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Full Length Research Paper

HBsAg, anti-HCV, anti-HIV and VDRL in blood donors: Prevalence and trends in the last three and a half years in a tertiary health care facility in Ile-Ife, Nigeria

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The aim of this work is to evaluate the prevalence and trends of transfusion transmissible infectious agents in our blood donors. The screening records of all blood donors from January 2006 to June 2009 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 total 14,500 donors bled, 7.50% were positive for HBsAg, 0.96% for anti-HIV, 0.86% for anti-HCV, and 2.61% for VDRL. There was a gradual decline in the prevalence rate of HBsAg from 9.20% in 2006, to 8.37 in 2007 and 6.25% in 2008; with a rise in the first half of 2009 to 6.32%. Similarly, HIV prevalence declined from 1.44% in 2006 to 0.94% in 2007 and 0.66% in 2008 but rose to 0.96% in the first half of 2009. HCV prevalence fluctuated throughout the period under study. Prevalence of syphilis declined from 2.93% in 2008 to 1.92% in 2009. Twenty- seven of those rejected had multiple infections. TTIs are still prevalent in our blood donors and the observed multiple co-infection in some of our donor reinforces the common route of transmission of these TTIs.

Key words: Prevalence, transfusion transmissible infections, blood donors, teaching hospital, Nigeria.

INTRODUCTION

Screening for transfusion transmissible infectious (TTI) agents is a routine 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 exclu-sion of those with clinical and theoretical risks of carrying infectious agents by the use of questionnaire, have also been adopted by many blood banks; use of more sensitive screening methods that may detect infectious agents during the 'window period' with the use of nucleic acid testing, particularly in advanced economies (Polizzotto et al., 2006; Glynn et al., 2000), and encouragement and maintenance voluntary non-remunerative pool of blood donors.

Monitoring the trends in prevalence of transmissible in-fectious agents in blood donors will provide a mechanism to evaluate the safety of the blood supply. Increase in incidence and prevalence rate of an infectious disease agent may reflect changes in population risks; may result from the introduction of new screening technique or confirmatory method which results in improved detection of infected individuals, an increased number of false positive results, or both (Glynn et al., 2000). It is therefore the aim of this study to investigate the prevalence and trends in HBsAg, HCV, HIV and VDRL positivity in our blood donors over a period of 42 months between January 2006 and June 2009 in Ile-Ife, south-Western Nigeria.

MATERIALS AND METHODS

Donor population

The screening records of 14500 consecutive prospective, mainly replacement and remunerative, blood donors from January 2006 to June 2009 were retrospectively evaluated with respect to screening outcome for HBsAg, anti-HIV, anti-HCV and VDRL.

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

Year	Total donors (%)	HIV (%)	HBsAg (%)	HCV (%)	VDRL (%)
2006	3195	46 (1.44)	294 (9.20)	27 (0.81)	-
2007	4036	38 (0.94)	338 (8.37)	65 (1.61)	-
2008	4975 (2.93)	33 (0.66)	311 (6.25)	14 (0.28)	146
2009*	2294	22 (0.96)	145 (6.32)	19 (0.83)	44 (1.92)
Total	14500	139 (0.96)	1088 (6.32)	125 (0.83)	190 (1.92)

*****Value for the first six months of the year; (%), overall prevalence.

Table 2. Transfusion transmissible infections: multiple infections in donors.

Infection	2006	2007	2008	2009
HBV and HCV	5	3	1	2
HBV and HIV	2	0	4	3
HBV and VDRL	0	0	5	0
HIV and VDRL	0	0	1	0
HBV, HCV and VDRL	0	0	0	1

Table 3. Various combinations of multiple infections.

Infection	No.	%
HBV and HCV	11	40.7
HBV and HIV	9	33.3
HBV and syphilis	5	18.5
HIV and syphilis	1	3.7
HBV, HCV and syphilis	1	3.7

Laboratory methods

HIV status of donors were determined by Determine (HIV-1/2) (ABBOTT-Japan), an immunochromatographic test kit with 97.96% specificity and 100% sensitivity. Invalid results were further tested using UNI-GOLD (Trinity Biotech PLC, Ireland) with 99.70% specificity and 100% sensitivity and/or GENIE 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 Diagnostics, Canada), which is an immunochromatographic test designed for qualitative determination of Hepatitis B surface antigen in plasma and serum. It has a sensitivity 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 Syphilis Ultra Rapid Test Strip (Global Strips, USA), which utilises a double antigen combination of a Syphilis antigen immobilised 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 a specificity of 99.6%.

