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Seroprevalence of transfusion transmissible infections among blood donors attending the Federal Medical Centre, Bida

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ABSTRACT

Transfusion transmissible infections, particularly the viral agents, insufficient supply of blood/blood products and continuous patronage of paid donors are some of the challenges inimical to ensuring blood safety in most Blood Banks in Nigeria. The objective of this study is to estimate the seroprevalence of transfusion transmitted infections among blood donors attending the federal medical centre, Bida. This is a cohort study of blood donors presenting at the blood transfusion unit of the Federal Medical Centre Bida. The study was designed for a duration of six months (between January 2011 and June 2011). Eight hundred of the Blood donors selected through simple random sampling were screened for hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV), using rapid kits. Haemoglobin concentration was determined using automated blood cell analyzer. The outcome of HIV screening using rapid screening kits was reaffirmed by Enzyme linked immunosorbent assay technique (ELISA). Of the eight hundred blood donors, young adults (18-33 years) were 75.6% while the middle age/elderly (50-65) were 1.4%. The mean age was 29.6 ± 6.9 years (range 18-65). The overall prevalence of HBV, HIV and HCV infections were 14.4% (CI_{95}: 12.0%-17.0%), 1.0% (CI_{95}: 0.4%-2.0%), and 3.9% (CI_{95}: 2.7%-5.5%). The Prevalence of transfusion transmissible viruses is still very high in Nigeria when compared with other developing countries with very similar challenges. This cannot be unconnected with the high level of poverty contributing to the emergence of paid donors that continue to form over 70% of the blood donor pool. This challenge needs to be addressed in order to ensure blood and blood product safety.

INTRODUCTION

Transfusion of whole blood and its components is life saving but may be accompanied by life threatening events. Millions of lives are saved through blood transfusion with attendant risk of acquiring transfusion transmissible infections (TTIs) (Buseri et al., 2009).

TTIs can be classified as viral, bacterial and parasitic infections. The most commonly encountered transfusion infection is of viral origin. In many cases, post transfusion diseases have been caused by human immunodeficiency virus (HIV), hepatitis B and C virus. The mode of transmission of these viruses is similar including transfusion of infected blood and blood products, unsafe sex, use of sharp needles contaminated with body fluid,

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cultural and behavioral practices (circumcision, tattooing, etc) and mother to child (Fessehaye et al., 2011; Leena and Mohd., 2012; Koate et al., 2005; www.news-medical.net/health/History-of-Blood-Transfusion.aspx; Ejele et al., 2006).

There is a 1% chance of transfusion associated problems including transfusion transmissible viral infections (Kaur et al., 2010). Malaria infestation through blood transfusion is particularly relevant in areas where these parasites are non-endemic, particularly the non-tropical countries. According to the World Health Organization (WHO) Global Database on blood safety, 20% of the global population residing in the developed countries has access to 80% of safe blood supply whereas 80% of the population residing in the developing countries has access to only 20% of safe blood (www.searo.who.int/en/section10/section17/section58/section225.htm). TTIs remain a major threat to safe blood transfusion particularly in countries where the prevalence rate is high. As a result of this, coupled with inadequate supply of donor blood, the WHO, in accordance with world health assembly resolution 28.72 (adopted in 1975), made recommendations that member states develop national blood transfusion services based on voluntary non-remunerated regular blood donation (https://apps.who.int/dsa/cat98/blood8.htm).

Many countries including Nigeria have established National Blood Transfusion Service (NBTS) aimed at attaining 100% voluntary blood donation, ensuring adequate supply; and by extension, providing safe blood devoid of TTIs. Unfortunately, as at 2008, only 62 of 124 countries surveyed, excluding Nigeria, had met WHO target for all blood donors to be volunteers (Koate et al., 2005).

The NBTS, established in Nigeria in 2005, is yet to attain or be seen to have strategic mechanism to effectively coordinate blood transfusion activities occurring at various levels of health care delivery. This situation continues to allow hospitals both in the public and private sector to source its blood supply in accordance with their local demands. As a result of this trend, various hospitals are continually challenged by factors such as TTIs, blood donor types, and availability of blood/blood products.

