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Blood Safety and Prevalence of Transfusion Transmissible Viral Infections Among Blood Donors in Lagos, Nigeria

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Abstract: Screening for Transfusion Transmissible Infections (TTI) agents is a routine practice globally to guaranty the safety of blood and products supply. The screening records of all blood donors from Febuary 2011 to August 2013 were evaluated with respect to screening outcome for HBsAg, anti-HIV, anti-HCV and VDRL. Rapid test kits were used for all screening. Prevalence rates were calculated for the TTIs per hundred donations. Of the 4,510 donors bled, 9.80% were positive for HBsAg, 1.37% for anti HIV, 0.84% for anti-HCV and 1.10% for VDRL. Sixteen of those rejected had multiple infections. TTIs are still prevalent in the blood donors and the observed multiple co-infection in some of the donor reinforces the common route of transmission of these TTIs. The transfusion transmissible viruses is still very high in Nigeria when compared with other developing countries with very similar challenges. Paid donors continue to form 80% of the blood donor pool. The complications of TTIs are of great importance both financially and in terms of mortality and morbidity because of frequency and severity of viral infections in these blood donors. It is recommended that periodic screening of donors be undertaken to permit early detection and treatment of the viral infection.

Key words: Blood safety, blood donor, transfusion transmissible infections, prevalence rates, mortality

INTRODUCTION

Monitoring the trends in prevalence of transmissible infections agents in blood donors will provide a mechanism to evaluate the safety of the blood supply. Increase in incidence and prevalence rate of an infections disease agent may reflect changes in population risks may result from the introduction of new screening technique or confirmatory method which results improved detection of infected individuals an increased number of false positive result or both (Glynn *et al*., 2000).

Transfusion of whole blood 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) screening for Transfusion Transmission Infections (TTI) agents is a routing practice globally to guaranty the safety of blood and blood products supply. To improve on the safety of the blood being donated, other measures such as the use of stringent donor selection criteria and exclusion of those with clinical and theoretical risks of caring infections agents by the use of questionnaire have also been adopted by many blood banks use of more sensitive screning methods that may detect infections agents during the window period with the use of nucletic acid testing. Particularly in advance economic (Polizzotto *et al*., 2008; Glynn *et al*., 2000) and encouragement and maintenance voluntary non-remunerative pool of blood donors.

TTIs can be classified as viral, bacterial and parasitic infections. The most commonly encountered transfusions infection is of viral origin. In many cases, post transfusion disease have been cause by Human Immune deficiency Virus (HIV), hepatitis B and C virus. The mode of transmission of this virus is similar including transfusion of infected blood and blood products, unsafe sex use of sharp needles contaminated with body fluid, cultural and behavioral practices (circumcision, tattocing, etc.) and mother to child (Fessehaye *et al*., 2011; Leena and Mohd, 2012; Koate *et al*., 2005; Erhaborm *et al*., 2006). Therefore, the present research was carried out to determined the safety and the prevelence of HBsAg, VDRL, HCV and HIV antibodies positivity among blood donors over a period of 30 months between February 2011 and August 2013 in Lagos South-Western Nigeria.

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MATERIALS AND METHODS

This study was done at the blood transfusion unit of the Laboratories Centre in Lagos State, Nigeria over a period of 30 months (between February 2011 and August 2013).

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.

Paid donor: Paid donor are blood donors who get paid by patients or recipients relation (s) in attempts to secure blood for their transfusion.

Finally replacement donor: Usually a friend or family member of recipient who donates blood to replace stored blood transfusion to a love one, ensuring a consistent supply.

Directed donor: Directed donor are often family members; donates blood for transfusion to a specific individual.

Sample size: The sample size of 4,510 donors gives 90% power to detect as statistically significient 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 80% of donors are paid.