RESULTS

Of the total 14500 donors screened during the 3.5 years under review, 1542 (10.63%) 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, hepatitis B virus infection accounted for 70.56% (1088), HIV infection for 9.01% (139), Hepatitis C virus infection for 8.12% (125), while syphilis accounted for 12.32% (190) (Table 1). Twenty seven (1.75%) of those rejected were multiply infected by two or three infectious agents (Tables 2 and 3).

The prevalence rate per hundred units of prospective donors screened for HBsAg were 7.50% for 0.96% for anti-HIV, 0.86% for anti-HCV, and 2.61% for VDRL. There was a gradual decline in the prevalence rate of HBsAg from 9.20% in 2006 to 8.37 in 2007 and reaching its lowest level of 6.25% in 2008; only to peak up in the first half of 2009 to 6.32% (Figure.2). A similar pattern was recorded for anti-HIV (Figure 1) which declined from 1.44% in 2006 to 0.94% in 2007 and to reach its lowest level of 0.66% in 2008 but rose to 0.96% in the first half of 2009. Anti-HCV prevalence fluctuated greatly through-out the period under study (Figure 3): rising from 0.81% in 2006 to 1.61% in 2007, then decreasing to 0.28% in 2008, only to rise to 0.88% in the first half of 2009. The newly introduced VDRL test showed a downward trend from 2.93% in 2008 when it was introduced, to 1.92% in the first half of 2009 (Figure 4). Twenty seven donors had multiple infections: 7 donors in 2006, 3 donors in 2007, 11 donors in 2008 and 6 donors in the first half of 2009. Of these, 40.7% were infected with Hepatitis B and C, 33.3% with Hepatitis B and HIV, 18.5% with hepatitis B and syphilis, 7.4% with HIV and syphilis, while another 3.7% had triple infections of hepatitis B, C and syphilis.

DISCUSSION

Acquisition of transfusion transmissible infectious in the in the process of therapeutic blood transfusion is a major global health challenge in transfusion medicine; therefore no effort should be spared at reducing this complication to the barest minimum. It is particularly important because of the long term morbidity and mortality associated with infections caused by hepatitis B and C viruses, and HIV. It is therefore important to continue to

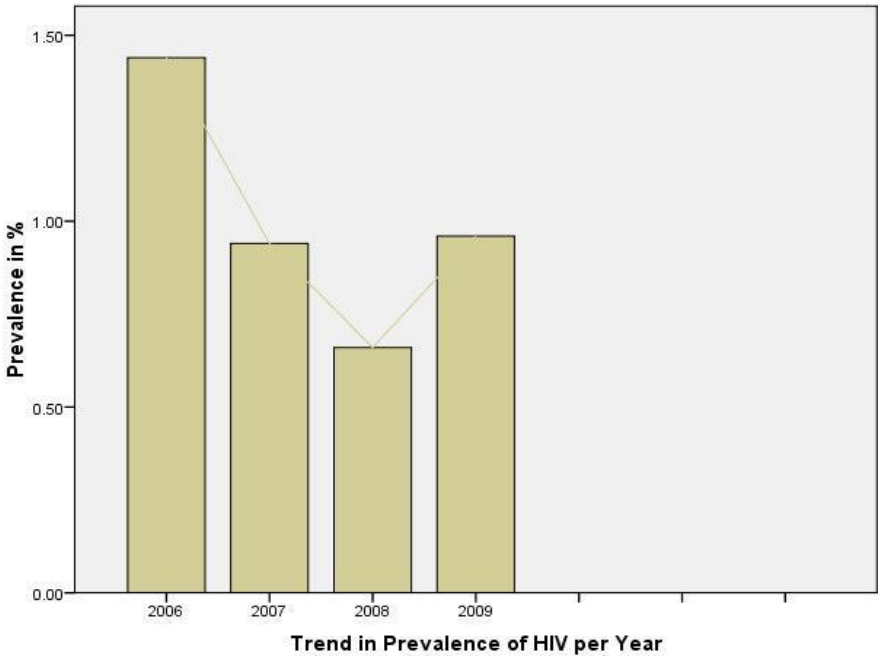

Figure 1. Trend in HIV prevalence in blood donors between 2006 and 2009 in Ile-Ife, South-western Nigeria.