This cohort study, based on these continuous challenges, was aimed at determining the seroprevalence of transfusion transmissible viral infections among blood donors attending the blood transfusion unit of this tertiary institution which serves as one of the referral centre in the North central region of Nigeria and to re-establish the category of blood donors in this setting. Its findings will be used to make appropriate recommendations to the relevant authority.

MATERIALS AND METHODS

This study was done at the Blood Transfusion Unit of the Department of Haematology and Blood Transfusion, Federal Medical Centre Bida, Niger State, Nigeria over a period of six months (between January and June 2011).

Inclusion Criteria

- Apparent healthy donors
- Haemoglobin concentration of ≥12.5 g/dl for females and ≥13.5 g/dl for males

Exclusion Criteria

- Donors <18 years and >65 years.
- Body weight <50 Kg
- History of jaundice, blood transfusion, sickle cell disease and hypertension

Study design

This is a cohort study of Blood donors presenting at the blood transfusion unit of the Federal Medical Centre Bida. Eight hundred (800) of the Blood donors were selected through simple random sampling.

Study population

The following category of blood donors were considered for the study:

Voluntary donor: - Non-remunerated blood donors who routinely donate their blood in accordance with minimum time interval at the same donation centre.
Family replacement donor: - Usually a friend or family member of recipient who donates blood to replace stored blood transfused to a love one, ensuring a consistent supply.
Paid donor: - Are blood donors who get paid by patients or recipient's relation(s) in attempts to secure blood for their transfusion.
Directed donor: - Are often family members; donates blood for transfusion to a specific individual.
Autologous donor: - Donating one's own blood prior to an elective surgical or medical procedure.

Sample size

The sample size of 800 donors gives 80% power to detect as statistically significant at the 5% level, an increase from 2% in the unpaid donors to 6% in the paid donors in the prevalence of a TTI, assuming that approximately 60% of donors are paid.

Every blood donor who met the inclusion criteria was recruited and the purpose of study adequately explained to the participants. Informed consent was obtained after the initial pre-test counseling. The characteristics of

individual donors were determined through the administration of a structured questionnaire. For donors who could not read or write, assistance on the content of the questionnaire was offered by qualified laboratory personnel. An interpreter was employed to convey the necessary information whenever a communication barrier was envisaged. Post test counseling was also offered while maintaining confidentiality of all participating blood donors.

Ethical approval for this study was obtained from the ethical committee of the hospital.

Sample collection and serological testing

After applying standard antiseptic technique, a total of 5.0 ml of venous blood sample was obtained from the ante-cubital vein of each individual donor by a phlebotomist. The samples were distributed as follows; 3.0 ml was introduced into plain sample bottles for the purpose of screening for HIV, hepatitis B surface antigen (HBsAg) and HCV antibody while 2.0 ml was introduced into EDTA vacutainers for estimation of haemoglobin (Hb) concentration estimation.

The collected serum samples were screened according to the manufacturers' standard operational procedure for HBsAg, antibody to HCV, and HIV I and II using the following screening kits: HBsAg kits (ACON Laboratories, Inc. USA), HCV kits (ACON Laboratories, Inc. USA), Uni-Gold HIV I and II kits (Trinity Biotech Plc. Ireland), Chembio HIV I/2 STAT- PAK (Chembio diagnostic system Inc. USA) and Determine HIV I/II kits (Alere Medical Co. Ltd. Japan). The outcome of HIV screening using rapid screening kits was reaffirmed by enzyme linked immunosorbent assay technique (ELISA).

Haemoglobin level was determined using the automated haematology counter KX 21N model.

Statistical analyses

The data were summarized by the use of descriptive statistics to describe all blood donor categories with regard to age, sex, prevalence for TTIs and to obtain confidence intervals where appropriate. All data analyses was performed using SPSS version 14 software using Pearson Chi-square test. The statistical significance of the data was based on a p-value of ≤0.05.

RESULTS

Results of 800 (787 males and 13 females) blood donors were analyzed (Table 1). Of the 800 donors, young adults (18-33 years) formed the largest group (75.6%) while the middle age/elderly (50-65) (1.4%) constituted the least group. The ages of donors ranged from 18-65, mean 29.6 (SD 6.9) years (Table 2) (Figure 1).

