SERO-EPIDEMIC SURVEY OF HEPATITIS B IN A POPULATION OF NORTHERN NIGERIA

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ABSTRACT

The rates of infection of various hepatitis B virus serological markers were measured on the basis of age, sex and socio-economic activities amongst the community population of Mubi, a known border community in North-Eastern Nigeria. Sera of 992 subjects consisting of 613 males and 379 females were analysed by radioimmunoassay. The overall HBV exposure among the subjects surveyed was 40.3 %. The rate of HBsAg infection was 9.0 %; 19.0 % for anti-HBs and 12.2 % for anti-HBc. The occurrence of HBV markers by age of the subjects showed that infants less than 1 year old had the highest HBV exposure rate of 43.9%; the rate declined at the 1-10 years age group and increased steadily thereafter with age until the ≥ 51 years age bracket. The incidence of the HBV markers by sex of subjects showed that infection rates were higher in males (43.4%) than in females (35.4%). The rate of HBs infection rose progressively with age and significantly higher (p<0.01) in males (20.1%) than in females (17.2 %). The infection rate of HBc did not correlate with increase in age and significantly higher (P < 0.01) in males (13.2 %) than in females (10.8%). The distribution of the HBV markers was associated with differences in socio-cultural environment and practices (Fig. 2); thus, prison inmates who constituted the bulk of commercial blood donors had the highest rate of infection (28.5 %), followed by traders/artisans (21.0%) and students/pupils (18.0%). This study suggests vertical (maternal to infant) and horizontal transmission early in life in the spread of HBV markers in Mubi area and recommends passive active HB immunization (anti-HB vaccine), personal and urban hygiene and that testing for HBsAg by the most sensitive methods should be required for all blood donors. HBsAg-carriers and People who are known to have the infection or to be at high risk e.g. prostitutes, prisoners, etc should be discouraged from donating blood.

Keywords: Hepatitis, Radio-immunoassay, Immunization, Cirrhosis, Serological-markers, Morbidity

INTRODUCTION

Viral hepatitis causes of considerable mortality both from acute infection and chronic disease conditions and ranks among the ten top killer diseases (Blumberg, 2002). Infection with hepatitis B virus (HBV) is a worldwide problem. It has been reported that hepatitis B related illnesses causes an estimated 1 – 2 million deaths per year world wide and 5,000 – 6,000 deaths per year in America (Blumberg, 2002; HBF, 2005). The World Health Organization (WHO) estimates that 400 million out of the about 2 billion subjects infected worldwide are at risk of developing hepatological and non-hepatological manifestations. Between a third to a quarter of these people are expected to develop digestive haemorrhage and progressive liver diseases including cirrhosis and hepatocellular cancer (Poynad, 2001; HBF 2005). The HBV infection varies widely worldwide from high (≥ 8 %) e.g., in Africa, Asia and the Western Pacific to intermediate (2 - 7.9 %) e.g., in Southern and Eastern Europe and low (≤ 2 %) e.g., in Western Europe, North America and Australia (Poynad, 2001).

In Nigeria, Hepatitis B virus (HBV) infection is a major health problem due to its associated mortality. Apart from the asymptomatic nature of the disease in most cases, the documentation of mortality is very poor. Furthermore, many people especially in the poor rural communities do not seek medical assistance early except for major health problems. Another factor is that most of the available health institutions lack the requisite manpower, equipment and reagents for virologic diagnosis. However, recent surveys have incriminated hepatitis B as a major aetiological agent of chronic disease in Nigeria (HBF, 2005).

Symptoms of hepatitis B virus infection are few, hardly noticeable When symptoms are present, they vary significantly depending on the overall health of the infected person and generally include extreme tiredness, loss of appetite, nausea and vomiting, fever, headache, muscle aches, abdominal disturbances and jaundice.