Laboratory methods: HIV status of donors were determined by HIV-1/2 ABBOTT-Japan an immune chromatograhic test kit with 97.96% specificity and 100% sensitivity-invalid result were further tested using UNI-GOLD (Trinity Biotect PLC, Ireland) with 99.70% specificity and 100% sensitivity and/or GENE II HIV-1/HIV-2 (BIO-RAD-France) which according to the manufacturer has 100% specificity and sensitivity, before being finally rejected, HBsAg status was determined using commercially available third generation clinotech HBsAg test strips (Clinotech Diagnostic, Canada) which is an immune chromatographic test designed for quanlitative defermination of hepaths B surface antigen in plasma and serum. It has a sentivity of 99.8% and specificity of 100%. Anti-HCV was similarly tested using commercially available anti-HCV clinotech diagnostics, Canada). Antibodies (IgG and IgM) to syphilis were tested in donor samples using syphillis ultra rapid test strip 2 (Global strips which USA) WHICH utilizes a double antigen combination of a syphilis antigen immobilized on the membrane to detect *Treponema pallidum* antibodies (IgG and IgM) qualitatively and selectively in whole blood serum or plasma. It has a sensitivity of 99.7% and specficify of 99.6%.

RESULTS

Of the total 4,510 donors screened during the 2.5 years under review, 592 (13.13%) were infected by one or more blood transmissible infectious agents and were rejected which also meant that approximately one out of every nine prospective donors were rejected. Out of the total units rejected, hepatis B virus infection accounted for 71.28% (422). HIV infection for 10.47% (62). Hepatitis C virus infection for 6.2% (38). White syphilis accounted for 8.45% (50) (Table 1 and 2). Sixteen (2.70%) of those rejected were multiple infected by two or three infectious agents (Table 3).

The prevalence rate per hundred units of prospective donors screened for HBsAg were 10.20% for 1.38% for anti-HIV, 0.87% for anti-HCV and 1.18% for VDRL. There was a gradual decline in the prevalence rate of VDRL from 1.27% in 2011 to 0.44% in 2012 and then increase to 1.83% in 2013. A similar pattern was recorded for anti-HIV (Fig. 1) which declined from 1.48% in 2011 to 1.14% in 2012 but rose to 1.54% in the first half of 2013. Anti-HCV prevalence fluctuated greatly throughout the period under study (Fig. 1): rising from 0.63% in 2011 to 1.01% in 2012

Table 1: Donor screening: number and percentage seropositive for the transfusion transmissible infectios

	Total				
Years	Donors (%)	HIV(%)	HBsAg (%)	HCV (%)	VDRL (%)
2011	1895 (42.0)	28 (1.48)	168 (8.87)	12 (0.63)	24 (1.7)
2012	1579 (35.0)	18 (1.14)	142 (8.99)	16 (1.01)	7 (44)
2013	1036 (23.0)	16 (1.54)	132 (12.74)	10 (0.97)	19 (1.83)
Total	4510	62 (1.37)	442 (9.8)	38 (0.84)	50 (1.1)

Table 2: Blood donor characteristics

	Gender (%)		Location (%)	
Parameters	Male	Female	Rural	Urban
Paid	3825 (86.3)	6 (0.12%)	391 (8.67)	3440 (76.27)
Voluntary	96 (2.2)	2727	76	47 (1.04)
Family				
Replacement	460 (10.3)	0.93	365 (8.9)	137 (3.04)
Directed	53 (1.2)	1 (0.2)	40 (0.89)	14 (0.31)
Total	4434 (98.3)	76 (1.7%)	872 (19.3)	3638 (80.7%)

Table 3: Various combinations of multiple infections

Infections	No.	Percentage
HBsAg and HCV	7	43.8
HBsAg and HIV	4	25.0
HBsAg and syphilis	3	18.8
HIV and syphilis	1	6.2
HBsAg, HCV and syphilis	1	6.2

Table 4: Viral transfusion transmissible status among blood donors

	HBsAg (%)		HCV (%)		HIV (%)		VDRL (%)	
Status	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.
Paid	374 (9.8)	3457 (90.2)	28 (1.0)	3793 (99.0)	53 (1.4)	3778 (98.6)	43 (1.1)	3788 (98.9)
Voluntary	5 (4.0)	118 (96.0)	3 (2.4)	120 (97.6)	3.0 (2.4)	120 (97.6)	1 (0.8)	122 (99.2)
Family	40 (8.0)	462 (92.0)	6 (1.2)	496 (98.8)	6 (1.2)	496 (98.8)	5 (1.0)	497 (99.0)
Replacement								
Directed	3 (5.6)	51 (94.4)	1 (1.9)	53 (98.1)	-	54 (100.0)	1 (1.9)	53 (98.1)

