

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

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), and hepatitis C virus (HCV) in
46 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°). The weather is characterized by two seasons the wet and dry
91 season. Rainfall (wet season) start late around June and end in September but May sometimes
92 extend to October. The average annual rainfall is 550mm with a peak rainfall usually recoded in
93 the month of august. The highest temperature of 45°C during the hot season is experienced in
94 the month of March and April. Harmattan, a dry cold and dusty condition is experienced
95 between the month of November and February (23).

96 Sokoto state has a population of 4.2 million as at 2006 census, the metropolis is estimated to
97 have a population of 427,760 made of up Hausa and Fulani majority and minority of
98 Zabarmawa and other non-indigenous settlers. There are two major languages in this state are
99 Hausa and fulfulde spoken among the Fulani. The main occupation of the people is grain
100 production and animal husbandry. Majority of the indigenous people practice agriculture.
101 Crops produced include commercial crops like millet, sorghum, beans, rice and maize. Other
102 occupations commonly practice are dying, blacksmithing, weaving, carving, trading, cobbling,
103 and working private and public sector, socio cultural characteristics is homogenous as majority
104 of its indigenes and inhabitants are Muslims, therefore the doctrine of Islam provides the
105 singular code of conduct and behavioral characteristics generally accepted across the state,
106 common practices art marriage, polygamy, consanguinity and multiple birth (24).

107 **Study Setting.**

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

110 **Study Subjects**

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

113 **Inclusion Criteria**

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

117 **Exclusion Criteria**

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

120 **Sample Size**

121 Included one hundred (100) male prisoners of Sokoto state central prison within age range of
122 18-75 range years

123

124 **Sample Collection**

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

128 **Method for screening**

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

134 **Data Analysis**

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

139 **Results**

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

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

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

150 **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)

151 KEY: (%)= Percentage

152 **Table 2: Seroprevalence of HIV, HBV and HCV Infections by Risk Factors and socio-demographic**
 153 **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
Marital status							
Married	32	0	0.487	3	0.704	3	0.062
Single	67	1		8		1	
Illicit drug use							
Yes	18	1	0.033	3	0.407	0	0.336
No	81	0		8		4	
Needle sharing							
Yes	6	0	0.798	2	0.074	0	0.604
No	93	1		9		4	
Age group							
18-35 years	72	1	0.827	7	0.074	2	0.337
36-55 years	21	0		3		2	
55-75 years	6	0		1		0	
Length of stay							
1-5 years	79	1	1.000	10	0.971	4	0.958
6-10 years	12	0		0		0	

154

11-15 years	2	0		0		0	
16-25 years	6	0		1		0	
Education level							
Formal	20	0		1		1	
Informal	51	1	0.622	8	0.319	2	0.968
Tertiary	28	0		2		1	
Sexual intercourse							
Yes	60	1	0.418	7	0.827	1	0.137
No	39	0		4		3	
Condom use							
Yes	29	0	0.518	2	0.390	0	0.189
No	70	1		9		4	

155 KEY: Pos= Positive

156 **DISCUSSION**

157 This study investigated the seroprevalence and risk factors for HIV, HBV and HCV infections
 158 among prison inmates in Nigerian Sokoto State. Such studies have been undertaken in a good
 159 number of countries, especially in Europe and America, yet reports on these infections among
 160 Nigerian prison inmates are scarce(25).The impact of HIV pandemic is enormous, robbing many
 161 countries of the world of both human and natural resources. A previous report of HIV among
 162 prison inmates in Nigeria has not yet provoked the expected government policies on care,
 163 management and prevention strategies on Nigerian prison inmate (26).

