Prevalence and determinants of hepatitis B virus infection among human immunodeficiency virus patients at a tertiary health care facility in Central Nigeria

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Abstract

Hepatitis B virus (HBV) co-infection with human immunodeficiency virus is a major public health problem especially in developing countries. In this study, the prevalence of HBV infection was evaluated among 400 consenting HIV patients accessing healthcare in Federal Medical Center, Keffi, Nigeria using HBsAg detection as the surrogate. Blood samples were collected and screened for HBsAg using ACON screening kit (ACON Laboratories Inc, USA). The Chi-square statistical test was performed to identify possible determining factors associated with the viral infection. Overall, 30 (7.5%) of the participants were reactive to HBsAg. The possible determining factors for acquiring the virus recorded in this study were marital status and alcoholism (p<0.05). Gender, age, educational status, occupation, history of blood transfusion, locality, cigarette smoking, self-manicure and pedicure, tribal marks, tattoos and history of HBV vaccination were not significantly associated with acquiring the viral infection (p>0.05). This finding calls for a concern because co-infection of HBV with HIV accelerates disease progression and also has an effect on the management of patients infected with HIV.

Keywords: Hepatitis B surface antigen; HIV; Co-infection; Nigeria

1. Introduction

Although hepatitis is caused by different agents such as heavy alcohol use, nonalcoholic steatohepatitis (NASH), certain medication, toxins, other infections, and autoimmune diseases. But worldwide, it is mostly caused by virus (viral hepatitis) [1].

Co-infection of HBV and HIV is commonly observed because both viruses have the same mode of transmission [2]. During co-infection, HIV significantly regulates the natural course of HBV infection. Compared with individuals that are only infected with HBV, the course of chronic HBV infection in HIV co-infected patients is more aggressive resulting in lower transaminase elevation, increased HBV DNA levels, decreased inflammatory activity and a higher prevalence of cirrhosis and hepatocellular carcinoma [3].

Hepatitis B virus is 50 – 100 times more infectious than HIV and 10 times more infectious than HCV, with many carriers not knowing they are infected with the virus and thus it is referred to as a “silent killer” [4,5].

To date, Nigeria remains one of the endemic nations of the world whose citizen’s health is being challenged with HBV and HIV infections and these viral diseases cause significant morbidity and mortality [6]. Although there are several reports of HBV/HIV co-infection in Nigeria [6, 7, 8], Nevertheless, for any control research work to be successful there is need for adequate information on the epidemiology of the disease including the population at risk. Considering this context, the present study was aimed to investigate the prevalence and determinants of hepatitis b virus among human immunodeficiency virus patients at a tertiary health care facility in Central Nigeria.

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2. Materials and methods

2.1. Study area and population
The study area for this research was Federal Medical Center, located in Keffi Local Government Area of Nasarawa State, Nigeria. Keffi is approximately 68km from Abuja, the Federal Capital Territory and 128km from Lafia, the capital of Nasarawa State. It is located geographically between latitude 803’N of the equator and longitude 7050’E and situated on an altitude of 850m above sea level [9].

The study was conducted on 400 consenting HIV positive individuals accessing Antiretroviral Therapy (ART) in Federal Medical Centre, Keffi Nigeria. The socio-demographic information of the participants was obtained by the use of a designed questionnaire. The study involved both male and female adult patients accessing ART in Federal Medical Centre. Such patients are mainly from Keffi and other surrounding Local Government areas. Those within Keffi metropolis were categorized as urban while those outside Keffi metropolis and other surrounding local government areas were categorized as rural.

2.2. Sample size determination
The sample size for this study was determined using the formula by Thrusfield [10]:

\[
N = \frac{(1.96)^2 \times \text{Pexp} \times (1 - \text{pexp})}{D^2}
\]

Where: \(N\) = Number of samples; \(\text{Pexp}\) = Expected prevalence of 12.3; \(D^2\) = Desired absolute precursor of 5

\[
N = 3.84 \times 0.12 \times 0.88 / (0.05)^2; N = 0.4048 / 0.0025; N = 161.92
\]

This was however rounded up to 400 samples.