Acute hepatitis, liver cirrhosis and hepatocellular carcinoma are presently important causes of hospitalization and death due to HBV. Hepatitis B virus is one of the major diseases of mankind and at high risk of developing cirrhosis and primary hepatocellula carcinoma and subsequent death. Hepatitis B virus related to hepatoma is the most common malignancy accounting for 20 – 50 % of all cancer-related deaths among males in Asia and African (Ojo, 1997). As a consequence of the chronic complications of Hepatitis B, there is a great demand on the health care system leading to considerable economic implications.

The basic reason for screening of blood before transfusion is to avoid the occurrence of complications in the recipient due to the blood received, particularly to avoid the transfusion of pathogenic micro-organisms such as *Mycobacterium tuberculosis*, *Treponema palladium* (causative agent of syphilis), *Plasmodium* (malaria parasite), the Human Immuno Deficiency Virus (HIV) and hepatitis B virus, etc. The screening of blood of donors for HBV is not routinely done in most rural health facilities in Africa, consequently, majority of the blood transfusion are undertaken without screening for hepatitis B.

Symptoms of acute hepatitis often subside without treatment within a few weeks or months. A few cases develop into a chronic and incurable form of the disease, eventually resulting in liver cirrhosis or cancer. Currently, there are 5 agents licensed in the United States for the treatment of chronic hepatitis B viz. interferon alfa-2b; pegylated-interferon alfa-2a; and the oral agent's lamivudine, adefovir dipivoxil, and entecavir. The oral antiviral agents against hepatitis B virus (HBV) are usually used for long-term periods in order to increase the probability of hepatitis B e antigen (HBeAg) seroconversion in HBeAg-positive patients and/or to maintain remission in both HBeAg-positive and HBeAg-negative CHB. Liver transplants may be beneficial to infected patients, but the virus remains in the body after transplantation surgery and may eventually attack the new liver (Papatheodoridis, 2006). There is effective vaccine that can prevent hepatitis B.

This study determined the infection rate of HBV serological markers in a population in North East Nigeria on the basis of age, sex and socio-economic activities. This would partly help to re-focus attention to other killer-diseases apart from the HIV/AIDS scourge. Based purely on economic point of view; hepatitis B is more significant than HIV/AID. Infact, the Hepatitis B virus is said to be about 100 times more infectious than HIV, the virus that causes AIDS (HBF, 2005).

MATERIALS AND METHODS

Study Location: The study location is the Mubi General Hospital, Mubi, in Mubi North LGA of Adamawa State. Mubi is an ancient urban settlement in the defunct North Eastern region and a notable border community, being bounded by Boukoula District of the Republic of Cameroun. The Mubi General Hospital is the largest health facility in the area and heavily patronized by residents of 6 adjourning LGAs - Mubi North and South, Gombi, Hong, Maiha and Askira-uba in neighboring Borno state. Also, Boukoula District of Cameroun Republic. The Hospital therefore serves a population of more than 250,000 people including serving as a referral for the state university, a Federal Polytechnic, a state College of Agriculture, School of Health Technology and several primary and post-primary schools all located in Mubi metropolis. Also serviced are the Police Mobile Training school Limankara, Prison and Custom formations and traders from within and outside Nigeria who patronized the thriving Mubi cattle market.

Sampling Frame: A total of 992 subjects who were either patients or blood donors at the Mubi General Hospital were enlisted for this survey and composed as shown (Fig. 1).

Serological Markers: The Hepatitis B virus (HBV) Markers studied were:

i HBsAg (Hepatitis B surface antigen) using the Austria II-125 radio-immunoassay method.
ii Anti-HBs (Anti-hepatitis B surface antibody) using the AUSAB® radio-immunoassay method.
iii Anti HBc (Anti-hepatitis B core antibody) using the CORAB radio-immunoassay method.

7 mls of blood was obtained from each subject using sterile, disposable syringes and needles. For pending tests, sera were extracted and stored, frozen at -20^{o} c. A close-ended questionnaire was used to obtain information on the age, sex and occupation of subjects.

Statistical Analysis: The chi-square (χ^2) test with Yates correction for small numbers (Swincow, 1983) was used to analyze the data.