164 The 1.0% prevalence rate of HIV observed in this study does not supports previously reported
 165 cases (27). In that report a prevalence rate of 12% was obtained in Kaduna prison. The HIV
 166 antibody seroprevalence in this study was however less than the 9% seroprevalence found
 167 among prisoners in Lagos by Idigbe and colleagues (14), it is less than the prevalence of 7%
 168 found in male prison inmates in Jos prison (28), it is also less than the National prevalence of 5%

169 estimated by the sentinel Survey of the Federal Ministry of Health in 2003 and an estimated HIV
170 prevalence by UNAIDS In 2006 which was 3.9% (29). In this study we observed that there may
171 be relationship between HIV infection and illicit drug injection ($p=0.033$). The seroprevalence of
172 (1.0) observed in this study were found in the 18-35 age group who made up majority of the
173 prisoners. This finding compared well with the National Sentinel Survey results showed these
174 groups to be the most affected probably because of their high sexual activity. However for this
175 age brackets in the National Survey, the prevalence was 5.6% (30) Compared to 1.0% in this
176 study. The less prevalence observed in this study may be as a result of decreased or absence
177 of some high risk behaviors in Sokoto State central prison such as homosexuality in those with
178 longer sentences where the older party provides the younger with resources such as
179 protection and food in exchange for sex (31). None of the respondent admitted to homosexual.
180 This is in contrast to the western world where homosexuality is an important risk factor as well
181 as a common occurrence, which is not voluntarily admitted by those who practice it in Nigeria
182 (31).

183
184 According to Hodges and colleagues the classification of high endemicity for HBV infection has
185 been defined as HBsAg greater than 7% in adult population (32). But from this study the
186 prevalence of hepatitis B virus infection among prisoners of Sokoto State central prison is 11
187 (11.1%). This therefore confirms that prisoners of Sokoto state central prison are chronic
188 carriers of HBV. The result of this study is in conformity with 9 (18%) among 50 inmates of Bali
189 prison in Taraba state reported previously by Monday and colleagues (33) the infection seen in
190 Sokoto state central prison may be attributed to the large population of prisoners which result

191 to overcrowding, the non-availability of clean/sterilized shaving instruments, probably sexual
192 activity among male within the prison, reuse of contaminated razor blades, and possibly sharing
193 of cups, spoons and toothbrush (34). The 11.1% sero-positivity reported in this study is higher
194 than 5.2% reported by Babalola and colleagues among selected tertiary institution student in
195 Ogun state, Nigeria (53). But in conformity with the 12.0% reported among pregnant women
196 attending ant-natal clinic at central hospital, Warri, Delta State (36). This is also in consistent
197 with previous report by Niematullah and colleagues in Quetta Pakistan (37).

198
199 The age of inmates may have also contributed especially young men between the ages of 18-35
200 years with factors such as high sexual behavior before and during incarceration, intravenous
201 drug use with sharing of syringes and tattooing among inmates. Also poor condition prevailing
202 in the prison could contribute to the higher prevalence of hepatitis B virus among the prisoners.
203 The presence of hepatitis B virus among inmates is a cause for continuing public health concern
204 because the incarcerated represent an extremely important segment of the community,
205 especially with regard to the communicable disease. We also observed that inadequate medical
206 facilities, staff and access to good health care delivery within and outside the prison could also
207 contribute to the prevalence of hepatitis B virus among prisoners of Sokoto State central prison.
208 This corroborates the findings of Muhammad and colleagues where he observed that
209 inadequate medical facilities and staff in the Lahore Jail and access to appropriate health care
210 outside the prison system was very difficult for inmates (38).

211 In this study, we observed HCV prevalence of 4.0% among prisoners of Sokoto state central
212 prison, North Western Nigeria. The seroprevalence of HCV observed in this study is in

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

225

226 **CONCLUSION**

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

234

235 **RECOMENDATION**

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

242 **LIMITATION OF THE STUDY**

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

245 **REFERENCES**

- 246 1. Bick J A. Infection control in jails and prisons. *Clinical Infectious Disease*. 2007; **45**:
247 1047–1055.
- 248 2. McIntyre AFA, Studzinski, H.A., Beidinger, C., Rabins. STD, HIV/AIDS, and hepatitis
249 services in Illinois County. *Jails Sex Transmissible Diseases*. 2009; **36 (2)**: S37–40
- 250 3. Walmsley R. World prison population list. London: King's College London; 2007.
251 Available at: [http://www.kcl.ac.uk/depsta/law/research/icps/downloads/world-prison-](http://www.kcl.ac.uk/depsta/law/research/icps/downloads/world-prison-pop-seventh.pdf)
252 [pop-seventh.pdf](http://www.kcl.ac.uk/depsta/law/research/icps/downloads/world-prison-pop-seventh.pdf). (accessed January 2010).
- 253 4. Niveau G. Prevention of infectious disease transmission in correctional settings: A
254 *Review on Public Health*. 2006; **120**: 33–41

