

Prevalence of seropositive blood donors for hepatitis B, C and HIV viruses at Federal Medical Centre, Ido-Ekiti, Nigeria

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Abstract

Background: Hepatitis B and C (HBV and HCV) and Human Immunodeficiency Virus (HIV) infections constitute immense burden in developing countries including Nigeria with wide variability in the prevalence of co-infection and clinical syndromes in various regions.

Objectives: This study set out, to determine the prevalence rate of these infections and their various co-infections among the blood donors at the Federal Medical Centre, Ido-Ekiti and to determine the more vulnerable age-group in this region.

Methods: From July 2007 to July 2009, 662 donors were studied. Blood samples taken from the donors were screened for HIV and HCV antibodies by double ELISA technique, and for HbsAg by ELISA technique. Data entry and processing were done using EPI-INFO version 6 and SPSS version 15. Data were compared using 2-tailed chi-square test and Yates correction or Fisher exact test when applicable. Probability value less than 0.05 was considered significant.

Results: Overall, 7.9% of the donors were sero-positive for HbsAg, 7.3% for HCV antibody and 5% for HIV antibody. Co-infection rate of HIV/HCV was 1.1%, HIV/HBV was 1.2%, HBV/HCV was 2.1% and HIV/HBV/HCV was 0.6%. The age-group 20-30 years had the highest prevalence for HCV (17.9%), HBV/HCV co-infection (2.4%) and HIV/HBV/HCV infection (1.2%). Up to 57.6% of HIV infected blood donors have co-infection with either HBV or HCV or both.

Conclusion: This study detected a high prevalence rate of HBV, HCV and HIV infections among Ido-Ekiti blood donors. All co-infections were detected at lower rate compared to single infections. The age-group 20-30 years were the most

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vulnerable group to these infections. A high percentage of HIV sero-positive donors had other co-infections. Adequate screening of blood donors and widespread awareness programme on these infections especially among the youth, immunization against HBV are mandatory in curtailing these infections. Follow-up incidence study in this field is recommended.

Keywords: Prevalence, Blood donors, Hepatitis B virus, Human immune-deficiency virus

Introduction

Viral hepatitis caused by Hepatitis B and C viruses is of major public health concern worldwide while Human Immunodeficiency Virus infection/Acquired Immunodeficiency Syndrome (HIV/AIDS) pandemic poses a major threat to public health and development with immense socioeconomic burden worldwide.^{1,2} The two hepatitis viruses (B and C) and HIV share common routes of transmission usually parenterally through blood transfusion, injury with contaminated sharps or by sexual contacts.^{1,3} Viral hepatitis and HIV/AIDS are endemic in tropical Africa including Nigeria.⁴⁻⁶

Hepatitis B Virus (HBV) represents the most common aetiological agent of serious liver infection globally with an estimated two billion people being infected and over 350 million people having chronic infection.⁷ More than 70% of Nigerian population is reportedly likely to have been exposed to HBV at one time or the other in their life.⁸

Hepatitis C Virus (HCV) is reported to have infected more than 170 million people worldwide representing a viral pandemic seven times more widespread than infection with HIV (estimated 39.5 million people infected worldwide in 2006).⁹ It has a high chronic infection rate. The global prevalence rate of chronic HCV infection is estimated to be approaching 3% at the end of 2nd millennium with prevalence rate among blood donors ranging from 0.1% in the UK and

Scandinavia.¹⁰ to 28% in Egypt.¹¹ It is estimated that 20% of people with chronic HCV will develop cirrhosis over 20-50 years interval.¹²

The Joint United Nation Programme of AIDS (UNAIDS) have estimated that at the end of 2003, there were a total of 40 million people living with HIV with 5 million newly infected and cumulative death for the year 2003 was 3 million people.¹³ The greatest burden of this infection is in the sub-saharan Africa with almost 9% of its adult population living with the virus.¹⁴ The incidence of the disease has continued to rise at an alarming rate in Nigeria with adult population prevalence rate rising from 1.8% in 1991, 4.5% in 1996 to 5.8% in 2001 and 5.0% in 2003¹³, but with a decrease to 3.1% in 2007.¹⁵

