Seroprevalence of hepatitis B and C and of human immunodeficiency virus among blood donors in south-west Nigeria

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Around the world, there has been an increase in epidemiological surveillance of bloodborne infections.[1–3] This is due to the fact that blood transfusion has served as a prominent route for transmission of such infections; however, prevalence varies from one region to another.[4–7] In order to prevent the transmission of these infections through blood transfusion, plans, policies and procedures have been put in place to screen prospective blood donors in Nigeria.

Although a variety of agents are transmissible through blood, hepatitis B (HBV), hepatitis C (HCV) and human immunodeficiency virus (HIV) rank high on the list of frequently screened infectious agents because of their pathological course.[8–10] Routine screening of blood donors for HBV and HIV is now carried out by most blood banks in Nigeria, but only a few centres[11] routinely screen for HCV. In West Africa, prevalence of HCV among blood donors is 1.1–6.7%,[12-15] but there is no national policy for screening donors for HCV in Nigeria.

The aim of this study is to estimate the seroprevalence and possible co-infections of HBV, HCV and HIV among prospective blood donors attending the authors' institution.

A total of 2496 asymptomatic prospective blood donors (voluntary and replacement) attending the blood bank at Ladoke Akintola University Teaching Hospital between July 2004 and December 2005 were recruited to the study. Informed consent was obtained from each participant. A 5 mL clotted sample of venous blood was obtained from each donor, and the serum was stored at –20°C until tested.

Hepatitis A surface antigen (HBsAg) was detected by a sandwich immunoassay test strip (Clinotech Diagnostics, Canada) in which monoclonal and polyclonal antibodies are employed. The strip was dipped into the serum for 2–3 sec and read for visibility of one test line and one procedural control line after 10–20 min. The limit of sensitivity provided by the manufacturer was 5 ng/mL. Antibody to HCV was detected using a recombinant double antigen sandwich immunoassay (Clinotech Diagnostics, Canada), following a procedure similar to that adopted for HBsAg.

Antibodies to HIV-1, HIV-2 and HIV-1 O subtypes were detected using the HIV1/2/O Tri-line HIV rapid test device, which is a qualitative immunochromatographic assay employing a membrane strip precoated with recombinant HIV antigens in the test lines, T1 (HIV-1 and subtype O) and T2 (HIV-2) regions, and a procedural control line C (relative sensitivity: 99.9%, relative specificity: 99.6%, relative accuracy: 99.7%, correlation with HIV enzyme-linked immunosorbent assay [ELISA]: 99.7%).

All 2496 prospective donors, comprising 1988 (79.6%) males and 508 (20.4%) females (male:female ratio 3.9:1) in the study were screened. Age ranged from 18 to 65 years, and the majority (68.3%) were in the 21-40 age group (Table 1).

Table 2 shows the prevalence of HBV, HCV and HIV infection among the group of blood donors studied, and Table 3 shows the age/gender distribution. No gender differences were seen in the distribution of single HBV, HCV and HIV infections (odds ratio [OR] 0.7986, 1.219 and 1.023, respectively).

Apparently healthy blood donors have been a constant source of transfusion-related infection, especially in the developing world where facilities for screening blood before transfusion are inadequate.

In the present study, the prevalence of 19.9% for HBsAg, a marker of chronic HBV infection is high when compared to values reported from other regions of Nigeria[6] and from other countries around the world.[4,8–10,15–17] However, the level reported here is less than the 21.3% reported in Ibadan,[18] which is in the same geographical zone. This indicates that there is a high prevalence of HBV infection in south-west Nigeria, which may be due to the socio-cultural practices reported by Otegbayo *et al*.[18]

Hepatitis C virus is now the most common bloodborne infection in the USA and is a leading cause of chronic hepatitis, cirrhosis and hepatocellular carcinoma.[19] However, few blood banks in Nigeria screen routinely for HCV, and there are no national records of HCV seroprevalence, although a prevalence rate of 1.28% among blood donors has been reported.[11]

In West Africa, HCV seroprevalence of 1.1–6.7% has been reported,[12–15] and the 6.4% reported in the present study is consistent with that reported in other tropical African countries,[12–14,20] but is higher than rates reported in the Middle East,[4,15] Asia,[8,16] Europe[9,17] and the USA.[19]

Factors responsible for the transmission of HBV also aid transmission of HCV, hence dual infection is not uncommon, especially in frequently transfused patients[21] and in injected drug users.[22] However, a dual infection rate of 1.6% reported in the present study is lower than rates reported among injected drug users[22,23] or haemodialysis patients.[21] Currently, injected drug abuse is not a problem in Nigeria and therefore is not a major factor involved in the transmission of HBV or HCV in this environment.

