

Current Trend of Transfusion Transmissible Infections among Voluntary Blood Donors in North Central Nigeria

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Abstract

Blood transfusion is an integral part of modern medicine which had saved many lives which would have been lost as a result of lack of blood. Although blood is needed for survival, it can also be a medium for the transmission of harmful infectious diseases. This study evaluated current trend of transfusion transmissible infections among voluntary blood donors in Nigeria.

This was a descriptive community-based study involving 600 prospective voluntary blood donors among staff and students of 5 tertiary institutions in Kwara and Kogi States. Hepatitis B surface antigen and Hepatitis C antibodies were screened for using Hepatitis B Virus Surface Antigen Bio-Inteco ELISA KIT, and Anti-HCV Bio-Inteco ELISA KIT, respectively. Screening for HIV was done with Enzyme immunoassay method using Human Immunodeficiency Virus (HIV) 1+2 Antigen Antibody ELISA KIT, product of Bio-Inteco HIV Diagnostics, UK. Testing for Syphilis was carried out using Rapid Plasma Reagin (RRR) test. Statistical analysis was done with IBM SPSS version 20. Level of significance was set at $p < 0.05$

The mean age of the subjects was 21.98 ± 5.17 years. Two thirds of the prospective blood donors were within the second decade of life and more than half were males. The prevalence of Hepatitis B among subjects were 4.7%, Hepatitis C, 0.2%, HIV 1% and Syphilis 0%.

The prevalence of hepatitis B and HIV were relatively high compared to Hepatitis C and Syphilis among voluntary blood donors, although lower than the prevalence among general population in Nigeria. In order to improve on blood transfusion safety, there is a need to increase public awareness on vaccination for

hepatitis B virus, Quality control of screening methods and rational use of Blood.

Key words: Transfusion transmissible infections, Voluntary blood donors, Screening

Introduction

The practice of transfusing blood is an essential aspect of modern medicine which has saved many lives which would have been lost as a result of lack of blood. Despite the fact that blood is needed for survival, it can also be a medium through which harmful pathogenic agents including HIV and Hepatitis are transmitted from blood donors to recipient of blood transfusion if stringent measures are not put into consideration in donor selection. Over 92 million blood from donors are obtained globally on a yearly basis, and as much as 1.6 million of these donated blood is eventually discarded on account of the presence of transfusion related transmissible infectious agents.¹ This amounts to serious wastage of scarce resources and reduction of amount of blood that is available for transfusion. In order to minimize these wastages, efforts should be geared toward collecting blood from low risk individuals.

In sub-Saharan Africa, chronically infected cases of HBV are said to be approximately 5-15% of the adults' human population and its transmission is largely attributable to transfusion of blood,³ as well as unprotected sex. According to the recent meta analyses carried out between 2000-2013, a pooled prevalence of 13.6% was reported among healthy population in Nigeria and over 21 million are currently infected with the disease in Nigeria.⁴ A study done among family replacement donor in Ilorin recorded a prevalence of 10.9%.⁵ A report of a study done among voluntary donors in North-Eastern part of Nigeria, a lower figure of 2.4% was recorded.⁶ This further shows that TTIs are lower among voluntary blood donors

Similarly, a known cause of liver disease is hepatitis C with varied prevalence among blood donors. Approximately 200 million cases of Hepatitis C infection have been recorded globally and this is a major health concern worldwide.⁷ The practice of transfusing blood that is not screened is common especially in villages and remote areas where

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awareness is low account for major identifiable medium for HCV infection transmission in Nigeria. Some other notable factors include body piercing, re-use of syringes and used needles, injury from needle stick and the act of tattooing. The use of shared razor blades, nail clippers as well as sharing tooth brush has increased the risk of transmission of infection.^{7,8} In the report of a study done in South-south, Nigeria, a figure of 5% was recorded as the prevalence rate among blood donors with majority of being commercial donors.⁹ Prevalence of 3.4% was reported in Kano,¹⁰ and 7.6% in South-Eastern State of Nigeria.¹¹

The human Immunodeficiency virus (HIV) is commonly transmitted through unprotected sexual relationships either homosexual or heterosexual, transfusions of blood and blood products and also from infected mother to the child usually during separation of placenta at delivery and breastfeeding.^{12,13} Others includes organ and tissue transplantation from infected donors or exposure of healthy person to infected blood during accidents.^{12,13} Nigeria has a high prevalence of HIV and has been ranked the second largest HIV epidemic globally.¹³ In 2018, approximately 1.9 million people living in Nigeria were infected with HIV with a recorded prevalence of 1.5% and 130,000 new cases.¹³ In Iran, the prevalence of HIV amongst blood donors was 0.004%,¹⁴ 0.08% in China,¹⁵ 0.07% in Saudi,¹⁶ and 3.1% in Osogbo, Nigeria.¹⁷

