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## Seroprevalence of major blood-borne infections among blood donors in Kano, Nigeria

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**Aim:** To examine the seroprevalence of common blood infections among blood donors, which remains a major concern in transfusion medicine in Nigeria. Blood transfusion is one of the known therapeutic interventions that cut across a number of clinical disciplines.

**Materials and methods:** The seroprevalences of human immunodeficiency virus (HIV), hepatitis C virus (HCV), hepatitis B surface antigen (HBsAg), and syphilis among 280 blood donors at the Murtala Mohammed Specialist Hospital (MMSH) were determined. The seroprevalences of the pathogens were determined with regard to age, sex, donor category, and occurrence of association pathogens. Between June and December 2008, 276 males (98.6%) and 4 females (1.4%), with an age range of 18-54 years, donated blood.

**Results:** Tests showed that 54 (19.3%) donors had serological evidence of infection with at least one pathogen, while 8 (2.9%) had multiple infections. The seroprevalences of syphilis, HBsAg, HCV, and HIV were found to be 7.5%, 11.1%, 1.8%, and 1.4%, respectively, at the MMSH in Kano. The age group of 28-37 years had the highest rates of syphilis (8.7%), HBsAg (15.5%), and HIV (2.9%), while the age group of 18-27 years had the highest prevalence of HCV (2.5%).

**Conclusion:** The high (19.3%) seroprevalence of transfusion-transmissible infections in blood donated at the MMSH calls for comprehensive screening of blood donors for HBsAg, HCV, HIV, and syphilis using sensitive techniques and strict selection criteria of donors.

**Key words:** Seroprevalence, blood-borne infections, Kano

### Introduction

Over a million blood units are collected from donors every year, and many more millions still need to be collected to meet global demand and ensure sufficient and timely provision of blood (1).

Blood transfusion is one of the known therapeutic interventions that cut across a number of clinical disciplines but the practice is not without risks, as 10%-15% of HIV transmission in Africa has been through blood transfusion (2,3).

Hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), and syphilis infections are public health problems that share similar routes of transmission such as sexual contact, exposure to contaminated blood or blood products, the dangerous tradition of sharing needles, intravenous drug use, and transfer from mother to child (4-6). HBV and HCV

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infections have been associated with long-term morbidity and mortality due to complications like cirrhosis, portal hypertension, chronic liver diseases, and hepatocellular carcinoma (7-9), but in HIV infection, it accelerates the progression of HBV- and HCV-related chronic liver disease (10).

Reports from different parts of the world vary, with prevalences of HBsAg, HCV, HIV, and syphilis among blood donors of 0.66%-25%, 1.0%-13.3%, 0.084%-11.7%, and 0.95%-4.7%, respectively (4,11-13), while, in Nigeria, prevalences of 1.3%-1.49%, 6%-8.4%, 1.1%-5.8%, and 0.1%-3.6% have been reported for HBsAg, HCV, HIV, and syphilis, respectively (14-19).

Murtala Mohammed Specialist Hospital (MMSH) is the largest state government hospital in the state of Kano and it is situated in the city of Kano, where most of the patients from all over the state seek medical attention because the charges are relatively affordable. It renders blood transfusion as one of the routine services. Most of the donated blood in the past was screened for HIV and HBsAg, until recently, when HCV screening was also introduced. The present study has become necessary due to the paucity of information regarding the seroprevalence of common blood infections among blood donors in Kano.

## Materials and methods

**Type of study:** Descriptive cross-section.

The blood samples of 280 donors (voluntary, replacement, and commercial donors), consisting of 276 healthy men and 4 nonpregnant, nonlactating women, aged between 18 and 54 years and weighing  $\geq 50$  kg, were collected into plain containers and studied at the MMSH, Kano, between June and December 2008. The sera obtained after centrifugation were analyzed immediately.

### Assays

**HIV serology:** HIV status was determined with DETERMINE HIV 1/2 (Abbott Japan Co. Ltd., Tokyo, Japan) and reactive samples were retested with STAT-PAK (Caldon Biotech, Inc., Carlsbad, CA, USA). These assays detect both HIV-1 and HIV-2 infections.

