Short communication

Hepatitis B surface antigen, hepatitis C and HIV antibodies in a low-risk blood donor group, Nigeria

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المستضد السطحي لالتهاب الكبد « بي » ، وأضداد فيروس التهاب الكبد « سي »، وأضداد فيروس الإيدز، في مجموعة منخفضة الاختطار من المتبرعين بالدم في نيجيريا

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الخلاصة: قام الباحثون بتحرِّي معدّل الانتشار المصلي لفيروس العَوَز المناعي البشري (فيروس الإيدز)، وفيروس التهاب الكبد « بي »، وفيروس التهاب الكبد « سي »، لدى 258 من القساوسة المتدرِّبين (الذين تتراوح أعمارهم من 18 إلى 39 عاماً)، والذين يمثِّلون مجموعة من المتبرعين المستوفين لمعايير نقل الدم المأمون. وبيَّنت الدراسة أن 15.1٪ من الرجال كانوا إيجابيِّين للمستضد السطحي لالتهاب الكبد « بي »، وأن 4.3٪ كانون إيجابيِّين لأضداد فيروس التهاب الكبد « سي »، وأن 2.7٪ كانوا إيجابيِّين لفيروس الإيدز؛ كما تبيَّن أن 22.1٪ كانوا مصابين بواحد أو أكثر من هذه الفيروسات. ولوحظت عدوى مشتركة بفيروس الإيدز وفيروس التهاب الكبد « سي » في 0.4٪ من عينة الدراسة، وعدوى مشتركة بفيروس التهاب الكبد « بي » وفيروس التهاب الكبد « سي » في 0.4٪، ولكن لم تُلاحَظ أي عدوى مشتركة بفيروس الإيدز وفيروس التهاب الكبد « سي ». وقد يُظْهِر أهمية التحرِّي الروتيني للدم قبل نقله، بغضِّ النظر عن خلفية المتبرِّع.

ABSTRACT We investigated the seroprevalence of human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV) infection among 258 clergymen-in-training (age range 18–39 years) who represented a donor population that fulfilled the criteria for safe blood transfusion. In all, 15.1% of the men were positive for HBsAg, 4.3% were positive for anti-HCV and 2.7% were HIV-positive; 22.1% were infected with at least one of these viruses. Co-infection with HIV and HBV was found in 0.4% of the subjects, HBV and HCV in 0.4%, and HIV and HCV in 0%. This underscores the importance of routine screening of blood before transfusion, regardless of the donor background.

L'antigène de surface de l 'hépatite B et les anticorps anti-hépatite C et anti-VIH dans un groupe de donneurs de sang nigérians à faible risque

RÉSUMÉ Nous avons cherché à évaluer la séroprévalence des infections dues au virus de l'immunodéficience humaine (VIH) et aux virus de l'hépatite B (VHB) et de l'hépatite C (VHC) chez 258 séminaristes (tranche d'âge : 18-39 ans) représentant une population de donneurs répondant aux critères de sécurité en vue d'une transfusion sanguine. Globalement, cette population s'est avérée positive à 15,1 % pour l'AgHBs, à 4,3 % pour les anticorps anti-VHC et 2,7 % pour les anticorps anti-VIH. Il apparaît que 22,1 % d'entre eux étaient infectés par au moins l'un de ces virus. En ce qui concerne les co-infections, on a recensé 0,4 % de cas de combinaison VIH/VHB , 0,4 % de cas d'association VHB et VHC, tandis qu'aucun sujet (0 %) ne combinait les virus VIH et VHC. Les résultats confirment l'importance cruciale de la pratique des dépistages de routine chez les donneurs de sang, en particulier avant transfusion, indépendamment de l'origine sociale, culturelle ou religieuse du donneur.

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Introduction

Human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV) are a burden to healthcare delivery systems.

Currently about 40 million people worldwide are living with HIV/AIDS [*1*]. The Nigerian Federal Ministry of Health 2003 sentinel survey recorded a prevalence of HIV/AIDS of 6.3% in Jos and 5.1% in Nigeria overall [*2*].

Worldwide there are 350 million chronic carriers of HBV [*3*]. The prevalence ranges from 1% in some developed countries to 15% in developing countries [*4*]. Approximately 18 million Nigerians are chronic carriers [*5*].

About 3% of the world's population has been infected with HCV and over 170 million people are chronic carriers [*6*]. HCV prevalence in developing countries has been reported to be 1%–2% [*6*]. HCV antibody prevalence among blood donors in Egypt ranged from 6% to 38% with a mean of 15% [*7*].