The HIV seroprevalence rate of 3.2% among donors is

Table 1. Age/gender group distribution of blood donors.

Age group	Male	Female	Total (%)
<20	196	36	232 (9.3)
21–40	1372	332	1704 (68.3)
41–60	400	140	540 (21.6)
>60	20	–	20 (0.8)
Total	1988 (79.6%)	508 (20.4%)	2496 (100)

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Table 2. Prevalence of HBV, HCV and HIV infections among blood donors.

Infection	Male (n=1988)	Female (n=508)	Total (n=2496)	Statistical analysis
HBV	380 (19.1%)	116 (22.8%)	496 (19.9%)	χ^2=3.287, P=0.0698
HCV	132 (6.6%)	28 (5.5%)	160 (6.4%)	χ^2=0.06804, P=0.4094
HIV	64 (3.2%)	16 (3.1%)	80 (3.2%)	χ^2=0.00634, P=0.9365
HBV+HCV	32 (1.6%)	8 (1.6%)	40 (1.6%)	
HBV+HIV	12 (0.6%)	–	12 (0.5%)	
HCV+HIV	12 (0.6%)	–	12 (0.5%)	
HBV+HCV+HIV	–	–	–	

lower than the national HIV prevalence rate of 5% in the healthy adult population and of 12% among healthy blood donors reported in Nigeria in 2003.[24] Hepatitis B or C have been known to co-exist with HIV, as they share similar modes of transmission. In Nigeria, Inyama *et al*.[25] reported a seroprevalence rate of 5.7% for HCV among 590 confirmed HIV patients, while Halim *et al*.[26] reported HBV and HIV-1 co-infections in blood donors.

Although the rates for HBV or HCV in these Nigerian studies are not dissimilar to those obtained in the present study, the prevalence of HBV and HCV was 15% among the 80 donors who were HIV-positive

Age and gender distribution in the present study agrees with trends established in developing countries;[27,28] however, prevalence of HBV and HCV markers did not differ significantly with gender or age group. This is in contrast with reports[16] to indicate that these factors are significantly associated with HBsAg and anti-HCV antibody prevalence. This difference may be attributed to the fact that the common route of virus transmission (scarification and indiscriminate injection) among blood donors already established in this part of Nigeria[18] is neither age group- nor gender-specific.

Other factors are also thought to be responsible for the high prevalence of HBV in south-west Nigeria, such as the use of unsterilised materials for tribal markings, ear piercing, tattooing, female genital mutilation, male circumcision and blood letting during cult rituals, all of which tend to cut across gender and age groups.

Owing to the high prevalence of HBV, HCV and HIV among the blood donors in the present study, it is important for blood transfusion services to incorporate screening procedures for these three viral agents. In addition, there is a need to increase public awareness of the socio-cultural practices that contribute to transmission of infection.

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Table 3. Age/gender distribution of HBV, HCV and HIV infections among blood donors.

Age group	Gender	Screened	HBV +ve (%)	HCV +ve (%)	HIV +ve (%)
<20	M	196	32 (16.3)	16 (8.2)	8 (4.1)
	F	36	8 (22.2)	0	0
21–40	M	1372	248 (18.1)	88 (6.4)	48 (3.5)
	F	332	84 (25.3)	20 (6.1)	16 (4.8)
41–60	M	400	96 (24.0)	24 (6.0)	8 (2.0)
	F	140	24 (17.1)	8 (5.7)	0
>60	M	20	4 (20.0)	4 (20.0)	0
	F	0	0	0	0
Total		2496	496 (19.8)	160 (6.4)	80 (3.2)
			χ^2=3.043 df=3 P=0.3850	$\chi^2$2=6.474 df=3 P=0.0907	χ^2=7.544 df=3 P=0.0564

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