

## Prevalence of HBsAg Among Prospective Blood Donors and Pregnant Women in Kebbi State, Nigeria

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**ABSTRACT:** This study was aimed at determining the prevalence of Hepatitis B surface antigen (HBsAg) among prospective blood donors and pregnant women in Kebbi State, Nigeria. Three hundred and sixty one (361) apparently healthy prospective blood donors were recruited and screened for HBsAg using HBsAg rapid test kit. Those that tested positive for HBsAg (16.6%) were further assessed for liver function. The prevalence by gender was 23.4% and 13.1% for male and female subjects respectively. Prevalence by the three senatorial zones of the state is in the order Kebbi South (21.8%) > Kebbi North (15.1%) > Kebbi Central (13.6%). Subjects within the age group 26-30 years had the highest HBsAg prevalence of 20.9% compared to the other age groups. Single males have higher prevalence (26.1%) of HBV infection than their married counterparts (16.7%). Local government workers had highest prevalence (29.2%) followed by self-employed (27.6%) and then state government employees (14.3%). In females, occupational exposure (healthcare worker) and polygamy are risk factors with highest prevalence of 40.0% and 23.2% respectively. The levels of serum liver enzymes and bilirubin were significantly higher ( $p < 0.05$ ) in HBsAg positive subjects compared to the HBsAg negative subjects. The reverse was, however, the case for albumin. Our result suggests that Kebbi State is one of the HBsAg hyper-endemic areas in Nigeria.

**Keywords:** Hepatitis B, Prevalence, Liver function test, Kebbi State.

### INTRODUCTION

Hepatitis B, also known as serum hepatitis is a disease of the liver caused by a double stranded DNA virus of the family Hepadnaviridae, which is reported to be the main aetiological factor in over 75% of chronic liver diseases worldwide (Ryan and Ray, 2004; Pungpapong et al., 2007; Oladele et al., 2013). Hepatitis B virus (HBV) is resistant to inactivation by heat and is highly infectious; it is 50-100 times more infectious than HIV and 10 times more infectious than hepatitis C. The virus is detected in virtually all body fluids (i.e. blood, saliva, semen, vaginal secretion, menstrual blood and to lesser extent in perspiration, breast milk, tears and urine) of infected individuals (Lavanchy, 2004; Elgouhari et al., 2008).

HBV infection is among the leading public health burdens especially in developing countries (Samuel et al., 2004; Elgouhari et al., 2008). In high prevalence areas, the most common routes of HBV transmission are perinatal and horizontal transmissions (Gitlin, 1997; Hollinger and Liang, 2001). Also, heterosexual practices, unprotected sex, injections, blood transfusion as well as sharing of sharp objects are among possible routes of transmission (Harry et al., 1994; Seeger and Mason, 2000; Oladele et al., 2013).

An estimated 5% of the global population is infected with HBV, with more than 350 million people as chronic carriers and over 1 million deaths annually (WHO, 1998; Drosten et al., 2004; Sharma et al., 2005; Liu and Hou, 2006; Ziraba et al., 2010; Eke et al., 2011). The prevalence of HBV varies significantly over the globe; low prevalence of 2% is reported in developed countries, while developing countries have prevalence of > 8.0% (Lule, 1997). Sub-Saharan Africa is HBV hyper-endemic, with 8-20% prevalence. Approximately 50 million people are chronic carriers (Drosten et al., 2004; Heathcote, 2008; Majori et al., 2008; Ziraba et al., 2010).

HBV infection is a serious health challenge in Nigeria. Seventy five (75) percent of the total population is exposed to the infection at one time of their life or the other, with an estimated 12% prevalence of chronic carriers (Alao et al., 2009; Oladele et al., 2013). Due to the infectious and asymptomatic nature of HBV infection, poor health care facilities and inadequate monitoring of HBV infection, controlling the spread of HBV infection remain a major challenge (Okoye and Samba, 2006).

The prevalence of HBV infection is disproportionate within the Nigerian population (Alao et al., 2009). Bello et al., (2013) reported 14.0% prevalence among patients visiting Sokoto Specialist Hospital, Sokoto. More so, a

prevalence of 7.9% and 7.6% were reported for pregnant and nonpregnant women respectively attending Aminu Kano Teaching Hospital, Kano (Yakasai et al., 2012). Study of ante-natal patients attending various clinics in Gwagwalada metropolis of Abuja revealed 9.5% prevalence (Agarry and Lekwot, 2010). Forbi et al. (2008) reported a prevalence of 17.1% among female sex workers in Nasarawa State. A prevalence of 9.0% in Mubi and 8.2% among pregnant women in Yola of Adamawa State was reported by Okoye and Samba, (2006) and Olokoba et al. (2011) respectively. In Jos, Plateau State, a prevalence of 20.8% was reported by Adekeye et al., (2013). Angyo et al., (1995) reported 19.5% prevalence among children attending Jos University Teaching Hospital, Plateau State. This study was aimed at determining the prevalence of HBV among prospective blood donors and pregnant women in Kebbi State and assessment of liver function of the HBV infected subjects.

