

Spatial distribution of hepatitis B sero-antibodies among subjects in some Niger Delta communities: A public health risk

Abstract

Hepatitis B virus is a major cause of viral hepatitis. The prevalence of the hepatitis B surface antigen (HBsAg) which is a component of HBV was investigated among some communities in Ahoada East Local Government Area of Rivers State in the Niger Delta Region. A total of 1000 randomly selected subjects from the Community Health Center Edeogha-Ekpeye, Community Health Center Ochigba, and Comprehensive Health Center Ahoada, Ahoada General Hospital, Ula-upata, Ahoada Timber Market and Ogbo town were recruited. Self-administered questionnaires were distributed to the subjects to get their socio-demographic data and also their blood samples collected for serological assay for HBsAg using the Acon HBsAg test strips (USA). The total prevalence of HBsAg was 14% out of which 5.7% were males and 8.3% were females. Of those infected 4.8% were within the ages of 25-34, 4% within ages 15-24, 3.9% within 35-44 and 1.3% are within the age of 45-54 years respectively. Nevertheless, 6% of positive cases were those with the senior school certificate, 3.6% were those with the First School Leaving Certificate, 3.3% had no educational qualification, 1% were BSc holders while 0.1% were MSc holders; 3.1% were students, 1.8% were farmers, 1.7% were applicants, 1.3% were civil servants, 0.4% were those with other occupations while 0.3 were fishermen; 7.5% were married, 4.9% were widowed while 1.6% were single. Among those infected, 13.4% of them knew the use of condoms could prevent HBsAg infection while 0.6% said they were not aware of such protective mechanism. The study revealed that marital status, age and occupation played a huge role in determining the prevalence; thus the need for vigorous health education and increasing efforts in immunization in our remote communities should be strongly sustained. Nevertheless, the vaccination against the virus should be made free and accessible to the weak and vulnerable.

Keywords: hepatitis B virus, prevalence, age, marital status, occupation, risk factor, Niger delta communities

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Abbreviations: HCC, hepatocellular carcinoma; HbsAg, hepatitis B surface antigen; NPI, national program on immunization; HBcAg, hepatitis B core antigen; FSLC, first school leaving certificate; NDPDC, niger delta petroleum development company ltd

Introduction

The Hepatitis B virus (HBV) is a member of the hepadnavirus family. The virion has an outer lipid envelope and an icosahedral nucleocapsid core made of protein.¹ It belongs to the hepatotropic DNA viruses which are major causes of viral hepatitis and is able to cause liver cirrhosis and hepatocellular carcinoma (HCC).² It is however preventable in our communities through the means of continues vaccination strategies.³ HBV is also known as Dane particles and has the viral DNA, hepatitis B core antigen (HBcAg) and hepatitis B surface antigen (HBsAg).⁴ Hepatitis refers to a potential life-threatening inflammation of the liver which may be caused by hepatitis C, D, B, A and E viruses respectively. When HBsAg persists in a person (carrier) for more than 6 months, a chronic infection is said to be occurred and the person is able to promote the spread of the infection to the unsuspecting members of the public.⁵ This is potentially possible if adequate preventive measures and control plans are not in place in good time. The HBV vaccine has however been available since 1982 but incorporated into Nigeria's immunization

schedule in 2004 under the National Program on Immunization (NPI) and is often administered to both children and adults in 3 doses. Children are immunized within 24 hours of birth while the second and third doses are taken at intervals of at least 4 weeks. In adults, the second dose is taken after 4 weeks and the third dose taken after 6 months.