The prevalence rate of these viral infections/co-infections (Hepatitis B, C and HIV) varies from region to region and various reports have shown that co-infection of the hepatitis viruses with HIV is of rapidly growing health concern. Co-infection of HCV with HIV has been documented to accelerate the progression of hepatitis to cirrhosis.¹⁶ while co-infection of HIV with HBV is associated with three-fold increase in the development of persistent hepatitis B surface antigenemia.¹⁷ However, only few studies in Nigeria have examined the co-infection rate of HBV and HCV with HIV among blood donors who serve as the major route of transmission of these viruses to patients.

This study aims at determining the prevalence of HBV, HCV, HIV, and different co-infections of these viruses among healthy blood donors at Federal Medical Centre, (FMC) Ido-Ekiti, Nigeria to establish a baseline data for policy makers, and to determine the more vulnerable age-groups to these infections as an aid to the ongoing preventive strategies to curtail infection with the viruses.

Materials and Methods

The study was conducted from July 2007 to July 2009 at the Federal Medical Centre, Ido-Ekiti, South-Western Nigeria. Six hundred and sixty-two consecutive male and female Nigerians of different age groups ranging from 16 to 55 years who presented at the blood bank of FMC, Ido-Ekiti to donate blood for their wards on hospital admission were recruited into the study. The study was carried out after obtaining approval from Ethics committee on medical research of the hospital while oral informed consent to participate in the study was taken from all participants before recruiting into the study.

Five to eight millilitres of blood were taken from each patient into a labelled tube, allowed to clot, and then centrifuged. After centrifuging, 2 mls of serum was stored at -20°C for further analysis to confirm any positive antibody test to HIV-1 and 2 and HCV. Detection of HBV infection was done by screening Hepatitis B surface antigen (HBsAg) by Enzyme-Linked Immunosorbent Assay (ELISA) (Clinotech Diagnostics Inc), antibody to HCV was detected by ELISA (Abbott murex version 4.0) and antibody to HIV-1 and 2 was detected by Unigold HIV test kit. All positive HCV and HIV-1 and 2 cases were confirmed with another ELISA test kit, Clinotech Diagnostic Inc for HCV and 'Determine' for HIV-1 and 2. Molecular method was not used

in confirmation of positive cases because of limited resources. All positive cases were referred to specialist internal physician as the case may be for adequate management.

The data entry and processing were done using computer software EPI-INFO version 6 and SPSS version 15. Prevalence rates of HBV, HCV and HIV-1 and 2 and various co-infections were determined among the male and female donors of varying age groups and data were compared using two-tailed chi-square test with Yates correction or Fisher exact test when applicable. Probability value less than 0.05 was considered significant. Data was presented in percentages and cross-tabulations.

Results

Six hundred and sixty-two (662) blood donors recruited into the study, 52 (7.9%) were seropositive for HBsAg, 48 (7.3%) were seropositive for antibody to HCV, while 33 (5.0%) were sero-positive for antibody to HIV. (Table 1) Co-infection of HBV and HCV was detected in 14 (2.1%) of the donors, co-infection of HIV and HCV in 7 (1.1%), co-infection of HIV and HBV in 8 (1.2%), while co-infection of HIV, HCV and HBV was detected in 4 (0.6%) of the blood donors. (Table 2) Sero-prevalence of HBsAg and anti-HCV was higher in females than the males (9.7% versus 6.7% and 7.8% versus 6.9% respectively), no significant difference was found between the two groups ($p > 0.05$). Antibody to HIV was detected at higher rate (5.2%) in males than (4.7%) females (Table 1), also, no significant difference existed between the two groups ($p > 0.05$). Various co-infections were higher in females than the males, there was no significant difference between the two groups for all co-infections ($p > 0.05$). (Table 2) Sero-prevalence rate of 17.9% was detected among the age range 20-30 years for HCV (Table 3). Also, the HBV/HCV and