Table 3 and Figure 2 show HBsAg, HCV and HIV seroprevalence status among different category of blood donors screened for TTIs. The percentages prevalence of viral infections among blood donors, stratified by donor type, was consistently higher in the paid donors in relation to other blood donor types. The difference in the positive status between paid and unpaid blood donors was statistically significant except in HCV category (Table 3).

Table 4 show Donors with dual infections. The prevalence in this category is 2% (CI_{95}: 1.0-3.3%). The difference in proportion of paid donors positive for dual infections was not statistically significant (p= 0.19) when compared with other groups.

The overall prevalence of HBsAg, HIV and HCV infections were 14.4% (CI_{95}: 12.0-17.0%), 1.0% (CI_{95}: 0.4-2.0%) and 3.9% (CI_{95}: 2.7-5.5%), respectively (Table 3).

DISCUSSION

Safe blood transfusion through sole involvement/ recruitment of voluntary non-remunerated blood donor remains a challenge in the developing countries despite continuous efforts by health professionals and organizations at reducing or eliminating the patronage of paid donor (www.news-medical.net/health/History-of-Blood-Transfusion.aspx).

Ensuring safe blood transfusion requires a number of standardized processes from recruitment of voluntary non-remunerated donors to delivery of safe blood to the recipient (www.who.int/bloodsafety; Ado et al., 2010; www.medindia.net/patients/patientinfo/blooddonation.htm ; Manzoor et al., 2009; https:// apps.who.int/dsa/cat98/blood8.htm). It is therefore mandatory that blood to be transfused is free from TTIs particularly the viral infections. Through various studies, blood donor groups other than non-remunerated voluntary donors have been identified to be of high risk for TTIs (Leena and Mohd, 2012; Diro et al., 2008; Gurol et al., 2006). Attempts to ensure the availability of blood/blood products and curb high morbidity/mortality incidences associated with TTIs underscores the WHO strategic policy and recommendations at the World Assembly, therein urging member nations to promote the development of National Blood Transfusion Service which would propel every country towards attaining the target of engaging 100% voluntary non-remunerated blood donors (www.who.int/bloodsafety/BTS_ResolutionsAdopted.pdf). The high prevalence of HBsAg and HCV (14.4% and 3.9%) recorded in this study agree with prevalence rates obtained from similarly defined populations (Buseri et al., 2009; Koate et al., 2005; Erhabor et al., 2006; Fernandes et al., 2010; Uneke et al., 2005). These findings however are at variance with a similar study by Manzoor et al.

Table 1. Blood donor characteristics.

Parameter	Gender		Locations	
	Male	Female	Rural	Urban
Paid	497(63.2)	0(0.0)	433(63.4)	64(54.7)
Voluntary	64(8.1)	6(46.2)	40(5.9)	30(25.6)
Family replacement	206(26.2)	7(53.8)	194(28.4)	19(16.2)
Directed	20(2.5)	0(0.0)	16(2.3)	4(3.4)
Total	787(98.4)	13(1.6)	683(85.4)	117(14.6)

Table 2. Age distribution of donors screened for TTIs.

Age Group	Paid		Voluntary		Family replacement		Directed		Total
	No	(%)	No	(%)	No	(%)	No	(%)	
18 – 33	380	62.8	51	8.4	161	26.6	13	2.1	605
34 – 49	112	60.9	16	8.7	49	26.6	7	3.8	250
50 – 65	5	45.5	3	27.3	3	27.3	0	0.0	11
Total	497	62.1	70	8.8	213	26.6	20	2.5	800

Table 3. Viral TTIs status among blood donors.