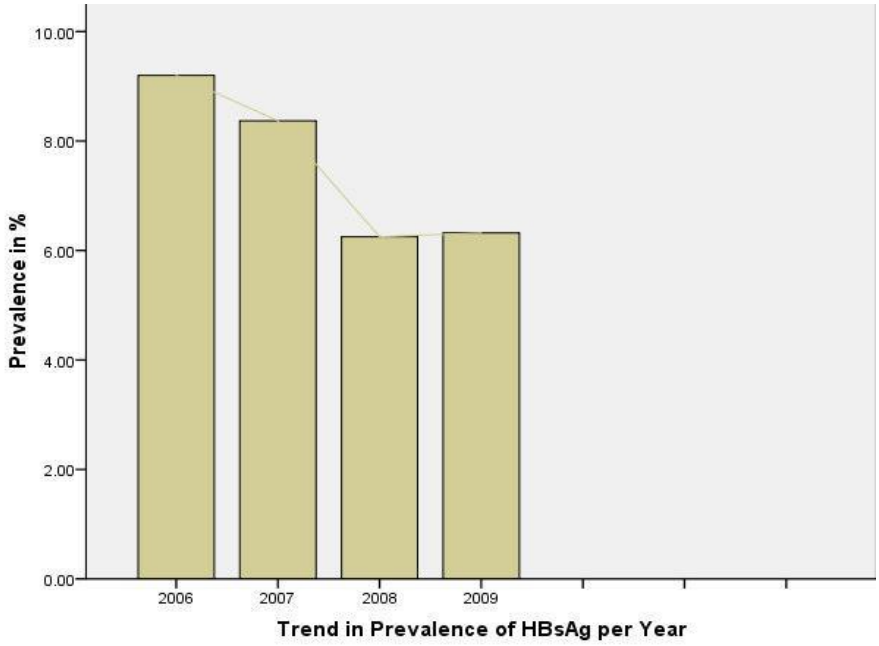

Figure 2. Trend in HBsAg prevalence in blood donors between 2006 and 2009 in Ile-Ife, South-western Nigeria.

monitor the trend in the prevalence of transfusion transmissible infections (TTIs) so as to assess the risk of TTIs in our 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 or antibody to infections being screened for.

The overall prevalence of HBsAg, HCV, HIV, and VDRL during the period under study was 7.50, 0.86, 0.96 and

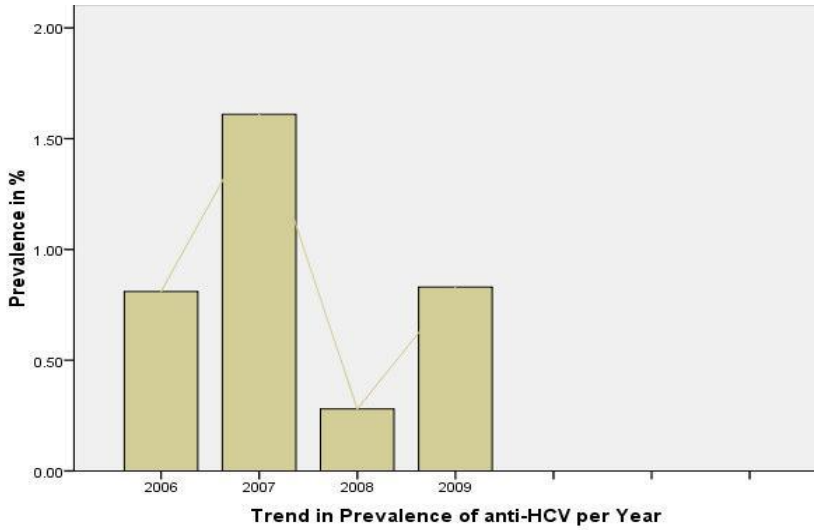

Figure 3. Trend in anti-HCV prevalence in blood donors between 2006 and 2009 in Ile-ife, South-western Nigeria.