2.3. Sample collection, processing and storage
A total of 400 blood samples were collected from patients in the ART clinic of Federal Medical Center, Keffi from May through August, 2018. About 3 ml of blood sample was collected from each consenting participant using a sterile vacutainer as described by Cheesbrough [11].

The samples were allowed to clot at room temperature and spun for 5 min at 3000 rpm. The resultant sera were harvested into well-labeled cryovials and stored at −20 °C until use.

2.4. Laboratory analysis
2.4.1. Screening for HBsAg
Screening for HBsAg from the HIV infected patients' blood samples was done using the ACON rapid test kit (ACON, USA) in accordance with the manufacturer's instructions.

2.5. Ethical approval
Ethical clearance and approval to conduct this study was sought and obtained from the Health Research Ethics Committee of Federal Medical Centre, Keffi, Nasarawa State on 6th February, 2018.

2.6. Statistical analysis
Chi Square analysis was used to test for significance using Smith Statistical Package (SSP) version 2.8. The statistical significance was determined at 5 % probability (\(P \leq 0.05\)).

3. Results and discussion
Hepatitis B virus infection among seropositive HIV patients is a growing public health problem [6]. A total of 400 HIV seropositive patients accessing ART in Federal Medical Centre, Keffi participated in the study. There was an overall HBV prevalence of 7.5% (Table1) based on the use of HBsAg as a surrogate for the viral infection. The prevalence of HBV infection in this study is lower than the earlier report of 9.7% [12] and 12.5% [6] among HIV patients in the same facility.
and 11.0% among HIV positive children in Nasarawa State [13]. However, it was higher than report of 6.3% [14] among HIV children in Anambra State and 4.6% in Benin City [15]. These differences might include but not limited to different screening methods, different population and different localities with probably different risk factors. Studies from HIV populations in other countries showed varying prevalence as well. For example, it was 5.9% in Ethiopia [16], 7.0% in South Africa [17] and 3.7% in Botswana [18]. Higher prevalence compared to reports of this study has also been reported in different population. For example, it was 9.2%, among students in Zaria [19], 11.3% among Health Care Workers in Bida [20], 10.7% among patients of Niger Delta University Teaching Hospital [21] and 9.7% in a subset of young people in Central Nigeria [22].

Table 1 The prevalence of HBV infection in relation to socio-demographic factors among HIV positive patients accessing healthcare in Federal Medical Centre, Keffi, Nigeria

| Socio-demographics         | No. Examined | No. Positive (%) | $\chi^2$ | p-value |
|----------------------------|--------------|------------------|---------|---------|
| **Gender**                 |              |                  |         |         |
| Male                       | 113          | 11(9.7)          |         |         |
| Female                     | 287          | 19(6.6)          | 1.5294  | 0.2161  |
| Total                      | 400          | 30(7.5)          |         |         |
| **Age (Years)**            |              |                  |         |         |
| 18-27                      | 35           | 1(2.9)           |         |         |
| 28-37                      | 132          | 10(7.6)          |         |         |
| 38-47                      | 152          | 15(9.9)          | 3.9658  | 0.5543  |
| 48-57                      | 66           | 2(3.0)           |         |         |
| 58-67                      | 9            | 1(11.0)          |         |         |
| 68-77                      | 6            | 1(16.7)          |         |         |
| Total                      | 400          | 30(7.5)          |         |         |
| **Marital Status**         |              |                  |         |         |
| Single                     | 132          | 18(13.6)         |         |         |
| Married                    | 250          | 10(4.0)          | 6.9652  | 0.0306  |
| Divorced                   | 18           | 2(11.0)          |         |         |
| Total                      | 400          | 30(7.5)          |         |         |
| **Educational Status**     |              |                  |         |         |
| Primary                    | 30           | 2(6.7)           |         |         |
| Secondary                  | 180          | 14(7.7)          | 1.4559  | 0.4828  |
| Tertiary                   | 190          | 14(7.5)          |         |         |
| Total                      | 400          | 30(7.5)          |         |         |
| **Occupation**             |              |                  |         |         |
| Students                   | 91           | 10(11.0)         |         |         |
| Farmers                    | 150          | 10(6.7)          |         |         |
| Unemployed                 | 120          | 8(6.7)           | 1.4301  | 0.8389  |
| Artisans                   | 21           | 1(4.8)           |         |         |
| Civil Servants             | 18           | 1(5.6)           |         |         |
| Total                      | 400          | 30(7.5)          |         |         |
| **Locality**               |              |                  |         |         |
| Urban                      | 130          | 5(3.8)           | 0.0161  | 0.8990  |
| Rural                      | 270          | 25(9.3)          |         |         |
| Total                      | 400          | 30(7.5)          |         |         |
Table 2: The prevalence of HBV infection in relation to possible risk factors among HIV positive patients accessing healthcare in Federal Medical Centre, Keffi, Nigeria