RESULTS

The overall incidence of HBV markers among the subjects surveyed was 9.2 % for HBsAg, 19.0 % for anti-HBs and 12.3 % for anti-HBc. The overall HBV exposure was 40.3 %.

The distribution of HBV markers by age of the subjects is shown on Table 1. Infants less than 1 year old had the highest HBV exposure rate of 43.9 %. That is, at birth and within the first 12 months of life, this percentage of the infant population was positive for at least one HBV marker. The rate declined at the 1-10 years age group and increased steadily thereafter with age until the $\geq$51 years age bracket.

The incidence of the HBV markers by sex of subjects showed that infection rates were higher in males (43.4 %) than in females (35.4 %). In males, the infection rate was highest amongst 41-50 years age group (46.5 %) and least in the 1 – 10 years (38.3 %) age group (Table 2). In females, the highest and least rates were in infants <1year old (42.9 %) and 1 – 10 years (30.0 %) age group respectively (Table 3). Values in the other age groups were intermediate.

The infection rate for anti-HBs was significantly higher ($P < 0.05$) in males (20.1 %) than in females (17.2 %). The highest rate of infection with HBs was recorded among the $\geq$ 50 years age group (22.5 %) and the lowest rate among subjects of the < 1 year (14.6 %) age bracket. The rate of HBs infection rose progressively with age. The infection rate for anti-HBc was significantly higher in males ($P < 0.001$) than in females. The anti-HBc infection rate was highest among the infants <1 year of age (19.5 %) and the least rate (9.3 %) was in the 21 - 30 years age bracket. Infection did not correlate with increase in age grouping.

Table 1: Hepatitis B Virus Markers by Age Grouping in a Population of Northern Nigeria

Age Group	No Examined	HBsAg No. +ve (%)	Anti-HBs No. +ve (%)	Anti-HBc No. +ve (%)	Total HBV Exposure No. +ve (%)
<1	41	3(7.3)	6(14.6)	9(22.0)	18(43.9)
1 – 10	180	14(7.7)	27(15.0)	23(12.8)	64(35.6)
11 – 20	160	15(9.4)	28(17.5)	22(13.6)	65(40.6)
21 – 30	289	32(11.1)	57(19.7)	27(9.3)	116(40.1)
31 – 41	156	13(8.3)	33(21.2)	20(12.8)	66(42.3)
41 – 50	126	10(7.9)	28(22.2)	16(12.7)	54(42.9)
≥ 51	40	3(7.5)	9(22.5)	5(12.5)	17(42.5)
Total	992	91(9.2)	188(19.0)	122(12.3)	400(40.3)

Table 2: Hepatitis B Virus Markers amongst Males in a Population of Northern Nigeria

Age Group	No Examined	HBsAg No. +ve (%)	Anti-HBs No. +ve (%)	Anti-HBc No. +ve (%)	Total HBV Exposure No. +ve (%)
<1	13	1(7.7)	2(15.4)	3(23.1)	6(46.2)
1 – 10	120	10(8.3)	19(15.8)	17(14.2)	46(38.3)
11 – 20	96	11(11.5)	18(18.8)	15(15.6)	44(45.8)
21 – 30	177	22(12.4)	36(20.3)	17(9.6)	75(42.4)
31 – 41	99	9(9.1)	22(22.2)	14(14.1)	45(45.5)
41 – 50	86	7(8.1)	21(24.4)	12(14.0)	40(46.5)
≥ 51	22	2(9.1)	5(22.7)	3(13.6)	10(45.5)
Total	613	62(10.1)	123(20.1)	81(13.2)	266(43.4)

Table 3: Hepatitis B Virus Markers amongst Females in a Population of Northern Nigeria