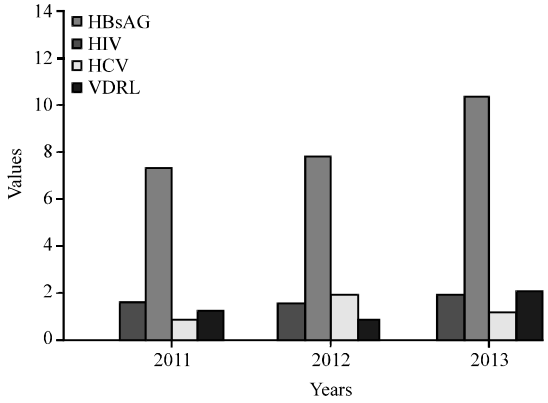

Fig. 1: Yearly distribution and percentage seropositive for TTI

then decreaseing to 0.97% in 2013 also the same fluctuated occure in VDRL 1.27, 0.44 and 1.83%, respectively. Sixteen donors had multiple infections: 5 donors in 2011, 3 donors in 2012 and 8 donors in 2013 of these 43.8% were infected with hepatitis B and C, 25.0% with hepatitis B and HIV, 18.8% with hepatitis B and syphilis 6.2% with Hivand syhillis while another 6.2% has triple infections of hepatitis B, C and syphilis (Table 4).

DISCUSSION

In this study, researchers found a high prevalence of transfusion transmissible infections in blood donor candidates in Lagos and in particular 80% in paid donors. It is therefore important to continue to monitor the trend in the prevalence of Transfusion Transmissible Infections (TTIs) so as to assess the risk of TTTIs in the pool of donors and by inference, the risk in the general population receiving such blood, bearing in mind the possibility of bleeding donors during the window period when they may be negative to the routine screening for antigen antibody to infection being screened for. Seroprevalence of Human Immune deficiency Virus (HIV). Hepatitis B surface antigen (HBsAg), syphilis (VDRL) and hepatitis C antigen (HCV) was 1.37, 9.8, 1.1 and 0.84%, respectively and 16 (2.70%) of those rejected were multiply infected by two or three infections agents. The prevalence for HBsAg is higher than what was obtained from on earlier study done about 3-5 years ago in Nigeria (Salawu and Murainah, 2006; Salawu *et al*., 2010). Although, the yearly prevalence showed a upwards trends from 2011 through in 2012, it is still above the value of 5.48% obtained in 2004 (Table 1 and Fig. 1). The value is similar to prevalence reported from other centres in Nigeria. Prevalence rate of 14.30% was reported from Jos, 13.22% from Ibadan and 21.70% from Ilorin (Uneke *et al*., 2005; Fasola *et al*., 2008; Bada *et al*., 1996). In other sub-saharan.

African countries, 15% has been reported from Ghana (Ampofo *et al*., 2002), 8.2% from Ethiopia (Diro *et al*., 2008), 14.0% from central African Republic (Pawlotsky *et al*., 1995) and 8.8% from Tanzania (Matee *et al*., 2006) suggesting that values obtained from Nigerian studies are not significantly different from some other sub-Saharan African countries where hepatitis B infection is said to be endemic (Kupski *et al*., 2008). This is unlike what were obtained in other part of the world such as Australia with 0.01 (Polizzotto *et al*., 2008), Iran with 0.56% (Kafi-Abad *et al*., 2008), India with 0.66% (Gupta *et al*., 2004), Saudi Arabia with 1.5% (El-Hazmi, 2004) and Turkey with 2.55% (El-Hazmi, 2004).

