SEROPREVALENCE OF HEPATITIS B SURFACE ANTIGENAEMIA AND ITS RELATIONSHIP TO CD4+ CELL COUNT AMONG HIV-INFECTED PATIENTS IN MAIDUGURI, NORTH EASTERN NIGERIA.

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ABSTRACT

Background: Both HIV and HBV infections are endemic in Nigeria and patients with dual HIV/HBV- coinfections are increasingly being recognized because of shared modes of transmission as well as synergy in pathogenesis. Reports have indicated that HBV will contribute significantly to morbidity and mortality among HIV-infected population over the coming years because of increasing access to highly active antiretroviral therapy (HAART).

Objective: To determine the prevalence of hepatitis B virus surface antigenaemia among HIV-infected patients and its relationship to CD4+ cell count.

Method: A cross-sectional observational study in which 100 newly diagnosed HIV-infected adults comprising 59 (59%) females and 41 (41%) males were selected for the study by systematic random sampling.

Results: The age range of the study population was 15-65 years. The mean ages for male and female subjects were 39.37 ± 10.52 and 31.32 ± 7.52 years, respectively. The prevalence of HBsAg among the study subjects was 21%. The mean CD4+ cell count of HBsAg positive subjects was significantly lower than that of HBsAg negative ones i.e. 105.43 cells/µl vs. 161.35 cells/µl ($p = 0.038$).

Conclusion: The HIV-HBV coinfection prevalence of 21% is fairly high and the significantly low mean CD4+ cell count among these subjects suggest that this group of patients are more immunocompromised and may perhaps have increased risk of liver-related morbidity and mortality than their HIV-monoinfected counterparts. Screening for serological markers of chronic HBV infection in all newly diagnosed HIV-positive patients is therefore recommended before commencement of HAART as it also guides the choice of ART regimen, as well as intensification of HBV immunization programmes in all newborns and persons at risk of contracting HBV infection.

Keywords: HBV surface antigenaemia, HIV, CD4+ cell count

INTRODUCTION

Hepatitis B virus (HBV) is a 42nm icosahedral-shaped, enveloped, double-stranded DNA virus that belongs to the family Hepadnaviridae.[1] It is a parenterally transmitted virus and it is acquired from exposure to infected blood or body secretions.[1] In developed countries especially in Europe and the United States, sexual contact and injection drug use are the most common routes of transmission, thus the majority of new cases of hepatitis B occur in adolescents and adults.[2] Perinatal and early childhood infections are much less frequent in developed countries, but in many underdeveloped countries e.g.

in sub-Saharan Africa and Asia, where HBV is endemic, perinatal and early childhood infections are common.[2,3]

A growing body of evidence indicates that human immunodeficiency virus (HIV)-positive individuals are more likely to be infected with hepatitis B virus (HBV) than HIV-negative individuals, possibly, as a result of shared risk factors.[4,5] There is also evidence that HIV-positive individuals who are subsequently infected with HBV are more likely to become HBV chronic carriers, have a high HBV replication rate, and remain hepatitis B "e" antigen positive for a much longer period.[5] In addition, it is evident that immunosuppression brought about by HIV infection may cause reactivation or reinfection in those previously exposed to HBV.[6] Furthermore, HIV infection exacerbates liver disease in HBV co-infected individuals, and there is even a greater risk of liver disease when HIV and HBV co-infected patients are treated with highly active anti-retroviral therapy (HAART), possibly due to immune reconstitution.[6] Complicating matters further, there have been several reports linking HIV infection to 'sero-silent' HBV infections, which presents serious problems for diagnosis, prevention, and control.[6]

In sub-Saharan Africa, where both HIV and HBV are endemic, little is known about the burden of co-infection and the interaction between these two viruses.[2,5,6,7]

This study was therefore aimed at determining the seroprevalence of Hepatitis B surface antigenaemia and its relationship to CD4+ cell count among HIV-infected patients in Maiduguri, Nigeria.

MATERIALS AND METHOD

Study Area: The study was carried out at the University of Maiduguri Teaching Hospital (UMTH), Maiduguri, Borno State, Nigeria.

Study Design: Cross-sectional observational study.