Age Group	No Examined	HBsAg No. +ve (%)	Anti-HBs No. +ve (%)	Anti-HBc No. +ve (%)	Total HBV Exposure No. +ve (%)
<1	28	2(7.1)	4(14.3)	6(21.4)	12(42.9)
1 – 10	60	4(6.7)	8(13.3)	6(10.0)	18(30.0)
11 – 20	64	4(6.3)	10(15.6)	7(10.9)	21(32.8)
21 – 30	112	10(8.9)	21(18.8)	10(8.9)	41(36.6)
31 – 41	57	4(7.0)	11(19.3)	6(10.5)	21(36.8)
41 – 50	40	3(7.5)	7(17.5)	4(10.0)	14(35.0)
≥ 51	18	1(5.6)	4(22.2)	2(11.1)	7(38.9)
Total	379	28(7.4)	65(17.2)	41(10.8)	134(35.4)

The distribution of the HBV markers on the basis of socio-economic groupings (Fig. 2) showed that prisoners had the highest rate of infection (28.5 %), followed by traders/artisans (21.0 %) and students/pupils (18.0 %).

DISCUSSION

The overall infection rate observed in this study for HBsAg (9.2%) and some HBV markers (40.3%) meets he number needed to treat (NNT) criteria for the disease (Craxi *et al.*, 2005) With a HBsAg carrier rate of 9.2%, Mubi area in Adamawa state Nigeria is classifiable as hyper-endemic HBV focus using the standard of Ponad (2001).

The age distribution of antigenemia in this study indicates early transmission. Incidence of HBV markers is high in infants <1 year (43.9%) and children 1-10 years (35.6%) indicating possible vertical (maternal infant) transmission utero or parentally and very early in life (horizontal) leading to the acquisition of HbsAg chronic carrier status.

Further investigations may be required to demonstrate whether the infected children in this study were infected utero (carriers) or contaminated with maternal blood during delivery (transient HBV antigenemia). Their low HBsAg blood levels appear to support the later suggestion. It has been observed that the risk of infection is about five time mothers higher in children of HBsAg positive mothers than those of HBsAg negative mothers. Transmission of HBV from mother to neonate can be activated through contact with material blood and other infectious fluid during labour, colostrium, and breast milk (Bornino, 1992). There is substantial risk of perinatal infection if the mother has acute HBV in the second or third trimester of pregnancy or within two months after delivering. Most children infected during perinatal period become persistent carriers. It is estimated that 5-10% of adults, 30-50% of children and 90% of babies will not get rid of the virus, develop chronic infection and can pass the virus on to others and are at increased risk for liver problems later in life (HBF 2005).

The infection rates for anti-HBc were significantly higher in males than females. The high prevalence among males agrees with the report of WHO (1983) that certain sex-specific pattern or occupational activities may expose males more often to Hepatitis B virus or that some immunological deficiency or genetic predisposition may mean that a larger percentage of infected males than females develop a chronic infection. The WHO report emphasized that the underlying mechanism of the sex difference in response to Hepatitis B virus remain obscured.

The prevalence of infection is associated with differences in socio-cultural environment and practices (Fig 2). The prevalence of infection with hepatitis B virus varies from country to country and depends on a complex mix of behavioural, environmental, and host factors (WHO, 1983). Factors likely to affect the occurrence of HBV markers are age, level of literacy, immunization records, skin scarification, human bite, sexual behavior of sexually active adults and teenagers, sharing of contaminated ear-rings, toothbrushes, razor, syringe or tattoo needles, level of drug-use, residential pattern, congregation of susceptible with infective, level of hygiene (personal and urban), general low level of living, etc. Unfortunately, prison inmates constituted the bulk of commercial blood donors encountered during this study.