Although every year millions of lives are saved through blood transfusions, blood transfusion remains a major route of transmission of these viruses (HBV, HCV and HIV). Each year up to 4 million blood donations worldwide are not tested for HIV or HBV and only a small proportion of donated blood is tested for HCV [*8*]. This is particularly true in developing countries where there is widespread transfusion of blood without screening. For instance, it has been documented that no more than 10% of the countries in Africa routinely screen donated blood for HBV or HCV [*8,9*]. This, together with the fact that these viruses largely have the same mode of transmission and risk factors [*10–12*] and other shortcomings (e.g. technical and clerical errors), contributes to the transmission of these viral agents by transfusion [*10*].

Key to the procurement of safe blood is the recruitment and retention of voluntary unpaid blood donors [*9*]; unfortunately, the World Health Organization and UNAIDS estimate that only 10% of countries in Africa receive 100% of their blood donations from voluntary donors [*9*]. Given this, a mathematical model developed supports the selection of donors from population groups that are at low risk for HIV infection [*13*]. This will significantly reduce the frequency of window-period donations, thereby minimizing the residual risk of viral transmission.

There is an increasing need to encourage blood donation by donors that fulfil the criteria for safe blood donation and nowhere is this need greater than in developing countries. These criteria include donation by unpaid, voluntary, responsible, young, healthy, adult, non-pregnant, low-risk and fully counselled donors [*8,14*].

In Jos, there is a group of young healthy clergymen-in-training who formed a charitable blood donor group that frequently offers blood donation free to save the lives of those in need of such services. They are considered a low-risk group by virtue of their chosen profession and thus they fulfil the criteria for safe blood donation. The purpose of this prospective study, therefore, was to document the seroprevalence of HIV, HBV surface antigen (HBsAg) and HCV in this group of young clergymen with a view to making recommendations that would improve the safety of blood transfusion.

Methods

Study population

This prospective study was carried out at Jos University Teaching Hospital in Jos, Nigeria. The study population consisted of 286 clergymen-in-training who formed a charitable blood donor group and were con-

sidered low risk. They came from different parts of the country to undertake their clerical studies in Jos.

The criteria for inclusion in the study were: voluntary participation, age not less than 18 years, free of any illness at the time of recruitment, no past medical history of yellowness of the eye, and no history suggestive of infection with any of the 3 viral agents in question. Of the 286 eligible clergymen-in-training, 28 declined to participate and thus 258 were included in the study.

After counselling and giving informed consent, each participant was assigned a numerical code so as to maintain confidentiality. The only data about these participants that was allowed for documentation were their ages. Ethical clearance for the study was obtained from the hospital ethical committee.

Blood assays

After counseling, 4–5 mL of venous blood was collected from each participant aseptically by venepuncture from the cubital fossa into clean plastic containers (Z-10 tubes) using a standard procedure. The blood was allowed to clot and centrifuged (Chris Craft centrifuge, model 6065, serial No. 12314) at 3000 rpm for 5 minutes to separate the serum. The sera so extracted were stored in cryovials at –20 °C until tested.

A rapid enzyme immunoassay was used for HIV screening (Genie HIV1/HIV2 kit. Samofi Diagnostics Pasteur, La Coquette) and the results read using a microplate reader (Elx 800 universal microplate reader, Biot-Tek Instruments Inc., Highland Park, United Sates of America. Serial No. 139065). Confirmation was made by Western blot for samples found positive.

HBsAg screening was done by spot test (Biotec Laboratories Ltd., Middlesex, United Kingdom). A rocker was used to rock the sample to enhance proper mixing for agglutination to occur. Testing for antibodies to HCV was done using an ELISA method (Diagnostic Automation Inc., United Sates of America).

Post-test counseling was offered to all the participants and the results were fully explained to them; those who were positive were offered medical assistance through the hospital. However, all of them preferred to seek medical assistance privately.

Statistical methods

Data was analysed using *Epi-Info*, version 3.3.

Results

A total of 258 clergymen-in-training aged between 18 and 39 years were tested for HBsAg and antibodies to HIV and HCV. The age distribution and prevalence of HBsAg and antibodies to HIV and HCV are shown in the Table 1. Table 1 also shows that 39 (15.1%) of the 258 subjects were positive for HBsAg, 11 (4.3%) for HCV infection and 7 (2.7%) for HIV infection. Table 1 shows that 22.1% of the participants were infected with at least 1 of the viruses. The highest infection (30.0%) with at least 1 of the viruses was recorded in the age group 30–39 years, followed by age groups 20–29 years (25.7%) and < 19 years (14.1%) (Table 1).

Co-infection was seen as follows: 0.4% (1/258) for HIV and HBsAg; 0.4% (1/258) for HCV and HBsAg; and 0% (0/258) for HIV and HCV.