Study Population: One hundred newly diagnosed HIV-positive patients 15 years of age and above who were referred to the infectious diseases unit of the UMTH formed the study group. They were selected by systematic random sampling. Newly diagnosed HIV-positive patients were those who were never diagnosed or treated for HIV infection in the past. HAART-experienced HIV-positive patients, patients on anti-TB therapy, patients on immunosuppressive drugs, diabetic patients, patients with non-HBV-related chronic liver diseases, patients with advanced malignancies as well as non-consenting patients were excluded from the study because these factors may confound the final outcome of the study.

Method of testing: Hepatitis B surface antigen (HBsAg) test was carried out using ELISA (ELISA, CALTECH, C.A, USA). Human immunodeficiency virus (HIV) screening test was done by the ELISA test method (ELISA, Sanofi Diagnostics Pasteur S.A, 92430 MARNES la COQUETTE-FRANCE); positive cases were subsequently confirmed by the western blot method (Immunoblott, QualiCode™, Immunetics, Inc, 27 Drydock Avenue, 6th floor, Boston, MA, 02210-2377, USA). The CD4+ cell counting was done automatically using flow cytometry test method.

RESULTS

One hundred newly diagnosed HIV positive subjects were recruited into the study. Of these, 59 (59%) were females and 41 (41%) males. Their ages ranged between 15 and 65 years. The mean ages for male and female subjects were 39.37 ± 10.52 years and 31.32 ± 7.52 years, respectively, ($p = 0.000$). Majority of the subjects in the study population were between the age groups 20-24 and 45-49 years as shown in table 1. In addition, female subjects constituted the significant majority amongst subjects in the age group 20-24 years i.e. 0 males (0%) vs. 8 females (13.56%), ($p = 0.014$), while

male subjects were in the majority amongst subjects in the age group 55-59 years i.e. 6 males (14.63%) vs. 1 female (1.70%), (p = 0.013). Twenty one subjects in the study tested positive for HBsAg giving a prevalence of 21%.

Table 2 compares the distribution of CD4+ cell count between HBsAg positive and negative subjects. The mean CD4+ cell count of HBsAg positive subjects was significantly lower than that of negative ones (105.43cells/µl vs. 161.35cells/µl, p= 0.38). Additionally, significant majority (i.e. 100.00%) of the study population whose CD4+ cell counts were less than 100 cells/µl were HBsAg positive, (p = 0.007).

DISCUSSION

The scourge of the HIV/AIDS pandemic is most pronounced in sub-Saharan Africa where it has been estimated that about 9% of its adult population are living with the virus.[10] Nigeria, being the most populous country on the African continent will continue to remain vulnerable to the threats of global pandemics like HIV/AIDS and other chronic viral infections including HBV. [11] There is evidence that coinfection with HBV will contribute significantly to morbidity and mortality within the HIV-positive population over the coming years. This may be partly due to increase in accessibility to highly active antiretroviral therapy (HAART) in developing countries.[6] Coinfection with HIV and HBV complicates the clinical course and management of HIV infection.[6] It may also adversely affect therapy for HIV infection.

The higher mean age of males compared with females indicates that there were older men than women in the study population with the majority of subjects lying between the age groups 20-49 years. Individuals in this age group are the most productive and sexually active; which may further suggest that the commonest route of transmission for both HIV and HBV infections in the study population could be the sexual route. In addition, female subjects constituted a significant proportion amongst subjects in the age group 20 to 24 years. This could suggest the possibility of early sexual exposure of the girl child through early marriage with its consequent effects on education as it is commonly the practice in most parts of Northern Nigeria. On the contrary, male subjects constituted a sizeable majority amongst individuals in the age group 55-59 years. This could explain the high rate of sexual promiscuity or trans-generational sexual activity amongst the study population. This finding is quite similar to those reported in studies elsewhere.[12,13,14,15,16,17,18,19,20,21,22,23,24,25,26] Furthermore, both gender groups were fairly represented in the study population i.e. males (41%) and females (59%), which may further indicate the possibility of heterosexual route of transmission for both viruses.

