

Seroprevalence of Transfusion-Transmissible Viral Pathogens among Potential Blood Donors in Kaduna, North-Western, Nigeria

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Abstract: Blood transfusion services are integral component of modern medical practices. It's however marred with several challenges, ranging from the use of screening techniques that do not detect infectious agents during the window period to the burden of infectious agents among apparently healthy individual in the population. We therefore sought to determine the seroprevalence of transfusion transmissible viral pathogens among apparently healthy blood donors in Kaduna, North-Western, Nigeria. A total of two hundred and seventy three (273) blood donors at Barau Dikko Specialist Hospital (BDSH) Kaduna, Kaduna State, were recruited for the study between October and December, 2015. Antibodies to HIV, were detected from the sera samples using DETERMINE[®] HIV 1/2 (Abbott Japan Co. Ltd., Tokyo, Japan), UNIGOLD[®] (Trinity Inc) and STAT-PAK[®] (Caldon Biotech, Inc., Carlsbad, CA, USA). Antigen to Hepatitis B virus were detected with ACON[®] Hepatitis B test Kit (ACON Laboratories, Inc. San Diego, CA, USA) and IgG antibodies to HCV were detected using ACON[®] Hepatitis C test Kit (ACON Laboratories, Inc., San Diego, CA, USA). Social demographic data and other relevant information were obtained using a proforma specially designed for this study. Data was analysed using SPSS version 21.0 (IBM, 2011) and Microsoft Excel. The overall seroprevalence of the transfusion transmissible viral pathogens was 25.0% (68/273). The seroprevalence of HIV, HBsAg, and HCV was 4.4%, 12.1% and 8.4% respectively. In addition, 2.9% of the donated units of blood had serological evidence of multiple infections, with Hepatitis B and C co-infection having the highest occurrence. Replacement blood donors constituted 58.6% of the entire blood donors. Commercial blood donors had the highest prevalence of HCV and HIV infection (20.8% and 8.3%) while replacement donors had the highest prevalence of Hepatitis B infection (13.8%). There was no significant statistical relationship between the prevalence of HIV, HBsAg, HCV and the donors status ($P>0.05$). Results from this study show that approximately one in every four persons in the study population harbours at least one of the transfusion transmissible viral agents. This is a reflection of the occurrence of these diseases in the locality. It also provides evidence for government and health policy maker in this region and the country at large to renewed their commitment towards strengthening infection control measures and blood safety guidelines with emphasis on strict donor screening and voluntary system of blood donation.

Keywords: Donors, Hbsag, Hcv, Hiv, Transfusion

I. Introduction

The adoption of blood transfusion therapy in modern medical practice has altruistically lowered the mortality rates of illnesses, conditions and medical emergencies needing urgent therapeutic procedures with no genuine substitution. Blood transfusion is beneficial and safe for the recipient when it is performed in strict compliance with blood safety guidelines, which necessitate blood banks to routinely screen blood for transfusion-transmissible pathogens (TTP) prevalent in a locality [1].

In Nigeria, the current blood safety guidelines oblige blood banks to routinely perform serological testing for viral pathogens such as; Human immunodeficiency virus (HIV), Hepatitis B virus (HBV) and Hepatitis C virus (HCV) [2]. Although blood safety has greatly improved over the past 15 years, transfusion transmitted infections (TTIs) still represent a major public health problem in regions with high prevalence of HIV infections, viral hepatitis, malaria, and several sexually transmissible infections [3].

The uses of screening techniques that do not detect infectious agents during the window period constitute a major challenge in the transfusion of safe blood in resource poor settings. Victims of such

inadequacies are left with complications, resulting to a long-term morbidity and mortality with far reaching consequences, not only to the recipients themselves but also to their families, their communities and the wider society [4].

The risk of transmitting TTIs in resource poor settings due to its high prevalence and the inability to adopt sensitive blood screening techniques can be thwarted when voluntary non-remunerative blood donations are encouraged from healthy donors and blood from such donations maintained in the blood banks [5].

