

Hepatitis B virus infections in apparently healthy urban Nigerians: data from pre-vaccination tests

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Abstract

Background: In spite of the availability of an effective vaccine since 1982 against hepatitis B, infection with hepatitis B virus (HBV), which is 50 to 100 times more infectious than HIV, still persists in most parts of the world with Nigeria being described as an endemic zone. We therefore set out to establish the prevalence of this infection and evaluate its relationship with age and gender in urban Nigerians.

Methodology: During pre-vaccination tests, blood samples were collected by finger-prick and venepuncture from 1,891 subjects aged ≤ 60 years, between 2008 and 2009 after having obtained informed consent and ethical clearance. Smart Check HBsAg (Globalemed, Cape Town, South Africa) and ShantestTM-HBsAg Elisa (Shantha Biotechnics Ltd, Hyderabad, India) were used for initial and confirmatory tests respectively.

Results: Of the 1,891 participants, 957 (50.6 %) were males and 934 (49.4%) were females. Overall 114 (6.0%) were positive, of whom 71 (7.4%) were males and 43 (4.6%) females. Those aged 21–30 years had the highest infection rate, and males were more likely to be infected with the virus than females ($P > 0.05$).

Conclusions: Such a high prevalence of a vaccine-preventable infection questions the effectiveness of the Nigerian vaccination strategies. The Nigerian government hepatitis B vaccination programme, which hitherto is limited to the National Childhood Immunisation Programme, should include the adult population.

Key Words: Hepatitis B Virus; prevalence; vaccination; Nigeria

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Introduction

Hepatitis B virus (HBV) infection is a major public health problem worldwide. HBV is 50 to 100 times more infectious than HIV, and it is an important cause of liver diseases such that chronic infection with HBV is a common cause of death associated with liver failure, cirrhosis, and liver cancer [1-3]. The endemicity of HBV in Nigeria has been variously described [4-6].

Globally, more than two billion people alive today have been infected with HBV at some time in their lives. Of these, about 350 million have chronic (lifelong) infections and become carriers of the virus

[1,3]. These chronically infected persons are at high risk of death from liver cirrhosis and hepatocellular carcinoma, diseases that kill about one million persons each year. Every year there are over four million acute clinical cases of HBV [3].

The risk of death from HBV-related liver cancer or cirrhosis is approximately 25% for persons who acquire chronic infection at childhood [1,3]. Moreover, 8% to 10% of people in the general population in the developing world become chronically infected and most acquire infection with HBV at childhood [3,7].

Although hepatitis B vaccination is highly effective in preventing infection with HBV and consequent acute and chronic liver disease [1], this infection is still a major problem in Nigeria as reported by various scientists [6,8-10]. The Nigerian government HBV vaccination programme that is designed only for children (excluding adults) might be a major contributing factor.

The need for periodic monitoring of the trend of infection in the general population as a necessary tool for effective intervention initiatives cannot be overemphasized. Therefore, using a representative sample size, we set out to determine the prevalence of this infection and evaluate its association with age and gender in apparently healthy urban Nigerians.

Materials and methods

Study area and population

The study area was comprised of the Nigerian Federal Capital Territory (FCT), Abuja, and part of Mararaba town at the boundary between Nasarawa State and the FCT. Abuja and Nasarawa State are located in the north-central zone of Nigeria. A total of 1,891 residents of the area, most of whom came from different parts of Nigeria, participated in our vaccination exercises and were considered for the study.

Ethical consideration

Informed consent of each participant was obtained prior to testing. Ethical approval was also obtained from our Research Ethics Institutional Review Board.

Inclusion and Exclusion Criteria

All subjects who gave informed consent were included in the study. Subjects who had once been vaccinated with the required three doses of the vaccine and those who declined to offer consent were excluded from the study.

Specimen Collection and Assay

In the course of our routine HBV vaccination exercises mostly targeting the adult population, finger-prick whole blood samples were collected for pre-vaccination tests from 1,891 participants aged \leq 60 years, between January 2008 and January 2009, after having obtained informed consent and clearance from our research ethics institutional review board. On-the-spot testing for HBsAg was conducted using Smart Check HBsAg (Globalemed, Cape Town,

South Africa) according to the manufacturer's instructions. Next 3 ml of blood was then aseptically collected by venepuncture from each reactive participant and conveyed in ice packs to our facility, where their respective plasma in EDTA containers were separated into cryovials. Confirmatory tests were then performed with ShantestTM –HBsAg ELISA (Shantha Biotechnics Ltd, Hyderabad India) according to the manufacturer's instructions.

Statistical Analysis

Data were subjected to statistical analysis using statistical software StatView version 4.5 (Abacus Concepts Inc, Piscataway, USA). Pearson chi-square was calculated at 95% confidence interval. P value \leq 0.05 was considered significant.

