ORIGINAL ARTICLE

PREVALENCE OF HEPATITIS B AND C INFECTIONS IN CHILDREN INFECTED WITH HUMAN IMMUNODEFICIENCY VIRUS IN ABAKALIKI, EBONYI STATE, SOUTHEAST, NIGERIA

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Abstract

Objective: Human immunodeficiency virus (HIV) infected children with chronic viral hepatitis infection may have increased morbidity and mortality when compared to HIV negative children. This study was aimed at determining the prevalence of hepatitis B virus (HBV) and C virus (HCV) infections among HIV infected children in Federal Teaching Hospital Abakaliki. Methods: It was a cross sectional study that involved consecutive recruitment of 88 confirmed HIV infected children aged 2-17 years, attending the antiretroviral therapy (ART) clinic. Testings of hepatitis B surface antigen and anti-HCV antibodies were done using the ACON hepatitis B and C rapid test strips (Acon laboratories Inc San Diego. CA). Results: A total of 88 subjects were recruited during the study period, prevalence of hepatitis was 4.5% (4/88). HIV/HBV co-infected was noted in 3.4% (3/88) of the subjects while HIV/HCV in 1.1% (1/88). Hepatitis B and C infections were highest among children more than 12 years of age and children from lower socio-economic class. There were however no significant relationships between hepatitis B and C infections and socio-demographic variables. There was also no significant relationship between prevalence of hepatitis B and C infections and immunologic stages of subjects. Although there was no case of hepatitis observed among HIV infected children on TDF/FTC/EFV drug combination, antiretroviral regimen had no significant relationship with prevalence of hepatitis B and C infections. Conclusion: The prevalence rates of HIV/HBV and HIV/HCV co-infections observed in this study are low when compared to previously reported prevalence rates. Sustained efforts at strengthening HBV immunization program and other preventive measures are recommended.

Keywords: ART, HBV, HCV, HIV/AIDS, Immunization, Immunodeficiency

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Background

Infection by human immunodeficiency virus (HIV) is a global phenomenon [1]. Sub-Saharan Africa is endemic for HIV and HBV infections while prevalence of HCV infection is not well documented in this region [2]. Nigeria has the largest burden of HIV in Africa, accounting for 14.0% of the total Africa’s burden [3-4]. Studies in Nigeria revealed prevalence rates of hepatitis B surface antigen ranging from 0.5 to 44.7% [5-7]. Importantly, these three viruses (HIV, Hepatitis B and C viruses) are transmitted vertically from mother to child and also transmitted via blood and blood products [8, 9]. Major risk factors include blood transfusion, scarification marks, circumcision, indiscriminate use of sharps, surgeries [8].

Nwolisa et al. [10] reported a prevalence rate of 5.8% of HBV infection among HIV infected children in a hospital based study. In a similar study Sadoh et al. [8] reported a prevalence of HBV infection of 7.7% among 155 HIV infected children. Nworie et al. [11] in a study among HIV negative children in a rural community of Ebonyi state, reported a prevalence rate of HBV infection as 6.5%. The high prevalence rate of HBV infection in these children was attributed to poor access to immunization. Peri-natal transmission of HCV infection occurs in approximately 3-5% of infants born to women infected with HCV. HIV infection has been associated with persistent HCV viraemia. Sadoh et al. [8] noted a prevalence rate of 5.5% of HIV/HCV co-infection.

Both HBV and HCV acute infections can progress to chronic infections [12-13]. Compared with patients who are infected with HIV alone, co-infected adults are more likely to develop chronic hepatitis, to have more severe liver disease, to experience HIV treatment failure, to have higher viral loads (for both viruses), and to develop antiretroviral-associated hepatotoxicity [14]. HBV infections acquired in the perinatal period and early childhood is more likely to lead to chronic infections [12]. Similarly chronic infections are likely to result in about 60-80% of children with acute infections from HCV [13].