The prevalence of Syphilis varied from different regions of the world. Higher values was however reported in some part of Western and Central Africa.^{18,19,20} In Ghana a prevalence of 3.7% was reported in blood transfusion facilities.²¹ As at present, there is still no cure for AIDS as well as some other infectious agents being transmitted through blood transfusion, efforts should be geared towards proper donor selections as well as obtaining donor blood from low risk individuals especially voluntary blood donors who were non-remunerated in order to prevent morbidity and mortality associated with these infections. Our research study determines the trend of transfusion transmissible infections among voluntary blood donors in some selected tertiary institutions in North Central, Nigeria.

Materials and Methods

A descriptive community-focused study was conducted among students and staff of 5 Tertiary Institutions in Kwara and Kogi States both located in the North-Central part of Nigeria between August 2016 and January, 2018. A total of 905 staff and students of the tertiary institutions gave consent to participate in this study, although only 600 of them eventually completed the study as some of them were rejected based on low haemoglobin level and making them unfit for blood donation. Before the study was commenced.

Standard ethical procedure was complied with in accordance with Helsinki declaration. Permissions from the management of the Institutions were obtained and the Ethical Review Committee of the University of Ilorin Teaching Hospital which is one of the members of the National Health Research Ethics Council gave us a written approval (Ethical Approval Number and date - UERC/ASN/2015/133/ 13th August, 2015) before commencing the study.

The socio-demographic information of the participants was obtained with a designed questionnaire which was self-administered. A brief physical examination was done for each prospective donor. About five millilitre of venous blood was collected via venipuncture using aseptic technique from all participants. The samples were dispensed into well labeled vacutainer plain bottles. The blood was then allowed to clot and retract and was then centrifuged at 2500rpm for a duration of 10 minutes to obtain serum which was kept at -20°C until analyzed for Hepatitis B, HIV, anti-HCV and Syphilis. Hepatitis B and C were first analyzed using hepatitis B surface antigen test strip, an immunoassay product of Grand Medical Diagnostic, USA in accordance to the manufacturer's instructions, while antibody to hepatitis C was tested using commercially prepared test kits from ACONS, USA. The samples were further analyzed with the use of Enzyme linked immunosorbent assay using Hepatitis B Virus Surface Antigen Bio-Inteco ELISA KIT, UK and Anti-HCV Bio-Inteco ELISA KIT, UK for HbsAg and antibodies to hepatitis C virus detection respectively.

The HIV screening was subsequently done with the use of Enzyme immunoassay technique which enables the HIV P24 antigen detection as well as identification of the antibodies to both HIV 1&2 in the serum of participants using the Human HIV 1+2 Antigen Antibody ELISA KIT, Bio-Inteco HIV Diagnostics, UK and testing for Syphilis in the participants' samples was done with the use of the Rapid Plasma Reagin (RRR) test in accordance with manufacturer's instruction.

Results

Six hundred (600) participants comprising of students and staff of five Tertiary Institutions in North Central geopolitical zone of Nigeria who were fit to donate blood based on haemoglobin concentration $\geq 12.5\text{g/l}$ and who eventually donated participated in the study. The mean $\pm$ SD age of the subjects was 21.98 ± 5.17 years (ranging from 15 to 63 years). The modal age was 30 years. Most of the participants were students, single and of Yoruba ethnic origin. Table 1.

The prevalence of Hepatitis among voluntary blood donors was 4.7%, Hepatitis C, 0.2%, Syphilis 0% and HIV 1% Table 2

Table 1: The socio-demographic variables of voluntary blood donors

Variables	Frequency	Percentage
Age group		
< 20	121	13.4
20 – 29	597	82.4
30 – 39	20	2.2
= 40	18	2.0
Range	15 – 63	
Mean $\pm$ SD	21.98 $\pm$ 5.17	
Gender		
Male	541	59.8
Female	364	40.2
Ethnic group		
Yoruba	769	85.0
Hausa	24	2.7
Igbo	9	1.0
Nupe/ Igala/ Ebira	57	6.3
Others	18	2.0
Not stated	28	3.0
Literacy level		
Secondary	7	0.7
Tertiary	887	98.0
Quranic	6	1.0
None	5	0.3
Occupation		
Student	863	95.4
Lecturer	12	1.3
Teacher	10	1.1
Others	20	2.2
Marital status		
Married	38	4.1
Single	860	95.0
Widowed	7	0.9
Religion		
Islam	634	70.1
Christian	271	29.9
Designation		
Staff	42	4.6
Student	863	95.4

Two thirds of the prospective blood donors were within the second decade of life and more than half were males. More than three quarters of them were students of tertiary institution.