**HCV serology:** IgG antibodies to HCV were detected using the HBsAg Kit (ACON Laboratories, Inc., San Diego, CA, USA). Results were interpreted according to the manufacturer's instructions.

**Syphilis serology:** Syphilis was diagnosed using the Venereal Disease Research Laboratory test (CDI Cal-Tech Diagnostics, Inc., Chino, CA, USA) and the *Treponema pallidum* hemagglutination test (CDI Cal-Tech Diagnostics, Inc.). Active syphilis was diagnosed if an individual's blood tested positive with both tests.

**Detection of HBsAg:** HBsAg was detected using the HBsAg Kit (ACON Laboratories, Inc.). Results were interpreted according to the manufacturer's instructions.

**Statistical analysis:** The seroprevalences of HIV, HCV, HBsAg, and syphilis were expressed in percentages for the entire study group. Comparisons between the donor categories were done using chi-square and  $P < 0.05$  was considered significant, while the odds ratio (OR) was employed to determine the association in the occurrence of syphilis, HBsAg, HCV, and HIV.

## Results

For this study, a total of 280 blood donors were recruited, 276 (98.6%) males and 4 (1.4%) females aged between 18 and 54 years. Of these donors, 157 (56.1%) were family replacement donors, while commercial and voluntary donors were 62 (22.1%) and 61 (21.8%), respectively.

Of the donated blood, 54 (19.3%) samples had serological evidence of infection with at least 1 pathogen, while 8 (2.9%) had multiple infections, with the association of syphilis and HBsAg occurring most frequently.

Table 1 shows the seroprevalences of syphilis, HBsAg, HCV, and HIV among the 280 blood donors to be 7.5%, 11.1%, 1.8%, and 1.4%, respectively. The age group of 28-37 years had the highest prevalences of syphilis (8.7%), HBsAg (15.5%), and HIV (2.9%), while the age group of 18-27 years had the highest prevalence of HCV (2.5%). The prevalences of syphilis, HBsAg, HCV, and HIV were, respectively, 7.6%, 10.9%, 1.8%, and 1.4% for males and 0%, 25%, 0%, and 0% for females.

Table 1. Seroprevalences of major blood-borne infections with regard to age and sex of blood donors.

	Total number of samples (%)	Number of positive cases (%)			
		Syphilis (%)	HBsAg (%)	HCV (%)	HIV (%)
<b>Age (years)</b>					
18-27	122 (43.6)	10 (8.2)	11 (9.0)	3 (2.5)	0 (0)
28-37	103 (36.8)	9 (8.7)	16 (15.5)	2 (1.9)	3 (2.9)
38-47	46 (16.4)	2 (4.3)	5 (10.9)	0 (0)	0 (0)
48-54	9 (3.2)	0 (0)	0 (0)	0 (0)	0 (0)
18-54	280 (100)	21 (7.5)	31 (11.1)	5 (1.8)	4 (1.4)
<b>Sex</b>					
Male	276 (98.6)	21 (7.6)	30 (10.9)	5 (1.8)	4 (1.4)
Female	4 (1.4)	0 (0)	1 (2.5)	0 (0)	0 (0)

Table 2 shows the prevalences of transfusion-associated viral infections and syphilis in the 3 blood donor categories. The prevalences of syphilis, HBsAg, HCV, and HIV were 12.9%, 12.9%, 4.8%, and 1.6%, respectively, for commercial donors; 5.7%, 12.1%, 0.6%, and 1.3%, respectively, for replacement donors; and 4.9%, 6.6%, 1.6%, and 0%, respectively, for voluntary donors. However, the differences in the prevalences with regard to donor categories were not

statistically significant ( $P > 0.05$ ), as they were for syphilis ( $\chi^2 = 4.115$ , df 2), HBsAg ( $\chi^2 = 1.66$ , df 2), HCV ( $\chi^2 = 4.528$ , df 2), and HIV ( $\chi^2 = 0.892$ , df 2).

Table 3 shows positive associations in the occurrence of HCV and HIV (OR = 22.7, 95% CI 1.9-268.0), syphilis and HBsAg (OR = 1.9, 95% CI 0.6-6.0), syphilis and HIV (OR = 4.1, 95% CI 0.4-40.0), and HBsAg and HCV (OR = 5.7, 95% CI 0.9-35.3).