The regular monitoring of the prevalence of these viral pathogens in a geographical location is expedient due to the frequently changing epidemiological and demographic parameters that include; urbanization, migration flows, and changes in life styles. The information harnessed from such surveillance would be a reflection of the occurrence of these diseases in the locality. Furthermore, regular surveillance will help in estimating the dangers associated with blood transfusion, as well as in modifying donor screening strategies to reduce or foil the transmission of the infections [6]. The present study has become necessary due to the paucity of information regarding the current seroprevalence of endemic viral pathogens among apparently healthy blood donors in Kaduna, North-Western, Nigeria.

II. Materials And Methods

2.1. Study Area

This study was conducted at Barau Dikko Specialist Hospital (BDSH) Kaduna, Nigeria, between October and December, 2015. BDSH is a 240-Bed Secondary Care Hospital, located in Kaduna metropolis. It is the largest hospital in Kaduna metropolis providing quality health services to citizens within and outside the state.

2.2. Study Design

The study was a cross-sectional, hospital based study. Prospective donors who satisfied the inclusion criteria and who consent to participate in the study were recruited as they presented to the blood bank at BDSH.

2.3. Inclusion Criteria

Donors aged between 18 to 65, weighed more than 50kg, with no past medical history of yellowness of the eye and no history suggestive of infection with any of the three viral agents in question were the inclusion criteria considered for patient inclusion into the study.

2.4. Sampling Technique

Purposive sampling, a non-probability method was employed for this study. Consecutive consenting donors, who presented at BDSH blood bank within the study period and in addition fulfilled the inclusion criteria, were recruited for the study.

2.5. Laboratory Procedures

A total of two hundred and seventy three (273) donors who satisfied the inclusion criteria were recruited for the study. 2ml of venous blood was collected from each participant by venipuncture. The blood samples were dispensed into plain containers, centrifuged at room temperature to extract serum. The Sera were aspirated and dispensed into serum vials already labeled for each participant. The sera were used to detect antibodies to HIV, HCV and antigen to Hepatitis B infection. Social demographic data and other relevant information were obtained using a proforma specially designed for this work.

2.5.1. HIV Serology

HIV status was determined with DETERMINE[®] HIV 1/2 (Abbott Japan Co. Ltd., Tokyo, Japan) and reactive samples were retested with UNIGOLD[®] (Trinity Inc). These assays detect both HIV-1 and HIV-2 infections. Discordant result were verified using STAT-PAK[®] (Caldon Biotech, Inc., Carlsbad, CA, USA) as a tie breaker. Test protocol and results interpretation were done according to the manufacturer's instruction.

2.5.2. Hbsag Serology

Hepatitis B surface antigen was detected using immunochromatographic rapid kits; ACON[®] Hepatitis B test Kit (ACON Laboratories, Inc. San Diego, CA, USA). Test protocol and results interpretation were done according to the manufacturer's instruction.

2.5.3. HCV Serology

IgG antibodies to HCV were detected using immunochromatographic rapid kits; ACON[®] Hepatitis C test Kit (ACON Laboratories, Inc., San Diego, CA, USA). Test protocol and results interpretation were done according to the manufacturer's instruction.

2.6. Definition of Blood Donors Status

Voluntary Donors: these are donors who out of their free will, donate blood without receiving or expecting any form of compensation in cash or in kind.

Replacement Donors: these are usually family members, friends or relatives of a patient that donate blood to replace the stored blood used in transfusion, ensuring a consistent supply.

Commercial Donors: these are donors who donate blood purposely for the financial benefit.

2.7. Data Analysis

All data generated from the study were analysed using Statistical Product and Service Solution (SPSS) software version 21.0 (IBM SPSS, 2011). Chi-square (χ^2) was used to compare the association between proportion and P-values <0.05 was considered significant at 95.0% confidence level.

2.8. Ethical Clearance

Ethical approval was obtained from the Ethical Review Committee of Kaduna State Ministry of Health before commencement of the study. The participants were adequately informed about the nature of the study and its benefits and were consented before samples were collected from them.