Table 1: Sex prevalence of HBV, HCV and HIV among blood donors

Sex	Number	Age (years) (Mean ± SE)	Prevalence n (%)		
			T-HBV	T-HCV	T-HIV
Male	405	36±4.5	27 (6.7)	28 (6.9)	21 (5.2)
Female	257	28±2.7	25 (9.7)	20 (7.8)	12 (4.7)
Total	662		52 (7.9)	48 (7.3)	33 (5.0)
P-value			0.19 (NS)	0.69 (NS)	0.77 (NS)
χ^2			1.73	0.15	0.08

NB:

- SE = Standard error
- N = Number of positive cases
- T-HBV = Total HBV positive donors
- T-HCV = Total HCV positive donors
- T-HIV = Total HIV positive donors
- P-value = Probability value
- NS = Not Significant
- χ^2 = chi-square value

Table 2: Sex prevalence of HBV, HCV and HIV co-infection among blood donors

Sex	Number	Prevalence n (%)			
		HBV/HIV	HBV/HCV	HCV/HIV	HBV/HCV/HIV
Mal	405	4 (1.0)	6 (1.5)	4 (1.0)	2 (0.5)
Fem	257	4 (1.6)	8 (3.1)	3 (1.2)	2 (0.8)
Total	662	8 (1.2)	14 (2.1)	7 (1.1)	4 (0.6)
p-val		0.7 (NS)	0.16 (NS)	1.00 (NS)	0.64 (NS)
χ^2		0.08	1.93	0.03	0.21

NB:

- N = Number of positive cases
- Mal = Male
- Fem = Female
- p-val = probability value
- NS = Not significant
- χ^2 = chi-square value

Table 3: Age prevalence of HBV, HCV and HIV among blood donors.

Age group (Years)	Number	Prevalence n (%)		
		HBV	HCV	HIV
< 20	63	3 (4.8)	4 (6.3)	2 (3.2)
20-30	254	26 (10.2)	22 (8.7)	14 (5.5)
31-40	272	19 (7.0)	18 (6.6)	10 (3.7)
41-50	70	3 (4.3)	4 (5.7)	6 (8.6)
> 50	3	1 (33.3)	0 (0)	1 (33.3)
Total	662	52 (7.9)	48 (7.3)	33 (5.0)

NB:

n = Number of positive cases

A-G = Age group

No = Number of blood donors examined

n = Number of positive cases

HIV/HBV/HCV co-infection rates of 2.4% and 1.2% respectively were detected among the age group 20-30 years while the age group <20 years had the highest HIV/HCV infection rate of 1.6% (Table 4).

Up to 57.6% of the HIV infected blood donor were co-infected with HBV or HCV or both. (Table 5) Also, 9.5% and 16.7% of HIV-infected male and female donors respectively were co-infected with both HBV and HCV. (Table 6)

Table 4: Age prevalence of HBV, HCV and HIV co-infections among blood donors

A-G (years)	No	Prevalence n (%)			
		HBV/HCV	HIV/HBV	HIV/HCV	HIV/HBV/HCV
<20	63	1 (1.6)	0 (0)	1 (1.6)	0 (0)
20-30	254	6 (2.4)	3 (1.2)	2 (0.8)	3 (1.2)
31-40	272	6 (2.2)	3 (1.1)	3 (1.1)	1 (0.4)
41-50	70	1 (1.4)	1 (1.4)	1 (1.4)	0 (0)
> 50	3	0 (0)	1 (33.3)	0 (0)	0 (0)
Total	662	14 (2.1)	8 (1.2)	7 (1.1)	4 (0.6)

NB:

A-G = Age group

No = Number of blood donors examined

n = Number of positive cases.

compatible vs.

Table 5: Relationship between single infection and co-infection with HIV, HCV and HBV among blood donors at Ido-Ekiti.