- 255 5. Adjei AA, Armah HB, Gbagbo J, Ampofo WK, Boamah I, Adu-Gyamfi C, Mensah G,
256 Quaye, IKE. Correlates of HIV, HBV, HCV and syphilis infections among prison inmates
257 and officers in Ghana. *A national multicenter study. BMC Infectious Diseases*.2008; **8**:33
- 258 6. Fialho M, Messias M, Shafer K, Farre L, Schmalb M, Pedral-Sampaio D. Prevalence and
259 risk of blood-borne and sexually transmitted viral infections in incarcerated youth in
260 Salvador, Brazil: opportunity and obligation for intervention, *AIDS Behav*. 2008 ; **12 (4)**:
261 S17–24
- 262 7. MacNeil JR, Lobato MN, Moore M. An unanswered health disparity: tuberculosis
263 among correctional inmates. *American Journal of Public Health*. 2005; **95**: 1800–1805.
- 264 8. Noeske J, Kuaban C, Amougou J, Piubello M, Pouillot R. Pulmonary tuberculosis in the
265 Central Prison of Douala, Cameroon. *East Africa Medical Journal*. 2006; **83**: 25–30
- 266 9. Singh S, Prasad R, Mohanty A. High prevalence of sexually transmitted and blood-borne
267 infections amongst the inmates of a district jail in Northern India. *International Journal*
268 *of STD AIDS*. 1999; **10**: 475–478.
- 269 10. Solomon L, Flynn C, Muck K, Vertefeuille J. Prevalence of HIV, syphilis, hepatitis B, and
270 hepatitis C among entrants to Maryland correctional facilities. *Journal of Urban Health*.
271 2004; **81**: 25–37.
- 272 11. Stuckler D, Basu S, McKee, M, King L. Mass incarceration can explain population
273 increases in TB and multidrug-resistant TB in European and central Asian countries.
274 *Proceeding of National Academy of Science U S A*. 2008; **105**: 13280–13285.

- 275 12. Wong MY, Leung CC, Tam CM, Kam KM, Ma CH, Au KF. TB surveillance in correctional
276 institutions in Hong Kong. *International Journal of Tuberculosis Lung Disease* 2008; **12**:
277 93–98.
- 278 13. Weiss RA How does HIV cause AIDS?. *Science*. 1993; **260(5112)**:1273-1279.
- 279 14. Idigbe ED, Nasidi A, Sofola T, Oyewole F, Odiah F, Ajayi A, Okoye R. Pulmonary
280 Tuberculosis and HIV infection among prison inmates in Lagos, Nigeria. *The Nigerian*
281 *Journal of Medical Research*. 1997; **1 (2)**: 17-21.
- 282 15. Cunningham AL, Donaghy H, Harman AN, Kim M, Turville SG. Manipulation of dendritic
283 cell functions by viruses. *Current Opinion in microbiology*. 2010; **13(4)**: 524-529.
- 284 16. Garg H, Mohl J, Joshi A. HIV-1 induced bystander apoptosis. *Viruses*. 2012; **4(11)**: 3020-
285 3043.
- 286 17. Kumar V. Robin basic pathology. (**9th edition**). ISBN 9781455737871. 2012: 147
- 287 18. Baker FJ, Silvertone RE, Pallister CJ. Hepatitis, Introduction to Medical Laboratory Science,
288 7th edition, Butterworth-Heinemann Publishers. 1998; 409.
- 289 19. Williams R. Global challenges in liver disease. *Hepatology*. 2006; **44(3)**: 521-526
- 290 20. World Health Organisation (WHO). *Weekly epidemiological record*. 2009; 84, 405–420
- 291 Harold S, Margolis MD, James M, Hughes MD. Prevention and control of infections with
292 hepatitis viruses in correctional setting. *National Centre for infectious Diseases*. 2003;
293 **52(01)**: 1-33.
- 294 22. Muhammad T, Auwal U, Baba M, Thilza IB. HIV Infection among Male Prison Inmates in
295 Abuja Nigeria. *The Nigerian Journal of Medical Research*. 2010;**2(3)**: 28
- 296 23. Udo RK, Mamman AB. Nigeria: Giant in the sun. 1993; vol. **2**. State survey