III. Results and Discussion

3.1. Results

A total of two hundred and seventy three (273) donors who satisfied the inclusion criteria were enrolled for the study. The mean age of the blood donors was 32.5±8.4, while the age range was 18-65years. There was a preponderance of male donors (90.5%) to female donors (9.5%). The overall seroprevalence of the transfusion transmissible viral pathogens was 25.0% (68/273). The seroprevalence of HIV, HBsAg, and HCV was found to be 4.4%, 12.1% and 8.4% respectively. HBsAg was found to be the most prevalent among the blood donors, trailed by HCV (8.4%) while HIV was least detected among the study population. Furthermore, 2.9% of the donated units of blood had serological evidence of multiple infections, with Hepatitis B and C co-infection having the highest occurrence. There was a significant statistical relationship between the prevalence of HIV infection and the Stratification of donor's age (P =0.015). There was however no significant statistical relationship between HBsAg (P=0.309), HCV (P=0.943) and the donor's age groups. More so there was no significant statistical relationship between HIV, HBsAg, HCV infection and the other socioeconomic variables (P>0.05) which include gender, marital status and employment status. Replacement blood donors constituted 58.6% of the entire blood donors. Commercial blood donors had the highest prevalence of HCV and HIV infection (20.8% and 8.3%) while replacement donors had the highest prevalence of HBsAg (13.8%). There was no significant statistical relationship between the prevalence of HIV, HBsAg, HCV and the donors status (P>0.05).

Table 1: Prevalence of the Viral Pathogens in Relationship to the Sociodemographic Variables

Parameters		Prevalence Of Viral Pathogens (%)					
Variables	Frequency(%)	Hiv (%)	P-Value	Hbsag (%)	P-Value	Hcv (%)	P-Value
Age							
15-24	43(15.8)	3(7.0)	0.015	4(9.3)	0.309	5(16.6)	0.943
25-34	127(46.5)	5(3.9)		18(14.2)		9(7.1)	
35-44	80(29.3)	1(1.2)		6(7.5)		7(8.8)	
45-54	20(7.3)	2(10.0)		5(25.0)		2(10.0)	
55-64	2(0.7)	1(50.0)		0(0.0)		0(0.0)	
65-74	1(0.4)	0(0.0)		0(0.0)		0(0.0)	
Total	273(100.0)	12 (4.4)		33(12.1)		23(8.4)	
Gender							
Male	247(90.5)	12(4.9)	0.250	31(12.6)	0.470	21(8.5)	0.888
Female	26 (9.5)	0(0.0)		2(7.7)		2(7.7)	
Total	273(100.0)	12 (4.4)		33 (12.1)		23 (8.4)	
Marital Status							
Single	102 (37.4)	4(3.9)	0.768	11(10.8)	0.610	8(7.8)	0.789
Married	171(62.6)	8(4.7)		22(12.9)		15(8.8)	
Total	273(100.0)	12(4.4)		33(12.1)		23(8.4)	
Educational Status							
Educated	227(83.2)	8(3.5)	0.119	26(11.5)	0.475	19(8.4)	0.942
Un-Educated	46 (16.8)	4(8.7)		7(15.2)		4(8.7)	
Total	273(100.0)	12(4.4)		33(12.1)		23(8.4)	

Table 2: Prevalence of the Viral Pathogens in Relationship to the Donors Status

PARAMETERS		PREVALENCE OF VIRAL PATHOGENS (%)					
VARIABLES	FREQUENCY (%)	HIV (%)	P-VALUE	HBsAg (%)	P-VALUE	HCV (%)	P-VALUE
DONORS STATUS							
REPLACEMENT	160(58.6)	9(5.6)	0.155	22(13.8)	0.588	13(8.1)	0.057
VOLUNTARY	89(32.6)	1(1.1)		9(10.1)		5(5.6)	
COMERCIAL	24(8.8)	2(8.3)		2(8.3)		5(20.8)	
TOTAL	273(100.0)	12(4.4)		33(12.1)		23(8.4)	

3.2. Discussion

Transfusion transmitted infections (TTIs) caused by viral agents sharing the same route of transmission with sexually transmitted infections (STIs) are endemic in developing countries and constitute a major public health menace. The prevalence of these viral agents is location dependent. The results presented in this study showed that the overall seroprevalence of the transfusion transmissible viral pathogens was 25.0% (68/273). This finding implies that approximately one in every four persons in the study population harbours at least one of these viral agents. This situation might lead to imminent scarcity of healthy donors if drastic measures are not taken by the relevant authority to address the trend. Various studies in developing settings have shown data ranging from a lower prevalence of 15.9% recorded in Tanzania [5] to a slightly similar prevalence of 26.2% recorded in Cameroon [7]. A higher prevalence of 43.2% was however recorded in Ethiopia [8]. The variation in the prevalence rate reported in the different developing settings might be attributed to the differences in geographical locations, age range of donors, sample sizes, the period of time the studies were carried out, and the different socio-cultural practices such as sexual behaviour, marriage practices, circumcision, scarification, tattooing etc which take place in these regions. Access to healthcare, immunization practices and the laboratory test reagents used may also be contributory factors [9].