Table 2: Hepatitis B&C, Syphilis and HIV infection

Variable	Frequency (N = 600)	Percent
HBV		
Positive	28	4.7
Negative	572	95.3
HCV		
Positive	1	0.2
Negative	599	99.8
HIV		
Positive	6	1.0
Negative	594	99.0
SYPHILIS		
Positive	0	100
Negative	600	

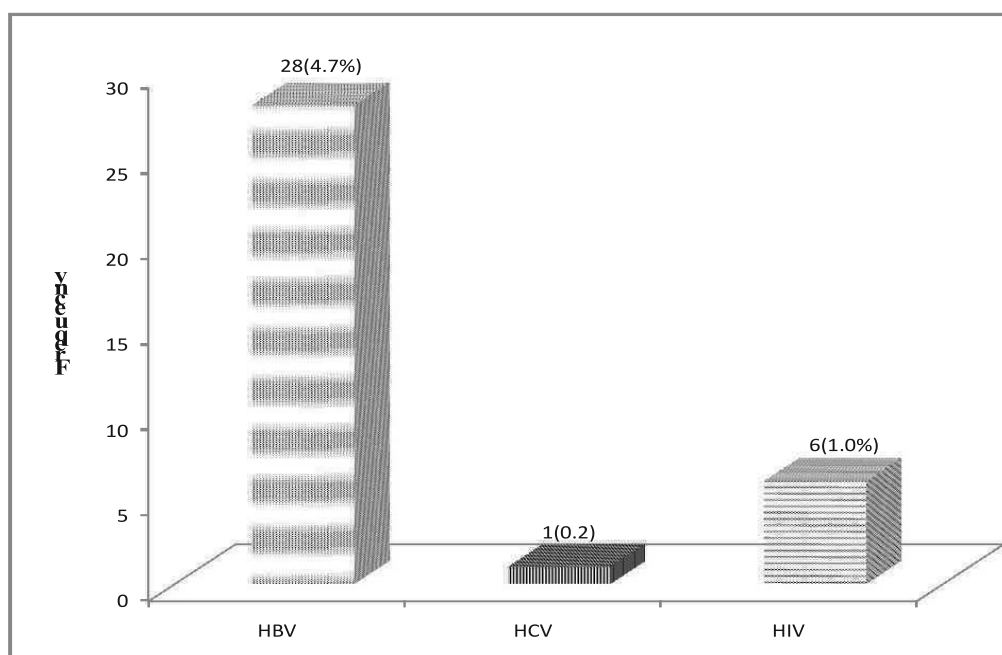


Figure 1: Prevalence of Transfusion Transmissible Infections

Discussion

Transfusion transmissible infections pose great threat to blood transfusion safety especially in sub-Sahara Africa and other developing countries due to limitation in donor blood screening, quality control measures and lack of altruism towards blood donation. The blood donor selection criteria and donor blood screening may offer some relief from the risk of TTIs but there is need for improvements in providing services aimed at reducing this risk. The mean age of the subjects was 21.98 ± 5.17 years (ranging from 18 to 63 years). 59.8% of our subjects were male. This finding is comparable to report of study done by Olookoba *et al* in which the age range of their subjects was 18-60yrs with a predominant male population.

The Prevalence of HBV infection in our study was found to be 4.7% and this was comparable to the prevalence of 4.0% revealed by Abdalla *et al* in Kenya.²² Ejileet *et al* in Southern-south and Olookoba *et al* in Maiduguri, Borno state of Nigeria however reported lower values of 1.1% and 2.4% respectively among voluntary blood donors.^{23,6} Higher prevalence rate of 10.9%, 10.6% and 13.2% was revealed by Shittuet *et al* in North-central, Esumeh FI *et al* in Southern South and Fasola *et al* in South West Nigeria respectively.^{5,24,25}

These studies with higher prevalence of HBsAg compared with our study were carried out among blood donors that includes voluntary, family replacement and paid donors), thus confirming the importance of ensuring blood donation from the low risk non-remunerated voluntary blood donors in which the prevalence of HBsAg was comparatively lower as shown in our study.

