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Seroprevalence of hepatitis C virus in HIV seropositive children in Lagos, Nigeria

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Human immunodeficiency virus (HIV) may influence hepatitis C virus (HCV) disease through immunosuppression. The aim of this study was to determine the sero-prevalence of HCV in HIV sero-positive children in Lagos, Nigeria. 132 blood samples of children aged 1-15 years were collected at the HIV clinics of Lagos University Teaching Hospital (LUTH) and Lagos State University Teaching Hospital (LASUTH). Confirmatory analysis of HIV sero-status was done using enzyme-linked immunosorbent assay (ELISA) kit. All the 132 children recruited were HIV sero-positive. Serological assay for HCV was done on the 132 HIV sero-positive serum samples using ELISA technique. Assay procedures were carried out at the Virology Unit, College of Medicine, University of Lagos. Out of the 132 HIV sero-positive samples, 6 were positive for HCV with a prevalence of 4.54% with sex related prevalence of four (6.58%) males and two (2.82%) females, respectively. Zero prevalence was recorded between age groups 1-3 years while a sero-prevalence of 20% was found among age groups 12-15 years. The result of this study implies that HIV positive children are likely to be co-infected with HCV, thus re-affirming the role of this virus in concomitant HIV associated infection in children which may further complicate their immunocompromised state.

Key words: Human immunodeficiency virus (HIV), hepatitis C virus (HCV), enzyme-linked immunosorbent assay (ELISA), Lagos.

INTRODUCTION

Hepatitis is an inflammatory condition of the liver, while viral hepatitis is a conventional term used to denote hepatitis caused by the hepatotrophic viruses (hepatitis A-G). Hepatitis C virus (HCV), one of the agent of the disease in question, is a member of the *flaviviridae* family which has a single stranded RNA

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genome with a size of about 9.4 kb.

According to a review of age-specific sero-prevalence studies carried out between 1990 and 2005, about 184 million people worldwide have anti-HCV antibodies. Also, the prevalence of HCV in the West African Sub-region was 2.8 million with Nigeria contributing to the number of data points in the region (Mohd Hanafiah et al., 2013). Although, HCV infection has been reported in the general Nigerian population, limited studies have reported HCV and HIV co-infection in children.

HCV infection is spontaneously cleared within 6 months. HCV clearance has been suggested to occur in individuals who have overt symptoms of hepatitis, who have non-African descent, and lack HIV infection (Thomas et al., 2000). In about 60 to 85% of persons, spontaneous resolution does not occur, chronic HCV infection is a heterogeneous condition, with individual manifestations and rates of progression (Hadziyannis and Vassilopoulos, 2001).

Patients infected with HIV may be co-infected with HCV because of the similar transmission routes of both etiologic agents. It is estimated that one-third of people living with HIV are co-infected with HCV worldwide (Bruno et al., 2002). The prevalence of HIV/HCV co-infection is high, with 13 times greater risk in HIV patients (Balogun et al., 2010). Evidence that HIV influences HCV disease progression through immunosuppression has been observed. The advent of effective prophylactic drugs highly active anti-retroviral therapy (HAART) has reduced HIV/AIDS related mortality but end-staged liver disease has become a leading cause of death in HIV infected individuals who do not clear HCV infection (Bica et al., 2001).

Nigeria is known to be highly endemic for viral hepatitis. HIV/AIDS among the general population has assumed a prevalence of 4.1% in 2010 (Bashorun et al., 2014). Although, HIV may be a chronic manageable disease for many individuals, but end stage liver disease is an increasing serious concern for people co-infected with HIV and hepatitis. The knowledge of this growing concern initiates the study to determine the burden of HCV in HIV sero-positive children in Lagos, Nigeria because of the associated risk of transmissible HCV infection which may accompany the transmission of HIV.

MATERIALS AND METHODS

This study was a retrospective case control study carried out in two tertiary health facilities in Lagos, Nigeria which are Lagos State University Teaching Hospital (LASUTH) and Lagos University Teaching Hospital (LUTH). Ethical approval was obtained from both institutional ethical review boards. The study was carried out in the HIV/AIDS clinics of the LASUTH and LUTH from December 2007 to July 2008. The HIV/AIDS clinic is one of the President's Emergency Plan Funds for AIDS Relief (PEPFAR) sites, where anti-retroviral regimen are provided free. The attendees at the clinic receive general and specialist care as required. One hundred and thirty two consecutive patients between the age group of one to fifteen years that visited these hospitals for HIV testing and consented to the study were enrolled for monitoring and treatment when positive by rapid immunochromatography kit. Informed consent was obtained from parents/guardians and from children older than 10 years with the assistance of the patients' physicians to avoid stigmatization of enrolled participants.