According to the WHO, estimated 240 and 150 million persons were affected by chronic liver disease caused by hepatitis B and C viruses respectively.⁶ The African continent is regarded as an area of high HBV with the largest number of HBV carriers.⁷ When the hepatitis B vaccine is administered immediately, it prevents the infection by the virus. Cirrhosis and hepatocellular carcinoma may result later in life if an infant acquires HBV.⁸ The incidence of chronic HBV infections has however reduced; due to the wide spread immunization of hepatitis B vaccine among infants and vulnerable adults that could be exposed to the epidemic outbreak.⁹ In 2015, 257 million were estimated to be living with chronic HBV in the world. Nevertheless, 68% of these were accounted for the Western Pacific and African regions. Persons born before the hepatitis B vaccine was made available, make up a large percentage of those presently living with HBV infection. Nonetheless, prevention of HBV infection prevention begins from children under 5 years of age since majority of the infected persons acquired the virus before age 5.¹⁰ Infants may acquire the virus from

their mothers during birth if she is not treated for HBV. Mother to child transmission of the virus may be prevented if the baby is given the first dose of vaccination 24 hours after birth. However, if the titre of HBV in the mother's blood is high, the efficacy of the vaccine reduces. Mothers who are hepatitis B e antigen (HBeAg) negative have an almost 0% chance of transmitting the virus to their offspring if they are vaccinated at birth, while those mothers who are positive have a 20% chance of transmitting the virus to their offspring.^{11,12} The infection rate of under 5 children reduced from 4.7% to 1.3% between the pre-vaccine era and 2015.⁸ Arguably, this could be linked to the availability, accessibility and increasing health education with respect to the gains of immunization in our present contemporary society.

HBV has been implicated as a common cause of liver disease and the third most common cause of death in medical wards and normal population having 15.60% HBsAg prevalence in Africa.¹³ In 12% of the total population is estimated to be chronic carriers of HBsAg.¹⁴ The virus can be contacted through semen, blood, saliva, menstrual blood, breast milk, tears, urine or other body fluids from an infected person.¹⁵ It can be transmitted through intravenous drug abuse, unsafe sex, tattooing, mother to child, transfusion of infected blood, needle injury, barbers razor, sharing of syringe, etc.¹⁶⁻¹⁸ There exists paucity of information on the prevalence of hepatitis B virus in rural communities within the Niger Delta Region of Nigeria which includes Ahoada East, thus this study was aimed at providing epidemiological data on the prevalence of HBsAg in Ahoada East Local Government Area in the Niger Delta Region of Nigeria.¹⁶ It is strongly believed that data generated will be used to engender prompt case management and develop more robust prevention strategy, especially in our remote communities with massive presence of confounding risk factors among the rural dwellers.

Methodology

Study Area

The location of this study was Ahoada East Local Government Area in Rivers State. It is one of the 23 Local Government Areas located in North-Western part of Rivers State in the oil-rich Niger Delta Region of Nigeria. It was created in 1996 and has a land area of about 341 km² with a population of 178,279 persons (NPC, 2008). Its natives belong to the Ekpeye ethnic nationality and they are predominately farmers while some are fishermen, artisans and traders. Oil exploration is carried out in the area, with the presence of companies such as the Niger Delta Petroleum Development Company Ltd (NDPDC) and Julius Berger Construction Company respectively. Subjects for this study were randomly selected among patients attending the Community Health Center Edeogha-Ekpeye (Location 1), Community Health Center Ochigba (Location 2), Comprehensive Health Center Ahoada (Location 3) and Ahoada General Hospital (Location 7). Non-hospital/clinic based samples were also collected from Ula-upata (Location 4), Ahoada Timber Market (Location 5) and Ogbo town (Location 6).¹⁷

Sample population

Sample population for this study was persons with age's ≥ 15 years resident in the area and willing to partake in the study. One thousand (1,000) self-administered questionnaires were used to get demographic data such sex, educational qualification, age, occupation, use of condom, marital status and access to health facilities. The questionnaires were read out to those who could neither read nor write

and their response filled in appropriately into the questionnaire.

Sample collection and preparation

A convenient sampling technique was explored throughout the sampling period. Thus, from each subject, whole venous blood (3 ml) was collected from the antecubital vein and dispensed into a serum bottle (gel tube) and allowed to clot. It was centrifuged at 1000 rpm for 5 minutes and the serum pipetted into a dry tube and it was stored at -20 °C till when needed.