We found the prevalence of HBC in our study to be 0.2%, and is comparable to the prevalence of 0.2% and 0.5% recorded by Abdalla *et al* in Kenya and Ejele *et al* in Southern Nigeria respectively.^{22,23} The HBC prevalence in our study was lower than report of similar studies conducted by Matte *et al* in Southern, Nigeria and Nwodedruko *et al* where a prevalence of 3.0% and 3.9% respectively were reported.^{26,27} There were significant differences in the reported prevalence of both hepatitis B and C infection across the different geo-political zones in Nigeria and globally and this could be due to differences in immunization coverage, the methodology adopted for screening, geographical locations and more importantly the socio-cultural behaviours including sexual practices, use of tattoos, etc.

The implementation of serological testing of blood donors has contributed significantly to reduction in transmission rate of both hepatitis B and C in Nigeria and other developing countries.²⁸ So much needs to be done to improve the accuracy of testing. Although, enzyme immunoassay technique was use for the detection of both hepatitis B and C of voluntary blood donors in our study which is more accurate than rapid kits test used in most of the studies on TTI in Africa, most blood donation centers in Nigeria and Sub-Sahara Africa rely more on the use of rapid test kit for screening tests. However, there is a need for routine validation of the test kits used for blood donors screening in sub-Sahara Africa since the precision of rapid test kits is less compared to Enzyme immunoassays and Nucleic acid testing which may be too expensive for use in developing countries.²⁹

Our study reported a prevalence of 1.0% for HIV 1 and II and this was similar to a figure of 1% and 0.87% reported among blood donors by Ejele *et al* in South-South and Ogunkolo *et al* in Southwest, Nigeria respectively^{23,30} However, it was lower than 1.5% found in Nigeria by UNAIDS.¹³ Higher prevalence of 3.1% for HIV was reported by Buseri *et al* among blood donors in Osogbo, Osun state, Nigeria.¹⁷ Amadi *et al* revealed a much higher figure of 10.6% in Aba, South-east, Nigeria.³¹ Ampofo in a similar study carried out in Ghana found a figure of 3.8%.³² The observed variations in HIV prevalence may be related to differences in some risk behaviours like; sexual practices, use of scarification marks, awareness programs, level of education and the safety measures adopted in centers in charge of blood transfusion services.

About 10% of HIV infection recorded in Nigeria resulted from blood transfusion.³³ The limitation of detection of HIV during window period with the use of rapid screening kit and ELISA is of great concern and this can be ameliorated with the adoption of Nucleic acid testing as this will enhance improvement in the safety services. Also the transfusion of blood should be carried out only when it is absolutely necessary as there is no zero risk in blood transfusion. The prevalence of Syphilis in our study was found to be 0%. Similar result was obtained from the study carried out by Buhari *et al.* in Sokoto, North-western Nigeria.³⁴ Ejele *et al* in Niger-Delta of Nigeria, Yusuf M in Ethiopia and Kamande MW *et al* in Kenya recorded a prevalence of 0.1% respectively.^{35,36,37} Shittu *et al* in Ilorin, Nigeria, reported a prevalence of 0.84% while Damulak in Jos reported a figure of 0.9%.^{38,39} Salawu in Ile-Ife, South-West and Chikwem *et al* in Maiduguri, North-Eastern, Nigeria recorded a higher figure of 2.6% and 3.6% respectively.^{40,41} The observed variation found in the prevalence of syphilis in our study in contrast with other similar studies could be related to differences in geographical location, methodology and risk behaviours. The serological tests commonly used for blood donor screening for syphilis could be specific or non-specific. The specific test includes Treponema Pallidum Particle Agglutination Assay (TPPA) and Treponema Pallidum Haemagglutination Assay (TPHA) while the non-specific includes the Rapid Plasma Reagin (RPR) and the Venereal Disease Research Laboratory (VDRL). There are differences in sensitivity of above listed test for Syphilis.

Conclusion: The recorded prevalence of hepatitis B virus and that of HIV were moderately high when compared with that of Hepatitis C and that of syphilis among voluntary blood donors although much lower than in the family replacement and among commercial

donors of blood. To achieve significant improvement on blood transfusion safety, careful selection of donors among populace is mandatory. Awareness among the general public on immunization for hepatitis B virus, quality control of screening methods and the use of blood for transfusion only when needed are all essential strategies to achieving safe blood transfusion practices.

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