Sex	Male (%)	Female (%)	Total (%)
HBV+ only	15 (55.6)	11 (44)	26 (50)
HBV co-infection	12 (44.4)	14 (56)	26 (50)
Total HBV+	27 (51.9)	25 (48.1)	52 (100)
HCV+ only	16 (57.1)	7 (35.0)	23 (47.9)
HCV co-infection	12 (42.9)	13 (65.0)	25 (52.1)
Total HCV+	28 (58.3)	20 (41.7)	48 (100)
HIV+only	11 (52.4)	3 (25.0)	14 (42.4)
HIV co-infection	10 (47.6)	9 (75.0)	19 (57.6)
Total HIV+	21 (63.6)	12 (36.4)	33 (100)

NB:

HBV only =donors positive to HBV only
HBV co-infection =donor positive to HBV plus other virus/viruses
Total HBV =Total HBV positive donors
HCV only =donors positive to HCV only
HCV co-infection =donors positive to HCV plus other virus/viruses
Total HCV =Total HCV positive donors
HIV only =donors positive to HIV only
HIV co-infection =donors to HIV plus other virus/viruses
Total HIV =Total HIV positive donors

Table 6: Sex distribution of various HIV co-infections among blood donors in Ido-Ekiti

Sex	HIV+ only (%)	HIV/HBV/HCV (%)	HIV/HBV (%)	HIV/HCV (%)	Total (%)
Male	11 (52.4)	2 (9.5)	4 (19.0)	4 (19.0)	21 (63.6)
Female	3 (25/0)	2 (16.7)	4 (33.3)	3 (25.0)	12 (36.7)
Total	14 (42.9)	4 (12.1)	8 (24.2)	7 (21.2)	33 (100)

NB:

HIV/HBV/HCV = HIV/HBV/HCV co-infection
HIV/HBV = HIV/HBV co-infection
HIV/HCV =HIV/HCV co-infection

Discussion

The results of this study suggest that infection with HBV, HCV and HIV is of great burden in Ido-Ekiti, South western Nigeria. Based on this study, infection with HBV can be described as highly endemic in this area with prevalence rate of 7.9%, as high endemicity of HBV has been put at prevalence rate of >7%,¹⁸ this is comparable to reports of similar studies in Sagamu (6.8%),¹⁹ Ife (7.3%)²⁰, Benin (10.4%),²¹ Zaria (11.4%),²² all in Nigeria and Rawalpindi, Pakistan (5.86%)¹⁰ but higher than the mean prevalence rate of 1.57% (range 0.53%-2.05%) reported in Port-Harcourt, Nigeria²³ and 3.7% in Enugu, Nigeria.²⁴ However, a prevalence rate as high as 14.3% has been reported in Jos, Nigeria²⁵ and 14.9% in Mali.²⁶

The overall prevalence rate of HIV in this study (5%) is similar to those of previous studies.^{18,26-28} It is higher than the global prevalence rate (0.8%) quoted by WHO for the year 2007 and UNAIDS quoted 3.1% prevalence rate for Nigeria in 2007¹⁵ but similar to WHO quoted 5% prevalence rate for Sub-Saharan Africa for the year 2007.²⁹ However, this result contradicted previous reports by National Agency for Control of AIDS (NACA) and USAIDS on HIV infection prevalence rate in this part of the country which was put at 1.6% in 2005,^{30,31} this might not be unrelated to the fact that there has been little prevalence studies in Ekiti in the past, and only few pregnant women deliver in hospital and very few of these consent to HIV testing and counselling, therefore, hindering the generation of accurate data, and as such, previous reports may be inaccurate and far from representing the through scenario in this region.

The prevalence rate of HCV in this study (7.3%) is comparable to 6.21% of Rawalpindi, Pakistan,¹⁰ but higher than 2.2% reported from Thailand,²⁸ 0.5% from Port-Harcourt, Nigeria,²³ and 3% from Benin-City, Nigeria,²¹

although, it is within the quoted range for its global prevalence rate of 0.1% - 28%.^{10,32} Moreover, earlier studies have reported similar prevalence rates among blood donors.^{19,23,25} In agreement with previous similar studies, various co-infections were detected at lower prevalence rates compared to single infections with highest co-infection rate being HBV/HCV (2.1%).^{19,26,33}

For unclear reasons, the prevalence rates of HBV and HCV infections among female blood donors in this study are higher than that of their male counterparts although there was no significant difference between the two groups for both viral infections, this might not be unrelated to the lower socioeconomic status of women compared to men which render them more prone to acquisition of the blood-borne viral infections. However, the prevalence rate of HIV in this study is higher among the male donors compared to female counterparts (5.5% vs 4.7%) although there was no significant difference between the two groups.