A sample of 132 was recruited, having calculated the sample size to be 118 using the formula:

$$n = \frac{Z^2pq}{d^2}$$

where n = sample size, z = standard deviation (1.96), p = prevalence, q = 1-p and d = degrees of freedom (0.05), and assuming a prevalence of 8.4% based on the most recent anti-hepatitis C virus antibodies prevalence done in Lagos (Ayolabi et al., 2006).

Structured questionnaire was used to obtain patient's bio-data (age, gender and ethnic group), Occupation, educational status of parents or guardian and questions on possible risk factors for HCV transmission were also obtained. About 3 ml of blood was drawn from the subjects for HIV and HCV assay by a pediatrician. The blood was quickly transferred to a plain sterile bottle and centrifuged within 2 h of collection to obtain serum for serological assays.

HIV sero-status of consecutive participants who were screened and found reactive with HIV antibodies at LASUTH and LUTH were confirmed by a third generation enzyme-linked immunosorbent assay (DIA. PRO. Diagnostic Bioprobes Srl., Italy) for antibodies to both HIV1 and 2 at the Central Research Laboratory, College of Medicine of the University of Lagos. All the 132 children confirmed HIV positive were screened for antibodies to hepatitis C virus by a third generation enzyme-linked immunosorbent assay (DIA. PRO. Diagnostic Bioprobes Srl., Italy) for antibodies to both HIV1 and 2 at the Central Research Laboratory, College of Medicine of the University of Lagos. All assay protocols, cut-offs and interpretation were done according to the manufacturer's instructions.

All data were entered into a Microsoft Excel spreadsheet. Analysis was done using statistical package for social sciences (SPSS) version 13. Prevalence was recorded in a table, simple percentages and bar chart. Mean, median and Chi square analysis was also calculated. A one sided $P<0.05$ was considered statistically significant for Chi-square (used to determine the differences between the groups).

RESULTS

A total of 132 children aged 1-13 years were enrolled in this study. The serum samples of the participants who reacted positive to the rapid test kits used in the hospitals were confirmed sero-positive for HIV. Six out of one hundred and thirty two children (4.54%) had detectable antibodies to HCV. Sex related prevalence showed that 4 out of 61 males and 2 out of females 71 had anti-HCV antibodies as shown in Table 1.

HCV antibodies were detected in children greater than 3 years old. There was an increased detection of antibodies to HCV among age groups 8-15 years in whom 5 participants had detectable anti-HCV antibodies. None of the patients within age groups 1-3 years had antibodies to HCV as shown in Figure 1. The median age group of those who were anti-HCV antibody positive was 8-11 years.

Table 1. Sex related sero-prevalence of HCV antibodies in HIV infected children (1-15years).

Sex	Number screened	Positive antibodies	Percentage infected (%)
Male	61	4	6.58
Female	71	2	2.82

$X^2 = 0.372$ P >0.05.