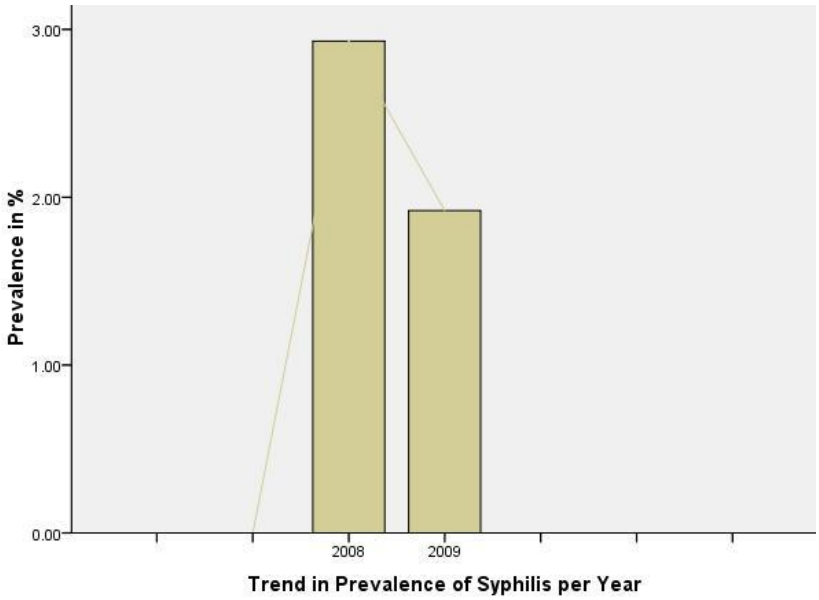

Figure 4. Trend in antibody to syphilis prevalence in blood donors between 2006 and 2009 in Ile-Ife, South-western Nigeria.

2.61%, respectively. The prevalence for HBsAg is higher than what was obtained from an earlier study done about 5 years ago at this centre (Salawu and Murainah, 2006). Although the yearly prevalence showed a downwards trend from 2006 through 2008, it is still above the value of 5.48% obtained in 2004 (Table 1 and Figure 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 parts of the world such as Australia with 0.01 (Polizzotto et al., 2008), India with 0.66% (Gupta et al., 2004), Iran with 0.56% (Amini et al., 2008), Saudi with 1.5% (El-

Hazmi, 2004), and Turkey with 2.55% (El-Hazmi, 2004). Presence of occult hepatitis B virus in blood donors is considered a potential risk for transfusion of hepatitis B virus and that is why screening for occult hepatitis B infection through the use of nucleic acid testing (NAT) of blood donors has been adopted in advanced countries. Low levels of HBV- DNA remain detectable, through NAT, in serum and liver tissue in some patients who cleared HBsAg from acute self- limited infection (El- Zayadi et al., 2008) and can result in overt hepatitis B infection, particularly when such blood is transfused to immuno-compromised patients (Hu, 2002). The use of NAT could have probably been responsible for the reduction of the prevalence of hepatitis B infection in the developed world as shown by the significantly low values reported.

The use of HIV-p24 antigen testing has also greatly reduced the residual risk of HIV infection from 0.38 to 0.24 per million (Chiavetta et al., 2003) in developed economies. Unfortunately, this is not the case with most developing economies like Nigeria that still depend on antibody screening methods. Therefore, so long as the resource-limited economies 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 continue to rise in our environment. The overall prevalence in our cohort of donors was 0.96%, with the highest (1.44%) rate occurring in 2006 and lowest (0.94%) in 2007. The rates in the last four years are significantly lower than the 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 in our centre has slightly increased compared with what was recorded five years ago (Salawu and Murainah, 2006), the fact that it is still below 1.0% is significant and showed that the efforts of both the various governments and non-governmental organisations are probably yielding good results at reducing the scourge of HIV/AIDS in Nigeria. It also suggests the effectiveness of our screening method; as all invalid results are further tested with two other kits for confirmation. It is important to note that both hepatitis B surface antigenemia and antibody to HIV showed an upward trend in the early part of 2009. The trend might probably be a reflection of a surge in incidence in our society due to economic down-turn which may push some unemployed persons to source for money through selling their blood as has been reported earlier (Durosinmi et al., 2003) and which calls for continued stringent measures at donor recruitment.