All co-infections were detected at higher rates among the female blood donors although no association between various co-infections and sex of blood donors was detected. It was noted that a high percentage (57.6%) of HIV infected blood donor (47.6% male and 75% female) were co-infected with either HBV, HCV or both. Up to 9.5% and 16.7% of HIV-infected male and female donors respectively were co-infected with both HBV and HCV, 19% and 33.3% of HIV –infected male and female donors respectively were co-infected with only HBV, while 19% and 25% of HIV-infected male and female donors respectively were co-infected with only HCV. These findings like earlier similar studies corroborated the assertion that HIV-infected individuals are at higher risk of co-infection with the blood-borne hepatotropic viruses such as HBV and HCV which share the same routes of infection with HIV.³⁴

The highest prevalence rate for HBV and HCV in this study was found among the age-group 20-30 years, this, like an earlier similar study³⁵ may be related to the well known fact that this age-group are more predisposed to all risk factors associated with acquisition of blood-borne viral infections such as sexual promiscuity, drug addiction/intravenous drug abuse, and alcoholism. One of the three donors in the age-group >50 years was positive for both HbsAg and HIV, but the number is too small for statistical consideration, however, the co-occurrence of HIV with hepatitis virus among older age-group may suggest chronicity of hepatitis virus although we cannot prove this since this study is a prevalence study as opposed to an incidence study. It is well documented that a chronic hepatitis infection is more likely in an HBV or HCV infected individual who is co-infected with HIV, it is asserted that HIV hampers the immune system with the consequent inability to eliminate the hepatitis virus.³⁶ Also, co-infection of the hepatitis virus with HIV has been associated with a more severe liver pathology and rapid progression of liver damage³⁷ while the clinical progression of HIV infection to AIDS was rapid in co-infected patients.³⁸

There has been little documentation especially in Nigeria on prevalence rate of HCV/HBV co-infection, but in this study, it was found to be less common than single infection with either of the two viruses but relatively more common than HIV/HBV, HIV/HCV or HIV/HBV/HCV co-infections. The two viruses share common mode of transmission especially through blood transfusion and injuries from contaminated sharps, the role of sexual and perinatal transmission is less pronounced for HCV as compared to HBV.³⁹ The outcome of co-infection with the two viruses varies; the progression of liver damage may be sped-up when the two viruses behave synergistically, the two viruses may inhibit each others

replication such that one is practically dormant especially HCV inhibiting the replication of HBV, or the two viruses may behave indifferently.⁴⁰ The pattern in a particular individual can only be ascertained by determining the viral loads in the serum, this is particularly important in determining the best intervention for a particular co-infected individual.

The overall prevalence rate (0.6%) of triple co-infection with HIV/HBV/HCV, like previous studies³⁴ is low, however, a prevalence rate as high as 2.4% was found among the age-group 20-30 years, in a similar trend, the highest prevalence rate for HBV/HCV co-infection was found among this age group, this underscore the role played by this vulnerable age-group as a potential focus in transmission of these blood-borne infections.

In conclusion, HIV, HBV and HCV infections are high among blood donors in this part of the country, the youth within the age-range 20-30 years constitute the most important focus in relation to these infections while older age-groups have relatively higher rate of co-infections with these viruses. Adequate screening and referral of positive blood donors is mandatory in reducing transmission of these infections while public awareness programmes to educate the general public and especially the youths on the risk factors associated with acquisition of these infections will go a long way in reducing the trend of these infections. The public should be aware of the need to be fully immunised against hepatitis B virus infection. Multi-centre prevalence study to determine the prevalence rate of these infections in Ekiti State is imperative while an incidence study in this environment as a follow-up of this work in near future is highly desirable to examine the role of HIV co-infections with HBV and HCV in the chronicity of viral hepatitis infections and progression of liver

pathology, also, it will be useful in determining the association of age-group with different co-infection types.

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