Results

A total of 1,891 subjects participated. Of these, 957 (50.6 %) were males and 934 (49.4 %) were females. Overall 114 (6.0 %) were positive for HBV. Of the 957 male and 934 female participants, 71 (7.4 %) and 43 (4.6 %) were infected respectively. Those aged 21–30 years had the highest infection rate, and males were more likely to be infected with the virus than females ($P > 0.05$). Table 1 shows the overall and the age-sex matched prevalence rates.

Discussion

The discovery of such a high HBV prevalence of 6.0% in this study, among an urban population which supposedly should have a low prevalence rate—unlike rural populations where most practices such as poor adherence to vaccination schedules, relatively low vaccination coverage, sharing of drinking cups, and relatively frequent unprotected sex favour transmission—underscores the endemicity of hepatitis B in Nigeria.

The finding is consistent with earlier reports. For instance, prevalence rates of 8.9 % and 10.3 % have been reported among women of child-bearing age in Lagos, Nigeria and in the general population of Uganda in a national sero-survey respectively [10,11]. However, inconsistent findings with ours of much higher seroprevalence rates of 26.0 %, 15.1 %, 13.2 % and 12.6 % have been reported in Nigeria [9,12,14,15]. The smaller sample sizes used by those researchers might explain the wide gaps that exist between their findings and ours.

Similarly, high seroprevalence rates, for instance, 17.1%, 23.0%, 9.2% and 26.5% have been reported

among the Nigerian high-risk populations of commercial sex workers, prison inmates and HIV/AIDS patients [3,5,17,18]. All these reports no

This study was done in an urban population that should have a lower prevalence rate than rural populations based on previous findings [11, 21].

Table 1. Age and sex distribution of Hepatitis B Virus infections among Nigerians

| Age (Yrs) | № Tested | Sex | | № Positive | | № / % Positive |
|-----------|----------|------|--------|------------|------------|----------------|
| | | Male | Female | Male (%) | Female (%) | |
| ≤ 10 | 409 | 216 | 193 | 8 (3.7) | 4 (2.1) | 12 (2.9) |
| 11-20 | 647 | 293 | 354 | 25 (8.5) | 17 (4.8) | 42 (6.5) |
| 21-30 | 401 | 186 | 215 | 24 (12.9) | 13 (6.0) | 37 (9.2) |
| 31-40 | 264 | 138 | 126 | 10 (7.2) | 7 (5.6) | 17 (6.4) |
| 41-50 | 138 | 101 | 37 | 4 (4.0) | 2 (5.4) | 6 (4.3) |
| 51-60 | 32 | 23 | 9 | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Total | 1891 | 957 | 934 | 71 (7.4)* | 43 (4.6)* | 114 (6.0) |

*P Value = 0.98, Male vs Female

doubt attest to the endemicity of hepatitis B in Nigeria.

However, comparatively lower seroprevalence rates of 3.2% and 4.98% have also been reported in Nigeria [19,20]. This study revealed that the males with the prevalence rate of 7.4% were more likely to be infected with the virus than females who had 4.6% infection rate. Although this did not reach statistical significance ($P > 0.05$), implying that the difference might be due to chance, our finding is in accord with previous studies that reported higher infection rates among males than females [11-13,16]. No concrete explanations can be given for the higher vulnerability of males to the infection than females.

When we compared prevalence rates across age groups, there was a relatively high infection rates across all the age brackets, though those aged 21-30 were more likely to be infected followed by those aged 11-20 years, with the difference not reaching statistical significance ($P > 0.05$). This implies that the difference might be a product of chance. However, previous findings have found significant association with age [11,19]. Given the sexual transmission of HBV, the high sexual activity of individuals within these age brackets might explain this.

Considering the age groups most infected in this study, one can speculate that the major transmission mode in this population is sexual intercourse; however, this hypothesis needs further evaluation. An incidence study could provide better understanding, since this study evaluated only the prevalence and it is possible that some of the infected subjects acquired infection at childhood either vertically (mother-to-child) or by other transmission routes.

Hence a much higher seroprevalence rate should be expected in a Nigerian general population study that will include rural populations. We therefore recommend that a Nigerian national survey like the Ugandan study [11] be conducted, as this will be a useful aid in understanding the situation in the general population, and in the planning of intervention initiatives, including a vaccination policy. Such a survey could be included in the Nigerian HIV/AIDS sentinel survey.

Such a high prevalence in an urban population questions the effectiveness of the Nigerian HBV vaccination programme. The role of vaccination in overcoming hepatitis B cannot be overemphasised. A notable example is a study in China that found reduced prevalence of HBsAg to be strongly associated with vaccination among all age groups [22]. We recommend that the Nigerian government HBV vaccination programme should be extended to the adult population and not just limited to the national childhood immunisation programme.

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