| Risk Factors                  | No. Examined | No. Positive (%) | $\chi^2$ | p-value |
|-------------------------------|--------------|------------------|---------|---------|
| **History of blood transfusion** |              |                  |         |         |
| Yes                           | 155          | 10(6.5)          |         |         |
| No                            | 245          | 20(8.2)          | 0.1784  | 0.6727  |
| **Total**                     | 400          | 30(7.5)          |         |         |
| **Alcoholism**                |              |                  |         |         |
| Yes                           | 30           | 5(16.7)          |         |         |
| No                            | 370          | 25(6.8)          | 9.4162  | 0.0020  |
| **Total**                     | 400          | 30(7.5)          |         |         |
| **Cigarette smoking**         |              |                  |         |         |
| Yes                           | 182          | 18(9.9)          |         |         |
| No                            | 218          | 12(5.5)          | 0.7621  | 0.3826  |
| **Total**                     | 400          | 30(7.5)          |         |         |
| **Self-manicure**             |              |                  |         |         |
| Yes                           | 385          | 29(7.5)          |         |         |
| No                            | 15           | 1(6.7)           | 3.2000  | 0.0735  |
| **Total**                     | 400          | 30(7.5)          |         |         |
| **Self-pedicure**             |              |                  |         |         |
| Yes                           | 390          | 30(7.7)          |         |         |
| No                            | 10           | 0(0.0)           | 0.0000  | 1.0000  |
| **Total**                     | 400          | 30(7.5)          |         |         |
| **Tribal mark(s)**            |              |                  |         |         |
| Yes                           | 20           | 1(5.0)           |         |         |
| No                            | 380          | 29(10.4)         | 0.8081  | 0.3686  |
| **Total**                     | 400          | 30(7.5)          |         |         |
| **Tattoo**                    |              |                  |         |         |
| Yes                           | 30           | 1(3.3)           |         |         |
| No                            | 370          | 29(7.8)          | 1.4815  | 0.2235  |
| **Total**                     | 400          | 30(7.5)          |         |         |
| **History of HBV vaccination**|              |                  |         |         |
| Yes                           | 150          | 8(5.3)           |         |         |
| No                            | 250          | 22(14.7)         | 0.4375  | 0.5083  |
| **Total**                     | 400          | 30(7.5)          |         |         |

The higher rate of HBsAg seropositivity among males (9.7%) than their female counterparts (6.6%) reported in this study is similar to other Nigerian studies among adult HIV patients [23,24]. This finding contradicts that of similar studies in Nigeria where the prevalence of the viral infection was higher in females [6,20]. However, there is no obvious
explanation for the difference in prevalence with regards to gender observed in this study. However, males may be more pruned to risky behaviors that predispose them to the viral infection such as multiple sexual partners without any protection and intravenous drug usage more than females.