Inclusion Criteria: Those who willingly agreed to participate in the study after the nature and aim of the study were fully explained to them were included. The subjects must be residing in the communities where the subjects were recruited and they must be 15 years and above in age. The subject must not be an already known diagnosed hepatitis B infected subject and must not be on antiviral drugs of any kind of viral infection.

Exclusion Criteria: Those who did not give their consent were excluded from the study, even as those who are below 15 years were also excluded. Those who are not permanently living in the communities were not allowed to participate. Those who are currently on hepatitis B treatment were removed from the study.

Hepatitis B surface antigen (HBsAg) test (Serology)

Commercially available Acon HBsAg test strips (Acon Laboratories, Inc. San Diego U.S.A) were used to detect the presence of HBsAg in the collected sera according to manufacturer's instruction. The test strip is a rapid and WHO accepted chromatographic immunoassay for the qualitative detection of HBsAg in serum as a point of care outcome especially in a limited resources setting like ours. The membrane of the strip is pre-coated with HBsAg antibodies conjugated particles. The serum migrates upwards on the membrane by capillary action and reacts with the HBsAg antibodies and generates a colored line in the test region as the serum is carefully dropped on the test kit bowl. Absence of the colored line indicates a negative result while its presence indicates a positive result. A control line should always appear whether it's a negative or positive result showing the validity of the test. If the control line fails to appear, then the test is invalid, thus should be repeated. All the invalid strips are repeated accordingly as a strong internal mechanism approach of quality control and quality assurance that is critically needed in a routine biomedical laboratory.

Statistical analysis

Data from the results were analyzed using mean, range, variance and standard deviation on the Statistical Package for Social Sciences version 22 (SPSS 22). Charts were used to represent the results.¹⁸

Results

Of the 1000 samples collected 140 (14%) were Sero-positive for HBsAg. Figure 1 indicates that 46.40% of the respondents were males while 53.60% were females. Also HBsAg prevalence among them was 5.70% and 8.30% for males and females respectively. Figure 2 shows the prevalence among the different age groups. Ages 15-24 had a prevalence of 4.0%, 25-34 had the highest prevalence of 4.8% while 35-44 was 3.9% and 45-54 was 1.30% of the study population. Figure 3 shows the prevalence based on educational qualification. Persons whose highest educational qualification was the Senior Secondary School Examination (SSCE) had the highest prevalence of 6.0%, next was those with the First School Leaving Certificate (FLSC) with

3.6%. Figure 4 those who had no educational qualification accounted for 3.3% of those infected with HBV; BSc 1.0%; while those who held a Masters degree accounted for 0.1% of those infected. However, with regards to marital status,¹⁹ 7.5% of those infected were married, 4.9% were widowed while 1.6% were single. Furthermore, 13.4% of those infected with HBV knew that the use of condoms during sexual intercourse may prevent one from contracting HBV while 0.6% said they were not aware. Based on occupation, the highest prevalence was among students (3.1%), farmers accounted for 1.8%,

unemployed (applicants) 1.7%, civil servants 1.3%, fishermen 0.3% while persons Figure 5 in other professions accounted for 0.4% of the total prevalence. Based on location, Ahoada General Hospital had a high prevalence of 47.14% of the total prevalence, Figure 6 Comprehensive Health Center Ahoada 13.57%, Ula-upata community 10%, Community Health Center Ochigba 8.57%, Community Health Center Edeogha-Ekpeye and Ogbo town 7.14% respectively and Ahoada Timber Market 6.43% respectively (Figure 7).²⁰

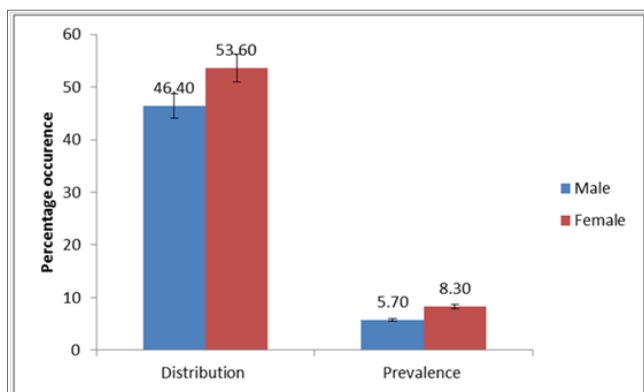


Figure 1 Sex distribution and percentage prevalence.