Discussion

This study was carried out to document the seroprevalence of HIV, HBsAg and HCV in a group of young Nigerian clergymen-in-

Table 1 **Hepatitis B surface antigen (HBsAg), hepatitis C virus (HCV) and human immunodeficiency virus (HIV) positivity by age group in a low-risk blood donor group in Nigeria**

Infection	Age group (years)						Total	
	< 19 (*n* = 99)		20–29 (*n* = 109)		30–39 (*n* = 50)		(*n* = 258)	
	No.	%	No.	%	No.	%	No.	%
HBsAg positive	9	9.1	20	18.3	10	20.0	39	15.1
Anti-HCV positive	3	3.0	4	3.7	4	8.0	11	4.3
HIV antibody positive	2	2.0	4	3.7	1	2.0	7	2.7
Total subjects infected	14	14.1	28	25.7	15	30.0	57	22.1

training who had formed themselves into a charitable blood donor group. We wanted to examine the safety of heterologous blood transfusion by donors that fulfil the criteria for safe blood transfusion. Out of the 258 clergymen that were tested, 39 (15.1%) were positive for HBsAg, 11 (4.3%) for HCV infection and 7 (2.7%) had HIV infection.

Although the HIV prevalence of 2.7% recorded in this study is similar to previous findings in blood donors in Jos [*15*], it is lower than the Federal Ministry of Health sentinel survey of 6.3% [*2*] and the National seroprevalence rate of 5.1% [*2*]. These differences with our survey may be due to the differences in sample population and size; our study included only males, while the national survey included both sexes, had a larger sample size and included groups with different sociocultural practices.

The HBsAg seroprevalence of 15.1% is similar to reports from other developing countries [*4*]. A higher prevalence (26%) was recorded in Benin [*16*]. However a lower figure of 7% was previously reported among blood donors in Ife [*17*]. Our data confirm the endemicity of hepatitis B infection in Nigeria, and show that it is a problem that appears to be growing.

The 4.3% prevalence of HCV recorded in this study is lower than the 6% recorded in previous work in blood donors in Jos [*18*] and reports from Egypt [*6*], but is higher than the 1%–2% reported for other developing countries [*6*]. Hepatitis C infection is clearly a problem in Nigeria as in other developing countries.

In all 22.1% of the participants were infected with at least 1 of the 3 viruses. HIV and HBV co-infection had a prevalence of 0.4% in our series, which is lower than the 28.7% previously reported in Jos among HIV patients [*5*]. This contrasts with the report from Benin city, Nigeria where no co-infection with these viruses was observed [*18*]. There is evidence to suggest that HBV can infect lymphocytes and produce a protein X that is capable of activating HIV-1 replication *in-vitro* [*5*].

Overall, the prevalence rates of 2.7%, 15.1% and 4.3% for HIV, HBsAg and HCV respectively are high, especially when this population group would be characterized as low risk, which is alarming given that this group regularly donates blood. And even with blood screening, the possible transmission of these viruses by blood transfusion as a result of the collection of blood during the so-called viraemic window period, before infection can be detected by laboratory testing, has been documented [*19*]. Furthermore, we used HBsAg as the only marker for HBV infection in our methods, but about

10% of occult HBV infection has been detected by use of polymerase chain reaction [*20*] and 10%–20% of all individuals with HBV have antibodies to the hepatitis B core antigen as the only marker for this infection [*20*]. Thus polymerase chain reaction and hepatitis B core antigen are more sensitive than the serological methods used in our study and so our results may be an underestimate of the infection rate among our study group.

HIV, HBV and HCV share similar rates of transmission and risk factors [*10–12*]. This could account for the high rates recorded in this population. The law in Nigeria permits blood donation only by adults, 18 years of age and above. The finding in this study, that the age group of 30–39 years had the highest prevalence of the 3 viruses is critical, since they come from such a presumably low-risk, responsible, population as this one. It also calls into question keeping the donor age at 18 years in the present circumstances. In Zimbabwe, following the lowering, through legislation, of the minimum age of blood donation from 18 to 16 years, there was a tremendous improvement in the low-risk donor base [*9*].

Although screening of donated blood is mandatory and essential for identification of infected donations as a standard practice, especially when sophisticated equipment like polymerase chain reaction is used [*20*], it is not a panacea for safe blood donations [*10*]. The availability of a safe blood supply is critical for both medical progress and national security [*21*]. Given that even an apparently low-risk group had relatively high infection rates for HIV, HBV and HCV, and thus could pass on these infections through blood donation, we advocate an autologous blood transfusion programme. This ensures that patients are carefully selected to receive their own blood, which is risk-free [*22*]. Above all, transfusion of blood and blood products should be given only when absolutely necessary [*8,14*].

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