	HBsAg		HCV		HIV	
	Pos	Neg	Pos	Neg	Pos	Neg
	No(%)	No(%)	No(%)	No(%)	No(%)	No(%)
Paid	84(16.9)	414(83.1)	24(4.6)	475(95.4)	8(1.6)	490 (98.4)
Voluntary	6(8.3)	64(91.4)	2(2.9)	68(97.1)	0(0.0)	70(100)
Family replacement	23(10.8)	189(89.2)	6(2.8)	206(97.2)	0(0.0)	212(100)
Directed	2(10.0)	18(90)	0(0.0)	20(100)	0(0.0)	20(100)
Total	115(14.4)	685(85.6)	32(3.9)	769(96.1)	8(1.0)	792(99.0)
	P=0.006		P=0.158		P=0.026	

Table 4. Donors with dual infections (HIV and HBsAg or HBsAg and HCV or HIV and HCV).

Donor type	Positive subjects	Negative subjects	Total
	No(%)	No(%)	
Paid	13(2.6)	485(97.4)	498
Voluntary	1(1.4)	69(98.6)	70
Family replacement	2(0.9)	210(99.1)	212
Directed	0(0.0)	20(100.0)	20
Total	16(2.0)	784(98.0)	800
P=0.19			

(2009) and Salawu et al. (2010). A much lower prevalence rate for HBsAg and HIV/HCV (0.34% and. 0.06%) was also recorded in a study by Fernades et al. (2010), although these studies were conducted among voluntary and replacement donors who can account for the lower prevalence.

Prevalence of TTI among different category of blood donors was noticed to be higher among the paid donors in this study. This finding is similar to figures obtained from studies carried out in other Centres (Buseri et al., 2009; Diro et al., 2008). The finding together with the significant population of paid donors in comparison with the other groups in this study signifies (by extension) that Nigeria- like other developing countries- is yet to meet

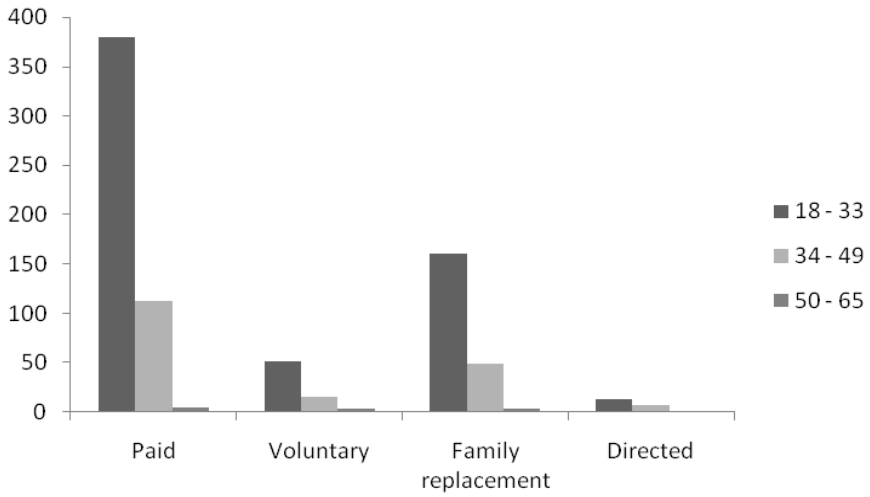

Figure 1. Age distribution of blood donor types.