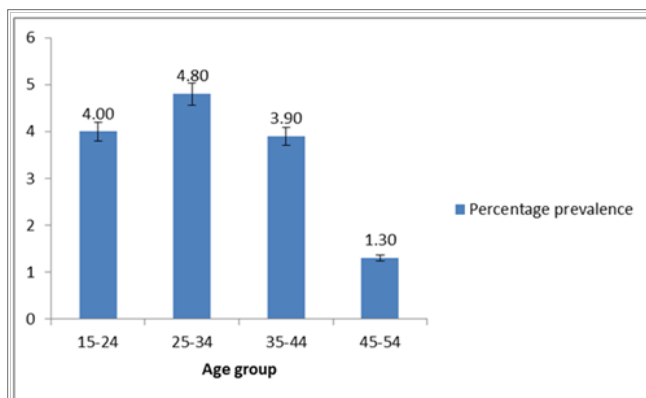


Figure 2 Percentage prevalence among the age groups.

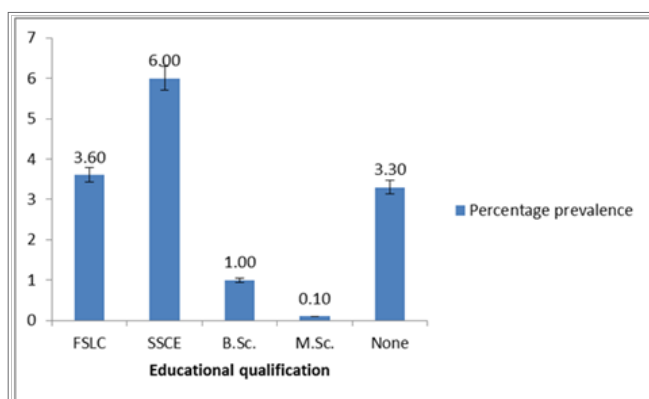


Figure 3 Percentage prevalence based on educational qualification.

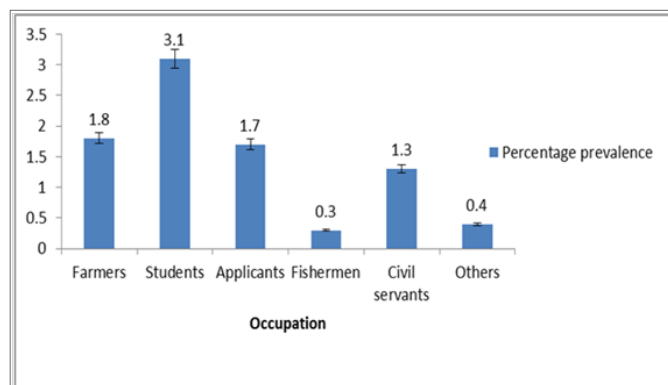


Figure 4 Percentage prevalence based on occupation.

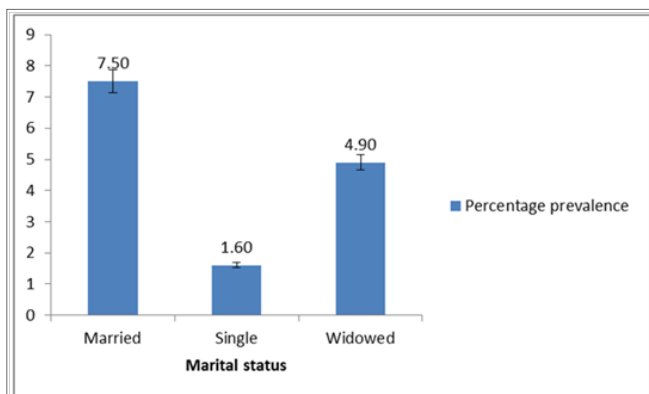


Figure 5 Percentage prevalence as related to marital status.