The distribution of HBV infection when stratified by age showed no significant association between age and the viral infection. It was highest in the age ≥50 years in this study contrary to a report where highest prevalence was observed among younger HIV patients in Nigeria [6] and in Ethiopia [25]. The highest prevalence among those ≥58 years in this study may imply that the elderly have acquired the virus through other means such as blood transfusion, alcoholism, sharing of sharp objects etc.

The viral infection in this study was higher among those that were single compared to those that were married. This is in agreement with the findings of Mohammed et al. [22] in a subset of young people in Central Nigeria. The higher prevalence rate of HBsAg recorded in this study among the unmarried and divorced participants may be due to the promiscuous lifestyle that is common among singles and divorcees.

With reference to occupation, students recorded the highest prevalence of HBsAg, followed by unemployed, farmers and artisans; the least seroprevalence was recorded among civil servants. Although there was no significant association between the viral infection and occupation of the partipants (p>0.05), the higher prevalence among students may be attributed to their life styles [22] which may facilitate the acquisition of both viruses (HIV and HBV).

History of blood transfusion was also not found to be associated with the viral infection in this study (p>0.05). Higher prevalence was observed among those with no history of blood transfusion. This outcome is in agreement with the outcome of other researchers [24,26] but contrary to that of Mohammed et al. [22]. The recorded higher prevalence in this study among patients with no history of blood transfusion may be that the patients have acquired the virus through other means such as unprotected sex and other risky behavior.

The prevalence of HBV infection in the present study was higher among those patients from rural areas. This outcome correlates with other reports in Nigeria [6,12] and in Ethiopia [27]. This may be due to poor hygiene practices such as, sharing of sharp objects which are common to rural settings.

There was a significant association between alcoholism and the viral infection (p <0.05). It was higher among those that take alcohol. These results agree with that of Ajegena et al.[12] and Pennap et al. [6] in Nigeria but contradict that of Bezabeh et al. [25] in Ethiopia among HIV positive patients. Alcohol sometime makes one to indulge in risky behavior which might promote the transmission of HBV infection.

There was no statistically significant association between cigarette smoking and the viral acquisition (p>0.05). However, it was higher among those that smoke cigarette. These results agree with that of Ajegena et al. [12] and contradict that of Pennap et al.[6] in Nigeria among HIV patients.

There was no correlation between the prevalence of the infection and manicure or pedicure practices. It was however higher among those who practice self-manicure. Similar studies have also reported higher prevalence among those who practice self-manicure and self-pedicure in Brazil among HIV patients [28].

There was no association between tribal mark(s) and tattoo(s) with HBV infection in this study (p>0.05). The infection was higher among those with no tribal mark(s) and tattoo(s) unexpectedly because scarification mark(s) has been established to be a determining factor for HBV infection [6,12,22] which may be as the result of the use of unsterilized objects in making those body piercing. Additionally, History of HBV vaccination was also not found to be associated with seropositivity of HBV infection among HIV patients in this study. It was however higher in those with no history of HBV vaccination which agrees with the report of Pennap et al. [6]. The presence of HBsAg among those with history of vaccination may be that the virus was present before the administration of the vaccine or inconsistency in receiving the vaccine.

4. Conclusion

A 7.5% HBV prevalence among HIV patients accessing healthcare in Federal Medical Centre, Keffi was reported. This is likely to have been driven by alcohol consumption and marital status which were found to be significant determining factors. This is a problem because there is likeness for chronic HBV to advances faster to cirrhosis, end-stage liver disease and liver cancer in people with HBV/HIV co-infection.
Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Statement of ethical approval

Ethical clearance and approval to conduct this study was sought and obtained from the Health Research Ethics Committee of Federal Medical Centre, Keffi, Nasarawa State on 6th February, 2018.

Statement of informed consent

All individuals included in this study completed and signed an informed consent form. Individual anonymity was treated with confidentiality and for the purpose of this study.

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