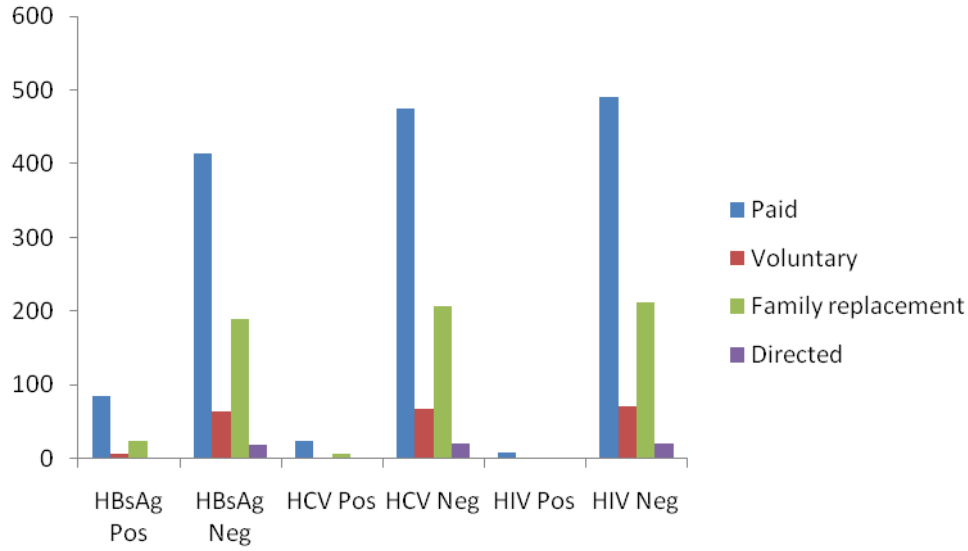

Figure 2. Prevalence rate of viral TTI among blood donors.

the global call of ensuring that blood donors should solely be volunteers. This study also shows that majority of blood donors (85%) come from the rural setting indicating the need for more awareness and rigorous campaign at the grassroots to change the mindset of these rural dwellers who often sees blood donation as more of a trade (to make money) than a humanitarian venture.

Paid donors still constitute a significant pool of those who donate blood in most Health Centres as evident in this study. Sixty-two percent (62%) of participants studied were paid donors and the majority within the sexually active age bracket of 18-33 years. Only a handful of participants (8.8%) were voluntary non-remunerated blood donors.

An interesting finding in this study is the fact that among the voluntary non-remunerated donors, 2.9% and 8.6% were also reactive to HCV and HBsAg, respectively which agrees with similar findings by Kaur et al. (2010). This indicates that the policy of 100% volunteers is relevant in Nigeria only among low risk urban dwellers where awareness of mode of transmission of viral infections is high and risky behavior is at the lowest ebb. In a rural setting, a significant level of risky behavior still flourishes due to a number of social/traditional factors;

namely cultural practices of local circumcision, tattooing, skin and lip piercing, unsafe sex practices, lack of access to modern health facilities and health education /information.

To ensure a safe and regular supply of blood, sole involvement of voluntary non-remunerated blood donors from a low risk population, should be made mandatory at donor recruitment stage by every hospital in the country. This policy to a large extent will improve the country's level of compliance to the WHO's recommendation, reduce the dependence on paid donors, and significantly reduce the population of those in the window period escaping early screening detection.

The National Blood Transfusion Service, as recommended by the WHO, needs to further establish more linkages with hospitals all over the country. There is the need to also re-strategize on how to maintain such linkages for effective coordination in terms of demand and supply of blood and blood products.

Ineffective coordination and lack of workable guidelines are some of the impediments responsible for the slow pace at ensuring regular supply of blood and blood products to every health facility and attaining significant level of compliance/implementation of the WHO Assembly resolution/recommendation 28.72 (Gurol et al., 2006).

Wherever inadequate supply is envisaged or inevitable, local blood banks could be empowered with strict guidelines that would enable them embark on donor drives based on WHO recommendation of engaging voluntary non-remunerated blood donors.

LIMITATIONS

The major limitation of this study is the fact that there is no previous study and or data available in this locality for comparison. The prevalence rate of HBV and HCV in this study could have been underestimated due to those in the window period that might have escaped detection. Therefore, the introduction of screening for hepatitis B core antigen and the use of nucleic acid testing are advocated in hospital blood banks and future studies in order to ascertain blood safety as well as the actual burden of TTIs in this locality.

CONCLUSION AND RECOMMENDATIONS

Prevalence of TTIs is still very high in Nigeria when compared with developing countries with very similar challenges like India and Pakistan. This cannot be unconnected with the high level of paid as well as family replacement donors that continue to form over 70% of the blood donor pool. This challenge needs to be addressed in order to ensure the safety of the users of this natural gift.

Hospitals engaging in blood banking / transfusion medicine should endeavor to introduce hepatitis B core antigen screening, as well as nucleic acid amplification testing for HCV and HIV to enhance detection of these agents during the window period.

Hospital transfusion committee needs to be established in all secondary and tertiary hospitals to streamline the process of blood screening/donation. This policy will significantly minimize the population of paid donors patronizing various centres.

Finally, the 2020 target date for all to attain 100% of voluntary non-remunerated donors is achievable if member nations show more commitments to various recommendations**.**

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