Study by Nworie et al. [11] was carried out among HIV negative children in Ebonyi state. There is no data on the prevalence of hepatitis B and C infections among HIV infected children in Ebonyi state. Hence there is need for this study.

Aims and Objectives

The study was aimed determining the prevalence of Hepatitis B and C infections among children confirmed to have HIV in Abakaliki, Ebonyi state. The study also aimed to determine the relationship between hepatitis (B and C) infections and immunodeficiency stage of HIV infection.

Methodology

Study area

Ebonyi State has a total population of 2,173,501 people, majority of which are Igbos [15]. The study is a cross sectional hospital based study carried out in Federal Teaching Hospital Abakaliki (FETHA), the Ebonyi State capital, from August 2015 to March 2016. The Federal Teaching Hospital Abakaliki (FETHA) operates provider-initiated HIV testing and counseling (PITC), in which every child that presents at the Children Out-patient Clinic is offered HIV antibody test irrespective of presenting complaint, except on objection by the
caregiver, however objection (opt-out) of the
caregiver to the screening test does not
affect quality of treatment given to the child.
Any child who tested positive to the test is
referred to the Paediatrics Infection Disease
Clinic for further evaluation and
management.

**Determination of sample size**

Sample size was calculated using the
prevalence rate of hepatitis infection
reported by Sadoh et al. [8] (12.8%). A
minimum sample size of 88 was obtained.

**Ethical considerations**

The study was conducted as part of the study
on haematological screening of HIV
infected children in FETHA. Ethical
approval was sought and obtained before the
commencement of study. The study was
explained to parents/guardian and only those
who gave informed consent were included in
the study.

**Subject selection**

The subjects that have been regular to
Paediatric Infection Disease clinic in FETHA in the past one year prior to the study and newly diagnosed HIV infected children that were referred from the Children Outpatient Clinic within the study period were recruited consecutively until sample size was met. A structured questionnaire was used to obtain information on socio-demographic characteristics, history of blood transfusion, other risk factors and use of ART.

Blood samples that were collected for haematologic profile of subjects were screened for hepatitis B and C viruses. Testing of HBsAg and Anti-HCV ab were done using the ACON hepatitis B and C surface rapid test strip (Acon laboratories Inc San Diego. CA). These rapid tests have
sensitivity of 88.8% and specificity of
100.0% [16].

**Data analysis**

The data obtained was entered into spread
sheet using the Microsoft excel 2007 and the
analysis was done using the Statistical
Package for Social Science version 19.0.
Descriptive results were expressed as
frequencies and percentages. The
significance of associations between
categorical variables was tested using
Pearson’s chi-square and Fischer’s exact
tests for comparison of proportions. The
level of statistical significance was achieved
if p < 0.05

**Results**

A total of 88 subjects were recruited during the study period. Majority were females 46
(52.3%). Male to female ratio was 0.91:1.
The age range of participants was 2-17
years. Majority of the children were 6-12
years (62.5%) and were of lower socio-
economic class (69.3%). Although
prevalence rates of hepatitis B and C were
commonest among subject greater than 12
years of age and lower socio-economic class, there were no significant relationships
between these variables and prevalence rate
of hepatitis as shown in Table 1. HCV
infection was observed in a male adolescent
that was of lower socio-economic class.
Risk factors to acquisition of hepatitis did
not influence prevalence rate of hepatitis in
this study as shown in Table 1.

Among the study participant, 3 out of the 88
subjects (3.4%) were positive for Hepatitis B infection and only one out of the 88
subjects (1.1%) had hepatitis C infection
giving an overall prevalence rate of hepatitis infection to be 4.5% (4/88).
Table 1. Distribution of HBV and HCV infections according to Socio-demographic characteristics of subject