The use of HIV-p 24 antigen testing has also greatly reduced the residual risk of HIV infection from 0.38-0.24 per million (Chiavetta *et al*., 2003) in developed economies. Unfortunately, this is not the case with most developing country like Nigeria that still depend on antibody screening methods. Therefore, so long as the resource-limited economics continue to transfuse anti-HIV negative blood which may be HIV infected as result of antibody screening during the window phase period the residual risk of HIV may continues to rise in the environment. The overall prevalence in this study for HIV was (1.37%) with the highest (1.54%) rate occurring in 2013 and lowest (1.14%) in 2012. The rates in the last 3 years are significantly lower than National value (5.0%) reported in 2004 following a sentinel survey (Federal Ministry of Health, 2004).

Rates below the sentinel value have also been reported in other centres in the country (Egah *et al*., 2007; Olatunji and Olawumi, 2006). Though the prevalence's in the centre has slightly increased compared with what was recorded 5 years ago (Salawu and Murainah, 2006), the

fact that it is still 1.37% is significant and showed that the efforts of both the various governments and non-governmental organizations are probably yielding good results at reducing the sourge of HIV/AIDS in Nigeria.

The sero prevalence of 0.84% obtained for anti-HCV is lower than what was obtained 5 years ago (Salawu and Murainah, 2006). It is also below figures obtained in some other parts of the country (Fasola *et al*., 2008; Egah *et al*., 2007; Ayolabi *et al*., 2006; Jeremiah *et al*., 2008; Onakewhor and Okonofua, 2009). In other sub-Saharan Africa countries, Matee *et al*. (1999) reported 8.0% in their study in Tanzania, 8.4% was reported by Ampofo *et al*., (2002) from Ghana. The 5.8% from Ethiopia (Diro *et al*., 2008), 5.0% from central African Republic (Batina *et al*., 2007) and 7.6% from Egypt (El Damaty *et al*., 2007). The trend, however, fluctuated greatly during the period under study (Table 1) paeking in 2012 ands first half of 2013. Such variation could be as a result of a combination of several factors including. A change in screening reagent used actual changes in population risks or effectiveness of prospective donor screening measures (Glynn *et al*., 2000).

The overall prevalence of antibody to syphilis in this study was 1.1% but showed a downward trend from 1.27% in 2011 when it was first started, to 0.44% in 2012 but in the first half of 2013 it was increase to 1.83%. The value obtained from this study is similar to the findings of Chikwem *et al*. (1994) from the Northern part of Nigeria who reported a value 3.6% in their blood donors. Similar high values have been reported in some African countries including Tanzania (4.7%) and Ghana (7.5%) (Matee *et al*., 2006; Adjei *et al*., 2003).

Prevalence of TTIs among different category of blood donors was noticed to be higher among the paid donors in this study. This funding is similar to figures obtained from studies carried out in other centers (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 that Nigeria-like other developing countries is yet to meet the global call of ensuring that blood donors should solely be volunteers. This study also shows that majority of blood donors (80%) come from urban setting indicating that there are more awareness. This is contrasts to the report of Amiwero *et al*. (2013) in Nigeria where rural setting was the most common blood donors.

Paid donors still constitute a significant pool of those who donate blood in most laboratory centers as evident in this study. The 85% of participants studied were paid donors and the majority within the sexually active age bracket of 20-35 years. Only a handful of participants (2.7%) was voluntary non-remunerated blood donors.

An interesting finding in this study is the fact that among the voluntary non-remunerated donors, 2.4 and 4.0% were also reactive to HCV and HBsAg, respectively which agrees with similar findings by Kaur *et al*. (2010).

CONCLUSION

Prevalence of TTIs is still very high in this study has shown that viral infection agents are still prevalent in the blood donors and that hepatitis B infection is endemic in the community. This cannot be unconnected with high level of paid as well as family replacement donors that continue to form over 80% of the blood donor pool. This challenge needs to be addressed in order to ensure the safety of the users of this natural gift. Laboratories and 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.

LIMITATIONS

The major limitation of this study is the fact that there is no sophisticated modern equipment like PCR and the use of nucleic acid testing. As a result the prevalence rate of HBsAg, HIV and HCV in this study could have been under-estimated due to those in the window period that might have escaped detection.

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