- 297 24. National population commission, 2007.
- 298 25. Moses, P, Adoga, Edmund B, Banwat JC, Forbi LN, Christopher R, Pam SD, Gyar YA, Agabi
299 SMA. Human immunodeficiency virus, hepatitis B virus and Hepatitis C virus: sero-
300 prevalence,co-infection and risk factors among prison inmates in Nasarawa State,
301 Nigeria. *Journal of Infection in Developing Countries*. 2009; **3 (7)**: 539-547.
- 302 26. Olayide A. HIV/AIDS in Nigeria: the policy and policies. *West African Journal of Medical*
303 *Research*. 2001; **20 (3)**: 191-8
- 304 27. Joshua IA, Ogboi JS. Seroprevalence of immunodeficiency virus.SWJ. 2008; 17-19
- 305 28. Abba OJ, Ibrahim IS, Idoko JA. Prevalence and risk factors for HIV/AIDS among male
306 inmates in Jos prison, Plateau State, Nigeria. *Nigerian Journal of Parasitology*. 2011; **32**
307 **(2)**: 181-186.
- 308 29. Federal Ministry of Health Department of Public Health, National AIDS/STDs Control
309 Program, Technical Report. 2003. National HIV Seroprevalence Sentinel Survey.
- 310 30. Ploenjai T. Efforts to prevent tattooing among prison inmates to curb spread of HIV.
311 Report. *The Family Foundation Kaisernetwork. Org*. 2007.
- 312 31. Jonathan E K, Henry M, King K. Giudeline for Preventing Oppotunistic Infections Among
313 HIV-infected Persons. National Center for HIV, STD, and TB Prevention. 2002; **51**: 1-46.
- 314 32. Hodges M, Sanders E, Ait K. Seroprevalence of hepatitis makers: HIV, HBV, HCV and HEV
315 among primary school children in free town Sierra Leon. *West African Journal of*
316 *Medicine*. 1998; **17 (1)**: 36-37.

- 317 33. Monday IE, Francis JI. A survey for hepatitis B infection among prison inmates in Bali
318 prison, Taraba State, Nigeria. *Journal of Pharmacy and Biological Science*. 2014; **9 (1)**:
319 134-137.
- 320 34. Monica C. District laboratory practice in Tropical countries. (**2nd edition**). Part 2, United
321 Kingdom, Cambridge University press, 2005. 250-253.
- 322 35. Babalola ET, Ainabe OB, Okonkwo OI. Confirmation of hepatitis surface (HBsAg) among
323 selected Tertiary institution student in Ogun State Nigeria. *Natural science*. 2013; **11 (3)**:
324 107-113 <http://www.sciencepub.net/nature>. (accessed August 2015).
- 325 36. Orphori EA, Wagbasoma A, Atunumu O. Sero-prevalence of hepatitis B among pregnant
326 women attending anti-natal clinic at central hospital ward. *Nigerian Journal of*
327 *Microbiology*. 2004; **18**: 1-2.
- 328 37. Niamatullah K, Habibur R, Ferhat A, Abbas., Asmatullah, K., Ihsanullah, K., Muhamma,
329 A.K. Seroprevalence and risk factors of hepatitis B, C and sexually transmitted
330 *treponemapallidum* infections in jail inmates of Quetta, Balochistan. *Global Advanced*
331 *Research Journal of Medicine and Medical Science*. (2014); **3 (11)** 367-373.
- 332 38. Muhammad N, Ghazali J, Ishtiaq A. Jail population; a survey for hepatitis B, hepatitis C
333 and Human immunodeficiency virus infections. *Professional Medical Journal*; 2011. **18**
334 **(4)**: 697-702.
- 335 39. Dada MO, Akanmu AS, Esan OA. Seroprevalence of HIV among male prisoners in Lagos
336 State, Nigeria. *Nigeria Postgraduate Medical Journal*. 2006; **13(1)**: 6-9.
- 337
- 338