<table>
<thead>
<tr>
<th>Socio-demographic</th>
<th>Number examined (%)</th>
<th>Number Positive for HBV (%)</th>
<th>Number Positive for HCV (%)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤5</td>
<td>13 (14.8)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>6-12</td>
<td>55 (62.5)</td>
<td>1 (1.1)</td>
<td>0 (0.0)</td>
<td>0.346</td>
</tr>
<tr>
<td>&gt;12</td>
<td>20 (22.7)</td>
<td>2 (2.3)</td>
<td>1 (1.1)</td>
<td></td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>42 (47.7)</td>
<td>1 (1.1)</td>
<td>1 (1.1)</td>
<td>1.893</td>
</tr>
<tr>
<td>Female</td>
<td>46 (52.3)</td>
<td>2 (2.3)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td><strong>Socio-economic class</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper</td>
<td>8 (9.1)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>Middle</td>
<td>19 (21.6)</td>
<td>1 (1.1)</td>
<td>0 (0.0)</td>
<td>0.762</td>
</tr>
<tr>
<td>Lower</td>
<td>61 (69.3)</td>
<td>2 (2.3)</td>
<td>1 (1.1)</td>
<td></td>
</tr>
<tr>
<td><strong>Risk factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>12 (13.6)</td>
<td>1 (1.1)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>Unsafe injections</td>
<td>28 (31.8)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>Surgeries</td>
<td>5 (5.7)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0.602</td>
</tr>
<tr>
<td>Scarification marks</td>
<td>7 (7.9)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>Not applicable</td>
<td>36 (40.9)</td>
<td>2 (2.3)</td>
<td>1 (1.1)</td>
<td></td>
</tr>
</tbody>
</table>

The only patient with HIV/HCV co-infection was in severe immunodeficiency stage of disease as shown in Table 2. Majority of the subjects, were in ‘not significant immunodeficiency stage’ of HIV infection and this stage recorded no case of hepatitis of either hepatitis B or C. Although majority of subjects with hepatitis B infection were in advanced stage of disease, there was no significant relationship between immunodeficiency stage and prevalence rate of hepatitis (B and C) infections. This is also shown in Table 2 below.

Table 2. Relationship between Immunodeficiency and hepatitis B & C infections

<table>
<thead>
<tr>
<th>Immunodeficiency Stages</th>
<th>Positive for Hepatitis</th>
<th>Negative (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HBsAg (%)</td>
<td>Anti-HCV ab (%)</td>
</tr>
<tr>
<td>Not Significant</td>
<td>0 (0.0)</td>
<td>43 (48.9)</td>
</tr>
<tr>
<td>Mild</td>
<td>1 (1.1)</td>
<td>19 (21.6)</td>
</tr>
<tr>
<td>Advanced</td>
<td>2 (2.3)</td>
<td>9 (10.2)</td>
</tr>
<tr>
<td>Severe</td>
<td>0 (0.0)</td>
<td>13 (14.3)</td>
</tr>
<tr>
<td>Total</td>
<td>3 (3.4)</td>
<td>84 (95.5)</td>
</tr>
</tbody>
</table>

χ²=95.306,  p=0.053

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Table 2 shows that two out of the 15 subjects that were not on ARV (ART naïve) had hepatitis B and C infections. Majority of subjects on antiretroviral (ARV), were on first line medications. Table 3 shows that fifty (56.8%) of the children that were on AZT/3TC/NVP combination were negative for hepatitis infection while all the 12 children who were on TDF/FTC/EFV were negative for hepatitis B and C infections. Out of the 10 children on second line of drug, only one (1.1%) had hepatitis B and none with hepatitis C, as shown in Table 3. There was no significant relationship between ARV use and prevalence of hepatitis B and C infections as shown in Table 3 below.