It is obvious from this and similar report in tropical Africa that unlike parts of western Europe and North America with sporadic HBV infection which occur mostly in adults, the disease is endemic and present very early in life in most areas and subjects as young as 1-10 years old already have infection rates similar to the adult population (Boxall *et al.,* 2006). Carrier rates in the tropics are generally higher among children and also among those of lower economic class (Ojo, 1997). The World Bank in the 1993 world development report stated that the addition of Hepatitis B vaccine to the Expanded Programme on Immunization (EPI) was among the cost effective health interventions in most developing countries (Cooksley, 1997). The objective of the World Health Organization (WHO) included the introduction of Hepatitis B immunization to EPI of all countries by 1997 and reduction in the incidence of new carriers among children by 80% by the year 2001 (Cooksley, 1997). The Centre for Disease Control (CDC) and the American Academy of Pediatrics recommend that all infants, children and adolescents up to 18 years of age and all adults at risk of infection should receive the HBV vaccine.

This study suggests vertical (maternal to infant) and horizontal transmission early in life in the spread of HBV markers in Mubi area.

Recommendations: The study recommends immunization (mass vaccination of young children against HBV), good personal hygiene and urban sanitation, health communication (education) and formal education generally as potent tools in the fight against HBV markers in this area.

Women, who acquire Hepatitis B before or while pregnant, can transmit the disease to their children. Diagnosis for HBV markers should be incorporated into the ante-natal schedule. Perinatal transmission can be prevented with the identification of HBsAg positive women and administration of immunoprophylaxis to their newborns. A national prevention programme for HBV with universal screening of pregnant women and vaccination of infants has been found effective in some countries such as Greece (Vassiliki *et al.,* 2006).

Testing for HBsAg by the sensitive methods should be required for all blood donors. People who are known to have the infection or to be at high risk e.g. prostitutes, prisoners, etc should be discouraged from donating blood. Blood transfusion should be undertaken only when absolutely necessary for life threatening conditions.

Persons identified in the course of sero-epidemiologic investigations as transient or persistent carriers of HBsAg such as those diagnosed positive in the present study should be treated and educated regarding the mechanism of HBV spread so that the rate of transmission might be minimized.

REFERENCES

BLUMBERG, B. S. (2002). *Hepatitis B: The Hunt for a Killer Virus.* Princeton University Press, London. 264 pp

BORNINO, F. (1992). Epidemiology of chronic Hepatitis B: The role of Interferon. In chronic Viral Hepatitis 5 - 11.

BOXALL, E. H., SIRA, J., BALLARD, A. L., DAVIES, P. and KELLY, D. A. (2006). Long-term follow-up of hepatitis B carrier children treated with interferon and prednisolone. *Journal of Medical Virolology. 78(7):* 888 – 895.

COOKSLEY, G. (1997). Hepatitis B status in EPI. 9th Satellite Symposium of the Asian Congress of Paediatrics, Hong Kong. 4th March, 1997.

CRAXI, A., ANTONUCCI, G. and CAMMA, C. (2005). Treatment Options in HBV. *Journal of Hepatology, 44(1 Suppl):* S77 -S83.

HBF (2005). *Hepatitis B Foundation: Cause for a Cure.* Available at >http://www.hebp.org\pdf< Accessed March 13, 2006

OJO, O. (1997). Viral Hepatitis: The Nigerian Picture. *The National Task-Force on Viral Hepatitis. Symposium on Liver Cancer and Hepatitis Viruses,* Abuja. 9th April 1997.

PAPATHEODORIDIS, G. V (2006). Hepatitis B Therapy - Clinical Highlights from DDW. A presentation for the 2006 Digestive Disease Week. Los Angles, California. >http//:www.medscape.com/view article<. Accessed June 8, 2006.

POYNAD, T. (2001). *Hepatitis B and C Management and Treatment.* Booksence Company. 148 pp.

SWINSCOW, T. D. V. (1983). The Chi-Square Tests. Pages 43 – 53. *In:* "Statistics at Square One". British Medical Association, London.

VASSILIKI, P., HADJICHRISTODOULOU, C., DIMITRIOS C. and THEODORIDOU, M. (2006). Adherence to the screening program for HBV infection in pregnant women delivering in Greece. *BMC Infectious Diseases 2006, 6:* 84.

WHO (1983). World Health Organization. Prevention of Liver Cancer. Report of WHO Meeting. WHO Technical Report Series No 691.