The seroprevalence of HIV, HBsAg, and HCV in this study was found to be 4.4%, 12.1% and 8.4% respectively. Hepatitis B infection was found to be most prevalent, while HIV was least detected among the study population. More so, 2.9% of the donated units of blood had serological evidence of multiple infections, with Hepatitis B and Hepatitis C co-infection having the highest occurrence. These findings are comparable to previous reports in Nigeria [10-16]. The variation in the occurrence of the various viral pathogens might be attributed to the infectivity of the viruses as the routes of transmission of the three agents are similar. HBV is said to be 50 to 100 times more infectious than HIV and 10 times more infectious than HCV [17]. Consistent with the reports of other findings, [9, 13,18] the mean age of the blood donors in this present study was 32.5±8.4, while the age range of the blood donors was 18-65years. There was a preponderance of male donors (90.5%) when compared to female donors (9.5%). This is also in agreement with previous reports [7, 10,13]. Socio-cultural influences and beliefs have been reported as the major reasons for this bias.

Establishing an effective voluntary blood donor system should be the aspiration of every national health system. The result of this study showed that commercial or paid donors had the highest prevalence of HCV and HIV infection (20.8% and 8.3%) while replacement donors had the highest prevalence of Hepatitis B infection (13.8%). These findings which are in tandem with earlier reports [5, 10, 16, 19] reaffirms the fact that commercial donors are less suitable for blood donation than family replacement and voluntary donors. The high prevalence of transfusion transmissible viral infections among commercial donors has been attributed to poverty, socioeconomic and environmental factors [10, 20, 21]. The dependence on commercial blood donor system provides only sub-optimally safe blood and in limited quantity [22]. Replacement donors under certain circumstance can be relatively unwilling donors who give blood under a form of coercion. It can result to people who have been recruited financially by the patients or family members donating blood, concealing the fact that they were in reality very much like commercial donors [22]. Result from this study has provided evidence for the dire need to review the replacement system of blood donations in health settings. For instance the highest prevalence of hepatitis B virus infection in this study was recorded among the replacement blood donors while HIV and HCV infection were found more among the commercial blood donors. The hindrance to achieving a 100% efficient voluntary blood donation services in health systems are enormous but surmountable and until health policy makers begin to have solemn interest in this subject, the benefits of blood donation services might not be fully harnessed.

IV. Conclusion And Recommendation

The utilisation of blood transfusion therapy in health systems has been encumbered by the prevalence of highly infectious agents among the apparently healthy individuals in the population. The findings of this study showed that approximately one in every four persons in the study population harbours at least one of the viral agents investigated. This in reality is a reflection of the prevalence of these viral agents in the locality. These are also indications for a renewed commitment from government and health policy makers in the region

and country at large. This could be in the form of strengthening infection control measures, reviewing blood safety guidelines with emphasis on mandatory screening of donors with sensitive techniques, instituting an effective voluntary blood donation system and increase public health education campaign.

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NOTICE OF APPROVAL AFTER FULL COMMITTEE REVIEW

SEROPREVALENCE OF TRANSFUSION TRANSMISSIBLE VIRAL PATHOGENS AMONG
POTENTIAL BLOOD DONORS IN KADUNA, NORTH-WESTERN, NIGERIA

Name of Principal Investigator:	JOSEPH ABIGAIL YOK
Address of Principal Investigator:	Medical Laboratory Dept, Barau Dikko Specialist Hospital, Kaduna State.
Date of receipt of Application	19 th Aug, 2015
Date of Ethical Approval	29 th Sept, 2015

This is to inform you that the Research described in the submitted Protocol, the Consent forms, advertisements and other participant information materials have been reviewed and given full approval by the Health Research Ethics Committee (HREC).

If there is delay in starting the research or any change, inform the HREC so that the dates of approval can be adjusted accordingly.

However, Researcher is kindly requested to submit a copy of his/her findings to the State Ministry of Health, please.


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