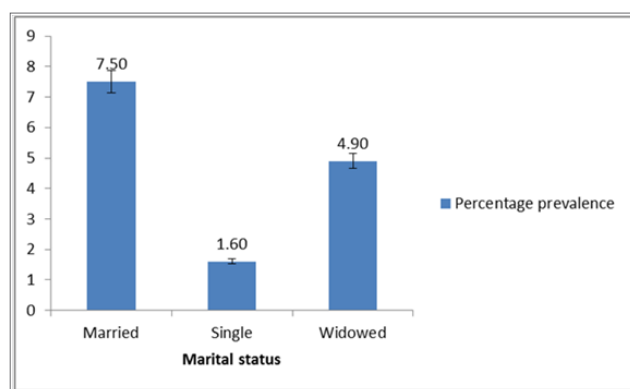


Figure 6 Awareness of HBV positive respondents on the use of condoms for prevention of the virus.

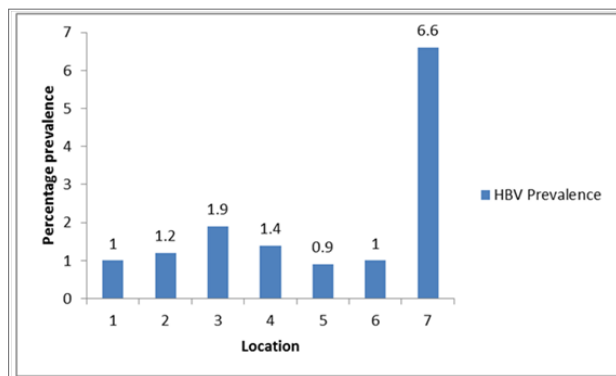


Figure 7 Spatial distribution of HBsAg in the seven locations.

Discussion

There is paucity of data from rural communities of Niger Delta (Ahoada East) on the incidence of Hepatitis B infection. This cross sectional health facility based study was explored to assess the sero-prevalence of Hepatitis B. The socio-demographic characteristics of adults which were screened for Hepatitis B were also investigated. A study carried out on the prevalence of HBV among the Nigerian populace reported a prevalence of 13.6%²¹ which is close to that obtained in this study. In this study, the female gender had a higher carrier (8.3%) status compared with the male gender which had an infection rate of 5.7%. It may be assumed that this is due to fact that more females were used in this study (53.6%) as against the 46.4% of males involved in the study. Also, since the survey was carried out mainly in health facilities and markets, females are more often involved in buying and selling compared with males. The report²² attests to the fact that females visit health facilities more than their male counterparts. Ages 25-34 had the highest prevalence of 4.8% compared with the other classes in this study; this class is made of youths who are sexually active and most often partake in harmful practices such as intravenous drug and sexual promiscuity. This is in consonance with a study carried out among military personnel in the Niger Delta Region where ages 20-39 had the highest prevalence of 4% compared with the other age groups and another carried out among university fresh students in Port Harcourt where the highest prevalence of 1.4% was among persons within ages 21 and 30.^{23,24}

The educational status of the respondents probably played a huge role in the infection rate as the highest prevalence (6%) was among those whose highest educational qualification was the First School Leaving Certificate (FSLC). Persons with a higher degree (MSc) had the least prevalence of 0.1%. The others may have had the opportunity of having knowledge of hepatitis B virus and its risk factors and as such may have been able to avoid its infection. Also, persons with university degrees rarely stay in communities or towns as most of them move to the city in search of white collar jobs or already engaged by the multi-national companies in the urban areas. Students had the highest prevalence of 3.1%. Since it is a rural area, the possibility of young students indulging in illicit sexual behaviour after school cannot be ruled out. Some students rather than attend school during school hours, meet with their peer groups and probably partake in either sexual activities or drug use. In a similar study carried out on fresh students of University of Jos, they recorded a prevalence of 16.67%.²⁵ Farmers and applicants contributed 1.8% and 1.7% respectively to the total prevalence. Idleness on the part