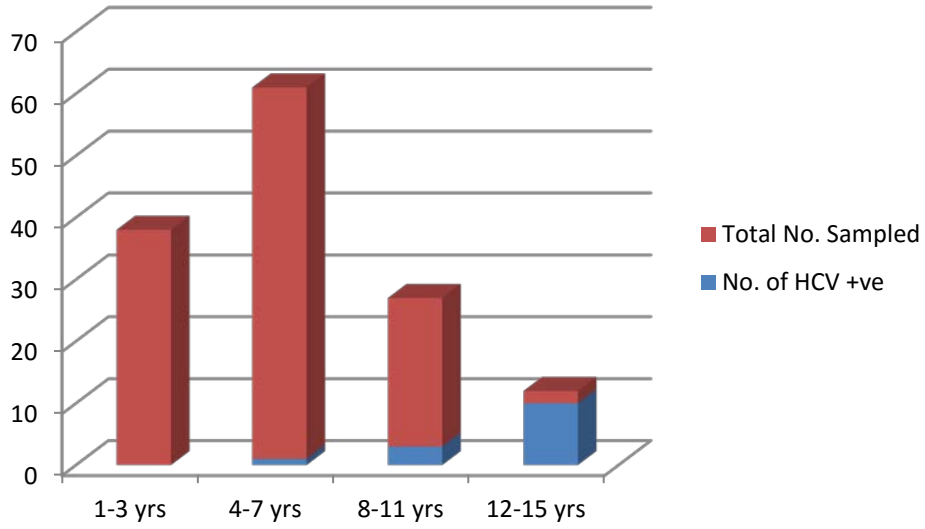

Figure 1. Age related sero-prevalence of HCV antibodies in HIV infected children (1-15 years).

Only blood transfusion was significantly associated with HCV infection in 3 patients (2 males and 1 female P<0.05); other risk factors for acquisition of the infections such as scarification, unsafe injections and surgery were found not to be related to HCV sero-status in this study.

Table 1 shows the females enrolled in this study were more than the males but antibodies were detected among the male participants than the females.

Comparison of anti-HCV antibodies in different age groups shows that only those from age 4-15 years had detectable antibodies while no antibody reaction was detected among age groups 1-3 years.

DISCUSSION

The HCV prevalence recorded in this study was in variance with a similar work conducted in Enugu, Nigeria which recorded a prevalence of 6.8% among adult population (Inyama et al., 2005) and higher than the prevalence of 1.6% recorded among children of age one to fifteen years in Karachi, Pakistan (Jafri et al., 2006). This work was similar to the work done by Sadoh et al. (2011) which reported that 5% of the children below 17 years tested positive for antibodies to hepatitis C virus in Benin City. HCV prevalence was estimated to be 2.1% in the general Nigerian population (Koroney and Sika, 2013). The improvements in health care practices (blood screening for HIV, HCV and other infections, use of disposable syringes) have reduced HCV sero-prevalence.

An increased detection of antibodies to HCV was documented among children in the age groups 8-15 years. This is in consonance with a similar study on HIV infected Tanzanian children (Telatela et al., 2007) which showed high frequency of positivity of HCV in children in the age group of 10–15 years as compared to children within the age groups below them, representing an increase in HCV positivity with increasing age.

Increased prevalence with age can be attributed to greater cumulative exposure to risk factors for HCV infection as a person gets older. The lower prevalence noted in children below 3 year age group found in this study is similar to the findings documented by Agbede et al. (2006) who recorded zero prevalence among pre-school age children in Ilorin. These may suggest a relatively low level of vertical transmission.

More males than females were positive for HCV in this study. The increased activity noticed in male children as they grow may be the reason for degree of transmission

experienced by this gender. Eze et al. (2014) in Enugu also observed this but adduced it to the preferential care of the male child which may have exposed them to more risks of acquiring HCV as they are given both orthodox and non-orthodox treatment when sick.

The significant risk factors for HCV positivity found among the studied cohort were blood transfusion. In a similar study at Jos (Inyama et al., 2005), blood transfusion was found as a significant risk factor. Other risk factors like scarification, circumcision and heterosexual activities have been documented as risk factors for HCV infection in different cohorts. These support the fact that the prevalence and risk factors for each region or age group depends on the predominant socio-cultural activity and life style found among them.

In conclusion, the increasing access to HAART means improved quality of life and increased life expectancy for HIV-infected children. Co-infection with HCV increases the chances of chronic liver disease which in turn reduces life expectancy most importantly when infection is acquired from childhood. More emphasis should be placed on screening of blood for transfusion for HCV, in addition to other blood transmissible diseases. Research should be conducted on larger cohort of patients of pediatric age, followed up over a period of time, to evaluate other possible risk factors and to study further the outcome of HCV/HIV co-infection.

Conflict of Interests

The authors have not declared any conflict of interests.

Abbreviations

HCV, Hepatitis C virus; **HIV,** human immunodeficiency virus; **LUTH,** Lagos University Teaching Hospital; **LASUTH,** Lagos State University Teaching Hospital; **ELISA,** enzyme linked immunosorbent assay; **HCC,** hepatocellular carcinoma; **HAART,** highly active anti-retroviral therapy.

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