## MATERIALS AND METHODS

### Study Area and Population

Three hundred and sixty one (361) apparently healthy blood donors and pregnant women within the age of 18-35 years, attending Argungu General Hospital, Sir Yahaya Specialist Hospital Birnin Kebbi and Martha Bamaiyi General Hospital Zuru all in Kebbi State, Nigeria, who willingly consented to participate in the study, were screened for HBV infection between the months of January to December, 2012. Subjects with established cases of liver disease and/or HIV infection were excluded from the study. Questionnaire was administered to obtain additional information/ history of each participant.

### Ethical Approval

This research was approved by the ethical committee of Kebbi State Ministry of Health, Birnin Kebbi, Kebbi State, Nigeria.

### Sample Collection and Preparation

Five milliliters of venous blood were collected from each participant using sterile syringe and transferred into plain specimen bottles. The blood was allowed to clot for 30 minutes, and then centrifuged at 2500 rpm for five minutes. The serum obtained was used for the analyses.

### HBV Analysis/ Test

Serum samples were tested for the presence of HBV infection using HBsAg rapid test kit (ACON, USA) which is based on the principle of antigen-antibody reaction.

The test and interpretation of results were carried out based on the manufacturer's specifications and guidelines.

### Liver Function Test and Prothrombin Time Estimation

HBsAg positive subjects were further screened for liver function parameters. Standard methods were used to determine Total Protein (Weichselbaum, 1946), Albumin (Doumas et al., 1971), Total Bilirubin (Doumas et al., 1973), Direct Bilirubin (Doumas et al., 1973), Aspartate aminotransferase (AST) (Reitman and Frankel, 1957), Alanine aminotransferase (ALT) (Reitman and Frankel, 1957), Alkaline Phosphatase (ALP) (Tietz et al., 1983) and Prothrombin Time (Quick, 1935). HBsAg negative subjects served as controls.

### Data Analysis

Data obtained for liver function parameters were expressed as Mean  $\pm$  Standard deviation. All the parameters were analysed statistically at  $P < 0.05$  by one-way analysis of variance (ANOVA) using GraphPad InStat Software (Version 3.05, San Diego, USA).

## RESULT AND DISCUSSION

The prevalence of HBV infection among prospective blood donors and pregnant women in Kebbi State is presented in Table 1.

Table 1: Prevalence of HBsAg in Kebbi State, Nigeria

| Gender | No. of Screened Subjects | No. of HBsAg +ve Subjects | Prevalence (%) |
|--------|--------------------------|---------------------------|----------------|
| Male   | 124                      | 29                        | 23.4           |
| Female | 237                      | 31                        | 13.1           |
| Total  | 361                      | 60                        | 16.6           |

The result reveal that Kebbi State has a high prevalence of HBV (16.6%), thus, is hyper-endemic. Males exhibited a higher prevalence of 23.4% as compared to females with 13.1%. This finding agrees with earlier reports (Oladele et al., 2013) classifying Nigeria as a HBV endemic region.

Based on senatorial district, Kebbi South has the highest prevalence rate (21.8%), followed by Kebbi North (15.1%), while Kebbi Central has the least prevalence (13.6%) (Table 2). Higher prevalence in Kebbi South and Kebbi North as compared to Kebbi Central may be attributed to poor awareness and counseling as well as difficulty in accessing healthcare facilities. Occupational

and mechanical transfers are also possible means of transmission in these areas, which is due to low socio-economic status and remoteness of the zones.

The prevalence of HBV among age groups in Kebbi State is shown in Table 3. A high prevalence of 20.9% was observed among 26-30 years age group. This is presumed to be due to the more sexually active life of youth at the stated age (Khan et al., 2011). Also, optimal social interactions and occupational interest (especially in self-employed) are observed within the stated age, thus, may be additional causes of exposure (Khan et al., 2011).

The prevalence of HBV by risk factors for males and females in Kebbi State are presented in Tables 4 and 5 respectively. Though, all the male subjects denied casual sex life style, a higher prevalence of HBV (26.1%) was observed in single subjects when compared to married subjects (16.7%).