Table 2. Prevalences of transfusion-associated viral infections and syphilis in 3 blood donor categories.

Donor category	Total number of samples (%)	Number of positive cases (%)			
		Syphilis (%)	HBsAg (%)	HCV (%)	HIV (%)
Commercial donors	62 (22.1)	8 (12.9)	8 (12.9)	3 (4.8)	1 (1.6)
Replacement donors	157 (56.1)	9 (5.7)	19 (12.1)	1 (0.6)	2 (1.3)
Voluntary donors	61 (21.8)	3 (4.9)	4 (6.6)	1 (1.6)	0 (0)
P-value		>0.05	>0.05	>0.05	>0.05

Table 3. Association in the occurrence of syphilis, HBsAg, HCV, and HIV in 280 blood donors using odds ratio (OR) with 95% confidence interval (CI).

Infections	Number of positive results	Percentage (%) positivity	OR (95% CI)
HCV and HIV	1	0.4	22.7 (1.9-268)
Syphilis and HBsAg	4	1.4	1.9 (0.6-6.0)
Syphilis and HIV	1	0.4	4.1 (0.4-40.0)
HBsAg and HCV	2	0.7	5.7 (0.9-35.3)

## Discussion

The need for the screening of blood for syphilis, HBsAg, HCV, and HIV cannot be overemphasized, as this study has shown that almost 1 of the 5 (19.3%) units of blood donated had serological evidence of infection with at least 1 pathogen. This is quite high and therefore calls for proper screening of donated blood with sensitive and specific reagents coupled with stringent donor selection criteria.

This study shows overall seroprevalences of 7.5%, 11.1%, 1.8%, and 1.4% for syphilis, HBsAg, HCV, and HIV, respectively, while 2.9% of the donated units of blood had serological evidence of multiple infections, with the association of syphilis and HBsAg having the highest occurrence. These findings are comparable to previous reports in Nigeria (14-19); however, the high prevalence of syphilis (7.5%) in blood donors in this study is a matter of concern, as most of the federal and state government hospitals in Nigeria are yet to embrace its screening. *Treponema palladium*, which causes syphilis, rarely survives in whole blood or blood products refrigerated at 2-8 °C after 96 h (20), but there are occasions when blood is transfused immediately after it is donated. If the donor is infected with syphilis, this will be transferred to the recipient. Moreover, its transmission contributes to very high exposure to infections such as HIV and hepatitis, since it is also sexually transmitted (21).

This study has also shown that commercial or paid donors had the highest prevalences of syphilis, HBsAg, HCV, and HIV, at 12.9%, 12.9%, 4.8%, and 1.6%, respectively, as compared to 5.7%, 12.1%, 0.6%, and 1.3%, respectively, for the family replacement donors and 4.9%, 6.6%, 1.6%, and 0%, respectively, for voluntary donors, though the differences were not statistically significant. These findings, which are

in agreement with earlier reports (12,13,19), indicate that commercial donors are less suitable for blood donation than family replacement and voluntary donors. The increase in the prevalence of transfusion-transmissible infections in commercial donors has been attributed to socioeconomic and environmental factors coupled with donors' concealment of their true state of health before donation (22,23).

In addition to screening blood donors using sensitive techniques, increased seroprevalences of HIV, HBsAg, HCV, and syphilis can be reduced using comprehensive evaluation of self-exclusion forms and clinical evaluation (24).

With regard to the occurrence of the pathogens, there were significant positive associations between HCV and HIV, HBsAg and HCV, syphilis and HIV, and syphilis and HBsAg. These associations of the pathogens could have been sexually transmitted; moreover, lesions from syphilis could enhance transmission of transfusion-transmissible infections (25).

## Conclusion

The high (19.3%) seroprevalence of transfusion-transmissible infections in blood donated at the MMSH is alarming and, therefore, calls for proper screening of blood for HIV, HBsAg, HCV, and syphilis with sensitive and specific reagents; if possible, nucleic acid technology should be employed (21,26). Strict selection of blood donors; public enlightenment on HIV, HBsAg, HCV, and syphilis infections; and prevention strategies should be strengthened. Motivation of voluntary donors should be encouraged and legalized by the government, as is practiced in other countries (27,28).

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