The sero-prevalence of 0.86% obtained for anti-HCV is lower than what was obtained five 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; Koate et al., 2005; Imarengiaye et al., 2006; Onakewhor and Okonofua, 2009). In other sub-Saharan Africa countries, Matee et al. (Matee et al., 1999) reported 8.0% in their study in Tanzania, 8.4% was reported by Ampofo et al. from Ghana (Ampofo et al., 2002), 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 (Figure 3) peaking in 2007 and first half of 2009. 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). Changes in population risks could probably explain the trend in this study as the majority of our donors continue to be replacement and remunerative donors as reported in a previous study at this centre (Durosinmi et al., 2003). In the absence of NAT screening method for HCV, efforts should be maintained at keeping false negative anti-HCV in our donated units low through stringent donor criteria and excluding subjects with high risk behaviours as studies have shown that the most efficient mode of transmission of HCV is blood to blood contact (Garcia et al., 2009; Fejza and Telaku, 2009), less efficiently through sexual route unlike HBV and HIV infection (Neumavr et al., 1999; Kao et al., 2000).

The overall prevalence of antibody to syphilis in this study was 2.61%, but showed a downward trend from 2.93% in 2008 when it was first started, to 1.9% in the first half of 2009. The value obtained from this study is similar to the findings of Chikwem and others (Chikwem et al., 1997) 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). In more advance economies, syphilis seropositivity is lower, being less that 1.0% in many of the reports (Kocak et al., 2004; Dilek et al., 2007; Cho et al., 2003; Nanu et al., 1989 – 1996; Sharma et al., 2004).

It is of interesting to note the occurrence of multiple infections in the donors, particularly between hepatitis B infection and other transfusion transmissible infectious agents (Table 3). Multiple infections with Human immunodeficiency virus, Hepatitis B and C viruses and syphilis are probably in line with common route of transmission of most of these agents, which are direct contact with blood, intravenous drug injections, transfusion of blood and blood products, and sexual activity. Intravenous drug usage cannot be said to be a problem in our environment presently, however, sexual activity and blood and blood products transfusion are major sources of transmission. Studies have shown that multiple co-infections, particularly hepatitis B and hepatitis C virus dual infection are associated with substantial risk of fulminant hepatitis (Chu et al., 1999) and a more severe histological lesions (Zarski et al., 1998), and poor response to therapy (Senturk et al.,

2008). HCV infection has also been shown to suppress HBV replication and with low HBV-DNA levels, decreased HBV-DNA polymerase activity, and decreased expression of HBsAg expression in blood (Chu et al., 1998) which may lead to false HBsAg negativity thereby presenting as occult hepatitis. In view of this, HBV coinfection with HCV should not be excluded by mere negative HBsAg status alone (Saravanan et al., 2009).

HIV infection increases HCV replication and accelerates progression of HCV disease due to accompany immunosuppression associated with HIV infection (Schooley, 2005; Saravanan et al., 2007). In view of all the negative interactions between transfusion and transmissible infectious agents, it is important to continue to apply stringent measures in donor recruitment, particularly on their social behaviour, and for clinician to transfuse when it is absolutely necessary. The study also suggests to us that sexual activity may play a prominent role in the transmission of these TTIs in our community in view of the various combinations of coinfection noted in this study.

We may conclude that this study has shown that TTI agents are still prevalent in our blood donors and that hepatitis B infection is endemic in our community. Stringent donor selection criteria must be strictly adhered to, and in addition, efforts should be geared to the introduction of screening for antibody to hepatitis B core antigen and nucleic acid testing in view of the high prevalence and the effect of its co-infection with other hepatotropic viruses, particularly HCV which could mask its identification.

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