Also, male subjects having a history of sharing sharp objects had an extremely high prevalence of HBV infection (80.6%). This concurs with reports of Khan et al. (2011) which suggests that sharing of sharp objects or needles is a possible route of HBV transmission due to its high infectious potential (Samuel et al., 2004).

For female participants, polygamy (2nd marriage) and occupational exposure (healthcare workers) are risk

factors with highest prevalence (23.2% and 40.0% respectively). Our findings agree with the report of Olubiye et al. (1997), which suggest that occupational exposure can be a major route of HBV transmission.

Liver Function Parameters and Prothrombin Time of HBsAg positive and HBsAg negative subjects are presented in Table 6. The level of aspartate aminotransferase (AST) and alanine aminotransferase (ALT) of HBsAg positive subjects were significantly higher ( $p < 0.05$ ) than that of HBsAg negative subjects, indicating liver injury. Also, elevated ALT (above ratio 1 of AST) observed in HBsAg positive subjects is an indication of viral hepatitis. A significant decline ( $p < 0.05$ ) in albumin level was observed in HBsAg positive subjects, indicating liver injury and corresponding decrease in protein synthesis by the liver (Whitby et al., 1988). The HBsAg positive subjects have significantly higher ( $p < 0.05$ ) levels of total and direct bilirubin when compared to HBsAg negative subjects, these concur to the report of Rozen et al. (1970). Also observed is significant elevation ( $p < 0.05$ ) of prothrombin time by more than 1.0 second above the upper reference limit, which is an indication of defect by hepatocytes to produce functional coagulation factors (Bonacini et al., 1997). Thus, indicating liver injury.

Table 2: Prevalence of HBsAg by Senatorial Zones of Kebbi State, Nigeria

| Senatorial Zone | No. of Screened subject | No. of HBsAg +ve Subjects | Prevalence (%) |
|-----------------|-------------------------|---------------------------|----------------|
| Kebbi Central   | 125                     | 17                        | 13.6           |
| Kebbi North     | 126                     | 19                        | 15.1           |
| Kebbi South     | 110                     | 24                        | 21.8           |

Table 3: Prevalence of HBsAg by Age Group in Kebbi State, Nigeria

| Age Group (Years) | No. of Screened Subjects | No. of HBsAg +ve Subjects | Prevalence (%) |
|-------------------|--------------------------|---------------------------|----------------|
| 16-20             | 68                       | 7                         | 10.3           |
| 21-25             | 84                       | 14                        | 16.7           |
| 26-30             | 110                      | 23                        | 20.9           |
| 31-35             | 99                       | 16                        | 16.2           |

Table 4: Prevalence of HBV Infection by Risk Factors among Male\* Participants in Kebbi State

| Risk Factors                                      | No. of Screened Subjects | No. of HBsAg +ve Subjects | Prevalence (%) |
|---|--------------------------|---------------------------|----------------|
| <b>Marital Status</b>                             |                          |                           |                |
| Single  | 88                       | 23                        | 26.1           |
| Married   | 36                       | 6                         | 16.7           |
| <b>Occupation</b>                                 |                          |                           |                |
| State Government Employee                         | 42                       | 6                         | 14.3           |
| Local Government Employee                         | 24                       | 7                         | 29.2           |
| Self Employed                                     | 58                       | 16                        | 27.6           |
| Healthcare Worker                                 | 0                        | 0                         | 0.0            |
| <b>History of Blood Transfusion</b>               |                          |                           |                |
| Yes   | 0                        | 0                         | 0.0            |
| No  | 124                      | 29                        | 23.4           |
| <b>Cigarette Smoking</b>                          |                          |                           |                |
| Yes   | 3                        | 0                         | 0.0            |
| No  | 121                      | 29                        | 24.0           |
| <b>Alcohol Consumption</b>                        |                          |                           |                |
| Yes   | 0                        | 0                         | 0.0            |
| No  | 124                      | 29                        | 23.4           |
| <b>Previous Contact with HBV Infected Persons</b> |                          |                           |                |
| Yes   | 0                        | 0                         | 0.0            |
| No  | 124                      | 29                        | 23.4           |
| <b>History of Unprotected Casual Sex</b>          |                          |                           |                |
| Yes   | 0                        | 0                         | 0.0            |
| No  | 124                      | 29                        | 23.4           |
| <b>Sharing of Sharp Objects</b>                   |                          |                           |                |
| Yes   | 36                       | 29                        | 80.6           |
| No  | 88                       | 0                         | 0.0            |