Laboratory analyses of blood samples for HBsAg revealed an HBsAg prevalence rate of 21% amongst the study subjects. This finding favourably compares with those reported by Sirisena et al[27] in Jos (28%), Forbi et al[28] in Keffi (20.6%) and Mustapha et al[29] in Gombe (26.5%). However, it was higher than those reported by Sulkwosky et al[30] in the USA (10%), Rai et al[17] in Jaipur region of India (12.2%), Saravanan et al[12] in Southern India (9%), Simpore et al[31] in Burkina Faso (11.6%), Egah et al[25] at Zawan community in Jos (3.4%), Ejele et al[24] in the Niger Delta region of Nigeria (9.7%) as well as Lesi et al[32] in Lagos (9.2%). On the other hand, the finding is substantially lower than those reported by Otedo et al[18] in Kisumu district of Kenya (53%), Nwokede et al[26] in Kano (70.5%) and Baba et al[33] in Maiduguri (41%).

The variability in prevalence rates in the studies quoted above could perhaps be due to the use of test kits with different sensitivity patterns as well as disparity in the socio-demographic and cultural characteristics of the study populations. Variation in the predisposition to risk factors for the

transmission of both HIV and HBV infections amongst the study populations could also play a role.

In terms of CD4+ cell count it was observed that the mean CD4+ cell count of HIV-HBV-coinfected subjects was significantly lower than those of HIV-monoinfected ones i.e. 105.45 cells/µl compared to 161.35 cell/µl (p = 0.038). Moreover, all HIV-HBV-coinfected subjects had CD4+ cell counts less than 200 cells/µl. These findings compare favourably with those reported by Zhou et al[34] in Taiwan, Rai et al[17] in India, Otedo et al[18] in Kenya, Forbi et al[28] in Keffi, and Uneke and co-workers[21] in Jos, Nigeria. Although the influence of HBV on the natural history of HIV infection is controversial, studies elsewhere have shown that there is an imbalance in peripheral T-lymphocyte subsets and turbulence in cellular immunity in patients with chronic HBV infections.[35] This may suggest that HIV-HBV-coinfected subjects are more likely to be immunocompromised than their HIV-mono infected counterparts.[35]

CONCLUSION

It can be seen from the study that the prevalence of HIV-HBV coinfection in the study population is 21%, which is fairly high and unacceptable considering the resultant increase in morbidity and mortality among this potentially vulnerable sub-population of HIV-infected persons. Furthermore, the finding of a statistically significant difference in the mean CD4+ cell count, between these two sub-populations (i.e. HIV-HBV-coinfected and HIV-monoinfected subjects) further lend credence to the fact that HIV-HBV-coinfected persons may be more immunocompromised and therefore more prone to liver-related complications than their HIV-monoinfected counterparts, and this calls for an intervention. From the foregoing, it is pertinent therefore to consider screening all HIV-infected persons for markers of chronic HBV infection, as clinical assessment alone may be unhelpful in identifying potentially co-infected persons. Moreover, preventive and control measures for HIV and HBV infections should be directed towards community enlightenment/campaign against potentially risky behavior.

Table 1: **Age And Sex Distribution of Patients**

AGE-GROUP	SEX	
	Male N (%)	Female N (%)
15-19	0(0)	1(1.70)
20-24	0(0)	8(13.56)
25-29	7(17.07)	15(25.42)
30-34	7(17.07)	16(27.12)
35-39	11(26.83)	11(18.64)
40-44	4(9.76)	3(5.08)
45-49	4(9.76)	4(6.78)
50-54	1(2.44)	0(0)
55-59	6(14.63)	1(1.70)
≥60	1(2.44)	0(0)

Table 2: **Distribution of Cd4+ Cell Count And HBsAg Status of the study Population.**

Cd4+ CELL COUNT (cells/µl)	HBsAg STATUS	
	Positive N (%)	Negative N (%)
0-199	21(100.00)	57(72.16)
200-499	0(0.00)	20(25.31)
≥500	0(0)	2(2.53)
Total N (%)	**21(100)**	**79(100)**

Table3: **compares the mean CD4+ cells of HBsAg positive and HBsAg negative patients.**

HBsAg status	Mean CD4+ cell count (cells/µl)
Positive	105.43
Negative	161.35
p value	0.038*

Legend * = statistically significant

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