Table 3. Use of ARV/Type of ARV versus positive HBsAg & Anti-HCV ab

<table>
<thead>
<tr>
<th>ARV Use</th>
<th>Type of ARV</th>
<th>HBsAg (%)</th>
<th>Anti-HCV ab (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>AZT/3TC/NVP</td>
<td>1 (1.1)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td></td>
<td>TDF/FTC/EFV</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td></td>
<td>ABC/3TC/LPV/r</td>
<td>1 (1.1)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>1 (1.1)</td>
<td>1 (1.1)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>3 (3.4)</td>
<td>1 (1.1)</td>
</tr>
<tr>
<td></td>
<td>χ²=0.362</td>
<td>p=0.834</td>
<td></td>
</tr>
</tbody>
</table>

*AZT= Zidovudine, 3TC= Lamivudine, NVP= Nevirapine, TDF= Tenofovir, FTC=Emtricitabine, EFV=Efavirenz, ABC=Abacavir, LPV/r=Lopinavir/ritonavir

**Discussion**

HIV infection is predominant in women of reproductive age and people of lower socio-economic class [17]. This group of people may also have high prevalence of hepatitis considering their common mode of transmission. High prevalence rates of hepatitis B and C in women of reproductive age translates to high maternal to child transmission of the virus. Although hepatitis was highest among subjects in lower socio-economic class in index study, there was no significant relationship between hepatitis infections and socio-economic class. The high prevalence rate of hepatitis in children from lower socio-economic class may be a reflection of the total number of HIV infected subjects that are from lower socio-economic class (69.3%). This corroborates finding by Nworie et al. [11] and Sadoh et al. [8] who observed hepatitis most in subjects in lower socio-economic class and no formal education in caregiver.

The prevalence rate of hepatitis B infection in the index study is consistent with HBV prevalence rate of 2.6% reported by Toussi et al. [18] but lower when compared with that reported by Sadoh et al. [8] Nwolisa et al. [10] and Nworie et al. [11] whose prevalence rates of HBV infection were reported as 7.7%, 5.8% and 6.5% respectively. This lower prevalence rate experienced in this study may be explained by the increased awareness and accessibility of caregivers to immunization program and preventive measures. The prevalence rate of HCV infection observed in this study was consistent with the prevalence rate of 1.5% reported by Schuval et al. [19] but lower when compared to that prevalence rate of
5.5% reported by Sadoh et al. [8] This may be a reflection on the mode of transmission of the hepatitis C virus. Telatela et al. [14] observed that in settings where antenatal screenings for HCV among pregnant women showed high prevalence rate, children born to such mothers would also be positive for the infection and vice versa. Zhou et al. [9] reported a high prevalence rate of 9.6% of HCV infection among HIV infected children in China and attributed the high rate to unsafe blood transfusion. This is contrary to index study where the only case of HCV infection observed, did not have history of blood transfusion, surgery, unsafe injections and scarification marks, suggesting that the virus may have been vertically transmitted from mother. Only one out of the 12 subjects with a history of blood transfusion had HBV infection. This underscores the effectiveness of the blood screening techniques in the health facilities. This is contrary to Zhou et al. [9] that reported a significant relationship between blood transfusion and hepatitis infection.

With introduction of highly active antiretroviral therapy, there is maximal suppression of HIV replication, reduction in viral load and increased cellular immune responses to opportunistic infections such hepatitis B and C infections [20]. This may be the reason for low prevalence rates of hepatitis B and C in index study, as majority of subjects were on HAART. Combination of tenofovir (TDF) with lamuvudine (3TC)/emtricitabine (FTC) is highly recommended as a highly effective first-line treatment for HBV infection [21]. The above combination with efavirenz (EFV) is recommended treatment for adolescent with HIV/HBV co-infection [21]. It is therefore not surprising that there was no record of hepatitis B viral infection among subjects on this medication in index study.

Hepatitis was observed to be highest in children with advanced HIV/AIDS (advanced and severe immunodeficiency stages) with no record of hepatitis among subjects in ‘not significant stage of the disease. This may underscore the fact that opportunistic infections such as hepatitis B and C occur commonly in advanced HIV/AIDS [3, 4].

In conclusion, the prevalence of hepatitis B and C infections observed in this study is low. Consistent and deliberate preventive measures towards further reduction in prevalence rate of hepatitis B and C infections are recommended.

Conflict of Interests

The authors declare that they have no conflict of interests. All authors contributed in different aspect of the article.

References