\*Total number of male participants= 124

Table 5: Prevalence of HBV Infection by Risk Factors among Female\* Participants in Kebbi State

| Risk Factors                               | No. of Screened Subjects | No. of HBsAg +ve Subjects | Prevalence (%) |
|--|--------------------------|---------------------------|----------------|
| Marriage Type                              |                          |                           |                |
| Monogamy                                   | 91                       | 8                         | 8.8            |
| Polygamy- 1 <sup>st</sup> Marriage         | 90                       | 7                         | 7.8            |
| Polygamy- 2 <sup>nd</sup> Marriage         | 56                       | 16                        | 28.6           |
| Occupation                                 |                          |                           |                |
| State Government Employee                  | 19                       | 2                         | 10.5           |
| Local Government Employee                  | 8                        | 0                         | 0.0            |
| Not Employed                               | 205                      | 27                        | 13.2           |
| Healthcare Worker                          | 5                        | 2                         | 40.0           |
| History of Blood Transfusion               |                          |                           |                |
| Yes  | 87                       | 3                         | 3.5            |
| No   | 150                      | 28                        | 18.7           |
| Cigarette Smoking                          |                          |                           |                |
| Yes  | 0                        | 0                         | 0.0            |
| No   | 237                      | 31                        | 13.1           |
| Alcohol Consumption                        |                          |                           |                |
| Yes  | 0                        | 0                         | 0.0            |
| No   | 237                      | 31                        | 13.1           |
| Previous Contact with HBV Infected Persons |                          |                           |                |
| Yes  | 0                        | 0                         | 0.0            |
| No   | 237                      | 31                        | 13.1           |
| History of Unprotected Casual Sex          |                          |                           |                |
| Yes  | 0                        | 0                         | 0.0            |
| No   | 237                      | 31                        | 13.1           |
| Sharing of Sharp Objects                   |                          |                           |                |
| Yes  | 0                        | 0                         | 0.0            |
| No   | 237                      | 31                        | 13.1           |

\*Total number of female participants= 237

Table 6: Liver Function Parameters and Prothrombin Time of HBsAg Positive and HBsAg Negative Subjects

| Parameters                 | HBsAg Positive Subjects  |                         | HBsAg Negative Subjects |                         |
|----------------------------|--------------------------|-------------------------|-------------------------|-------------------------|
|                            | Male*                    | Female**                | Male***                 | Female****              |
| AST (U/L)                  | 24.28±6.04 <sup>a</sup>  | 21.26±4.50 <sup>b</sup> | 13.35±2.37 <sup>c</sup> | 12.36±1.68 <sup>d</sup> |
| ALT (U/L)                  | 31.00±10.70 <sup>a</sup> | 30.01±8.30 <sup>a</sup> | 9.04±1.48 <sup>b</sup>  | 9.39±1.33 <sup>b</sup>  |
| Albumin (mg/dl)            | 3.39±0.15 <sup>a</sup>   | 3.40±0.23 <sup>a</sup>  | 4.57±0.39 <sup>b</sup>  | 4.38±2.24 <sup>b</sup>  |
| Total Bilirubin (mg/dl)    | 0.79±0.12 <sup>a</sup>   | 0.74±0.07 <sup>a</sup>  | 0.49±0.07 <sup>b</sup>  | 0.54±0.07 <sup>c</sup>  |
| Direct Bilirubin (mg/dl)   | 0.30±0.05 <sup>a</sup>   | 0.29±0.04 <sup>a</sup>  | 0.17±0.03 <sup>b</sup>  | 0.20±0.03 <sup>c</sup>  |
| Prothrombin Time (Seconds) | 16.1±0.90 <sup>a</sup>   | 16.4±1.10 <sup>a</sup>  | 11.6±0.80 <sup>b</sup>  | 11.7±0.67 <sup>b</sup>  |

Values are expressed as Mean ± Standard Deviation, Mean values with different superscripts in a row indicate significant difference (p < 0.05), AST = Aspartate aminotransferase, ALT = Alanine aminotransferase, \* = 29 Subjects, \*\* = 31 Subjects, \*\*\* = 95 Subjects, \*\*\*\* = 206 Subjects.

## CONCLUSION

The result of this study reveals that Kebbi State is HBV hyper-endemic, with males having higher prevalence than females. More so, subjects with history of sharing sharp objects and those with occupational exposure (healthcare workers) had high HBV prevalence. Therefore, there is need for continuous routine screening and rigorous awareness as well as vaccination of the populace so as to tackle the menace of HBV infection in Kebbi State.

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