 estimated by the sentinel Survey of the Federal Ministry of Health in 2003 and an estimated HIV  
176 prevalence by UNAIDS In 2006 which was 3.9% (29). In this study we observed that there may  
177 be relationship between HIV infection and illicit drug injection ( $p=0.033$ ). The seroprevalence of  
178 (1.0) observed in this study were found in the 18-35 age group who made up majority of the  
179 prisoners. This finding compared well with the National Sentinel Survey results showed these  
180 groups to be the most affected probably because of their high sexual activity. However for this  
181 age brackets in the National Survey, the prevalence was 5.6% (30) Compared to 1.0% in this  
182 study. The less prevalence observed in this study may be as a result of decreased or absence  
183 of some high risk behaviors in Sokoto State central prison such as homosexuality in those with  
184 longer sentences where the older party provides the younger with resources such as  
185 protection and food in exchange for sex (31). None of the respondent admitted to homosexual.  
186 This is in contrast to the western world where homosexuality is an important risk factor as well

187 as a common occurrence, which is not voluntarily admitted by those who practice it in Nigeria  
188 (31).

189  
190 According to Hodges and colleagues the classification of high endemicity for HBV infection has  
191 been defined as HBsAg greater than 7% in adult population (32). But from this study the  
192 prevalence of hepatitis B virus infection among prisoners of Sokoto State central prison is 11  
193 (11.1%). This therefore confirms that prisoners of Sokoto state central prison are chronic  
194 carriers of HBV. The result of this study is in conformity with 9 (18%) among 50 inmates of Bali  
195 prison in Taraba state reported previously by Monday and colleagues (33) the infection seen in  
196 Sokoto state central prison may be attributed to the large population of prisoners which result  
197 to overcrowding, the non-availability of clean/sterilized shaving instruments, probably sexual  
198 activity among male within the prison, reuse of contaminated razor blades, and possibly sharing  
199 of cups, spoons and toothbrush (34). The 11.1% sero-positivity reported in this study is higher  
200 than 5.2% reported by Babalola and colleagues among selected tertiary institution student in  
201 Ogun state, Nigeria (53). But in conformity with the 12.0% reported among pregnant women  
202 attending ant-natal clinic at central hospital, Warri, Delta State (36). This is also in consistent  
203 with previous report by Niematullah and colleagues in Quetta Pakistan (37).

204  
205 The age of inmates may have also contributed especially young men between the ages of 18-35  
206 years with factors such as high sexual behavior before and during incarceration, intravenous  
207 drug use with sharing of syringes and tattooing among inmates. Also poor condition prevailing  
208 in the prison could contribute to the higher prevalence of hepatitis B virus among the prisoners.

209 The presence of hepatitis B virus among inmates is a cause for continuing public health concern  
210 because the incarcerated represent an extremely important segment of the community,  
211 especially with regard to the communicable disease. We also observed that inadequate medical  
212 facilities, staff and access to good health care delivery within and outside the prison could also  
213 contribute to the prevalence of hepatitis B virus among prisoners of Sokoto State central prison.  
214 This corroborates the findings of Muhammad and colleagues where he observed that  
215 inadequate medical facilities and staff in the Lahore Jail and access to appropriate health care  
216 outside the prison system was very difficult for inmates (38).

217 In this study, we observed HCV prevalence of 4.0% among prisoners of Sokoto state central  
218 prison, North Western Nigeria. The seroprevalence of HCV observed in this study is in  
219 agreement with a prevalence of 6.7% among male prisoners in Lagos reported by Dada and  
220 colleagues, this prevalence rate is startling because it is not higher than that of the general  
221 population of Lagos, even though the prisoners population is known to be a high risk one;  
222 however, it is possible that the Lagos inmates have low or absence of high risk behavior similar  
223 to our subject (39). The HCV prevalence observed in this study is less than 12.3% previously  
224 reported by Moses *et al.*, (2009) in Nasarawa State of Nigeria it is also inconsistent with 19.2%  
225 previously reported among prison inmates in Ghana (5). However, the HCV sero-prevalence  
226 rates from both studies are higher than what our study reveals, and this may be attributed to a  
227 possible practice of high rate of injected drug use by those inmates and a high risk behavior  
228 absent among our subject. It should be noted, however, that although majority of our subjects  
229 did not confirm the practice of injected drug use, it is possible this probability happens among  
230 Nigerian prisoners but at a very minimal level, not enough to influence the outcome.

231

232 **CONCLUSION**

233 In this study we observed a high sero-prevalence of blood borne infections among our subjects  
234 in Sokoto State central prison, Nigeria and reaffirm the need to routinely screen all prisoners  
235 before and after incarceration for HBV, HIV and HCV. As a safety measure because active and  
236 untreated HBV, HCV, and HIV infections among prison inmates can lead to transmission in both  
237 civilian and incarcerated populations. The insecure manner of acting such as illicit drug  
238 injection, tattooing, piercing, use of unsterilized blades and extramarital sex with very low  
239 condom use were the most important factors related to the infections.

240

241 **RECOMENDATION**

242 In view of the observed presence of the viruses among prison inmates, we therefore  
243 recommend the regular testing for hepatitis B, hepatitis C and HIV antibodies in prisons is  
244 necessary to identify those already infected and those in need of specific health care to help  
245 limit further transmission of the disease within and outside the prison. Furthermore,  
246 introduction of effective preventive measures is recommended and uninfected inmates should  
247 be vaccinated with the available vaccines as this will reduce the spread of the diseases.

248 **LIMITATION OF THE STUDY**

249 Rapid test kit was used for testing of the subjects. It may be necessary to carry out a larger  
250 study and include the use of more advanced and sensitive methods like ELISA and PCR

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**FEDERAL MINISTRY OF INTERIOR**  
**NIGERIAN PRISONS SERVICE**  
**SOKOTO STATE COMMAND**

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Our Ref: \_\_\_\_\_  
Date: <sup>th</sup> February, 2015

The Head of Department,  
Faculty of Medical Laboratory Science,  
Usman Danfodiyo University,  
Sokoto.

RE: ALIYU UMAR ALIYU (ADM NUMBER 0912200040)

APPROVAL OF

Reference to your letter dated 4<sup>th</sup> July, 2014. I am directed to convey to you  
the approval of the Controller of Prisons, for your further necessary action.

  
Ummu M. Mustapha (Mrs)  
Deputy Controller of Prisons (Medical)  
For: Controller of Prisons