of the applicants may have made them to indulge in certain activities that predispose them to HBV infection. The study also showed that married persons contributed 7.5% of the total prevalence. The reason for this not clear parse, but it could probably believe that some married persons are sexually promiscuous and may potentially indulge in extra-marital affairs that could promote their vulnerability or susceptible to the infection. The widowed who are sexually active may also find themselves partaking in unwholesome sexual activities without protection, even as they may also be involve with other risk factors of high public health magnitude.

Condoms have been found to largely prevent the transmission of most sexually transmitted diseases. It is worthy of note that 13.4% of the 14% infected were aware that the use of condoms can prevent the spread of HBV. The question however is if they practiced what they knew by making use of condoms during sexual intercourse. Thus, having a strong knowledge of a subject matter is good but being careful towards putting that knowledge into practice is another element to be seriously and critically sustained. The need for increasing call for speedy behavioral attitudinal change cannot be over-emphasized. Nevertheless, location 7 which is the Ahoada General Hospital made up 47.14% of the total study population with the highest prevalence of 6.6%. The reason for this could be linked to the fact that the hospital is the largest, well equipped and massively endowed with well-trained competent staff in the Local Government Area thus, this encouraged more patients visiting the hospital, when compared with others, these may have probably accounted for this increased prevalence rate among subjects in the hospital settings. The incubation period for Hepatitis B virus on the average is about ninety (90) days but this could vary between thirty (30) to one hundred and eighty (180) days.¹⁹ This might also be influenced by the immunity status of the patients. More so, the provision of vaccine and improved health education has helped to reduce the incidence of Hepatitis B infection especially in industrialized nations unlike in the developing countries such as those in Africa where health information and access to good health care facility is still a challenge.

The prevalence of HBV is relatively not common in developed countries probably due to the availability of vaccine and good health education/awareness on the prevention and control of the infection. On the contrary, HBV is endemic in developing countries, especially in Asia and Africa since sanitation, poverty and risk behavioral patterns are issues to contend with. HBV is transmitted horizontally by blood and blood products and sexual transmission. It is also transmitted vertically from mother to infant in the parenteral period which is a major route of transmission in regions where the pathogen is endemic. Blood supply in the advanced world is properly screened thus the chances of transmission through blood transfusion is extremely low. One critical route of transmission among adults in developed countries is intravenous drug use and sexual contact. The risk of HBV infection is probably high among promiscuous homosexual men but it is also transmitted sexually from man to woman and woman to man. Health care workers and patients receiving haemodialysis are also at increased risk of infection and risk of infecting others (20).

Conclusion

This study was carried out on indigenes of Ahoada East Local Government Area of Rivers State where 1000 randomly selected apparently healthy subjects from markets, towns and health facilities were randomly recruited. The total prevalence of hepatitis B virus in

Ahoda East as at the time of this study was 14%. 7.5% of the 14% infected were married while 4.9% were widowed and only 1.6% of them were single. However, 13.4% of those infected with the virus admitted that they were aware of the use of condoms during sexual intercourse for the prevention of the virus. Nevertheless, age, marital status and even sex of the subjects were all implicated as potential risk factors that succinctly promoted the increasing trend of the epidemic outbreak in our rural communities of Niger Delta.

Recommendation

Awareness on the modes of transmission of hepatitis B virus should be carried out in this Local Government Area and other rural communities. The hepatitis B vaccine should be made available to those in the rural areas at no cost. Individuals should be encouraged to stick to one sexual partner and where not possible make use of condoms during sexual intercourse. Furthermore, regular studies should be carried out on the prevalence of HBV in rural communities and not just in cities, so as to help determine the extent to which eradication of the virus has reached.

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Conflict of interest

None reported among authors.

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