

*Full length Research*

# **Seroprevalence of Human Immunodeficiency Virus (HIV), Hepatitis B Surface Antigen (HBsAg) and Hepatitis C Virus (HCV) among voluntary blood donors in Enugu Metropolis**

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**Human Immunodeficiency Virus (HIV), Hepatitis B Surface Antigen (HBsAg) and Hepatitis C Virus (HCV) transmission through blood transfusion has not been effectively reduced in low income countries due to unavailability of screening methods involving the detection of viral nucleic acid and pathogen inactivation. This study was carried out to assess the prevalence of HIV, HBsAg and HCV in voluntary blood donors. A total of 282 blood samples were screened for HIV, HBsAg and HCV by rapid test kits. Eighty six point two percent (86.2%) of the participants were 18-27 years, 76.6% of the subjects were males and students in higher institutions in Enugu state. Overall prevalence of HIV, HBsAg and HCV in this study was 2.8%, 5.3% and 1.1%. This study demonstrates high prevalence of HIV & HBV in blood donors residing in Enugu state. To reduce the transmission of HIV, HBsAg & HCV through blood transfusion more sensitive technique (Polymerase Chain Reaction) should be using in screening blood donors.**

**Keywords:** Prevalence, HIV, HBsAg, HCV, blood, donors, infection, tests.

## **INTRODUCTION**

HIV, HBsAg and HCV epidemic in Nigeria is still a general problem despite the effort of government and non-governmental organizations Mitsunaga et al. (2005). Some parts of the country are worse than others, but no State or community is free from scourge of HIV or HBsAg. It affects people from all works of life, students and civil servants, married and unmarried, the young and the old, though the prevalence rate may differ. Many studies have been published on various aspects of HIV, HBsAg and HCV epidemics in Nigeria. HIV, HBsAg and HCV are among leading course of morbidity and mortality in Nigeria. Data from different parts of Nigeria indicate unprotected anal intercourse with multiple male partners,

increasing sexual activity among single adolescents of both sexes and poor contraceptive use as the risk factors for HIV and HBV infections Orji and Esimai, (2005). Other risk factors that may be responsible for high prevalence of HIV, HBsAg and HCV is believe by some people that condom hampers their sexual satisfaction, give them health problems, and make their sexual interest poor; and therefore avoid the use it. In Nigeria most of the blood transfusion service centers are not fully equipped to cater for the extensive screening tests obtained in developed countries despite the high burden of HIV, HBsAg and HCV infections Entonu and Agwale, (2007). There are also cases of donors giving false information about their personal lifestyle because of fear that they can be exposed to their family or friends. In such case detection of TTIs are only through laboratory tests which are mostly the antibody based tests that cannot offer near risk free detection limits Ahmed SG, (2003). At present three virus-

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es including HIV, HBsAg and HCV are those that are routinely tested for prior to blood donation. This is in line with the recommendation by the Nigerian National Blood Transfusion Service (NNBTS) guidelines (NBTS, 2007). In addition to all these only one HIV antibody testing and counseling facility are available for approximately every 53,000 Nigerian adults (Ogbuji CO, 2005; Sunmola AM, 2005). There is also absent of well equipped facilities that can detect viral nucleic acid and pathogen inactivation in blood transfusion service centers in Nigeria. Hepatitis B virus is the most common cause of both acute and chronic liver infection in the world. This deadly virus has infected more than 2 billion people with 350 million being confirmed as chronic carriers Ahmed et al. (2007). Studies have shown that individuals that are chronically infected with HBV are likely to pass the medical tests required for blood donation in Nigeria and also current serological test of HBsAg can be negative, this has posed great threat to safety of blood transfusion in our country (Allain and Owusu-Ofori, 2006; Baumert et al. 2007; Muktar et al. 2005). As long as serological testing is the only method of detecting HCV in Nigeria, the safety of blood transfusion in Nigeria is in danger. The risk of transfusion transmitted HCV in setting where only serological testing is being used as only screening method for HCV is 1 in 276,000. In order to reduce this risk to 1 in 2 million transfusions, there is urgent need of molecular method of detecting HCV RNA in this country since HCV is the leading cause of liver cirrhosis, liver failure and hepato-cellular carcinoma Goodman JL, (2004). However HIV, HBsAg and HCV infections are among leading course of morbidity and mortality in Nigeria with varying prevalence rate in the different geographical state, this study was carried out to determine the sero-prevalence rate of HIV, HBsAg and HCV among the voluntary blood donors in Enugu metropolis.

## **MATERIALS AND METHODS**

### **Study Area**

The study was carried out in the Department of Hematology and Immunology, Faculty of Medicine, Enugu State University of Science & Technology Enugu, Enugu State. Enugu State is in the South-East geographical zone of Nigeria. According to the 2006 Nigerian census, the Enugu metropolitan area has an estimated population of 722,664.

### **Study Population**

Two hundred and eighty two voluntary blood donors are randomly selected during the National blood transfusion blood drive in Enugu urban. Information on donor's age,

sex and education status was collected through questionnaire. All were screened for HIV, HBsAg and HCV by immunochromatographic method. This study was carried out from the month of April 2012 to December 2012.

### **Sample Collection**

Three milliliters of venous blood (without anticoagulant) was collected aseptically from the intending donors. Sera were separated and stored frozen (-20°C) until required for assays.

### **Detection of HIV, HBsAg and HCV**

Alere Determine HIV-1/2 (manufactured by Alere Medical Co. Ltd, 357 Matsuhidal, Matsudo-Shi, Chiba, 270-2214, Japan, Lot No:38960k100) were used in a stepwise order for the detection of HIV-1 and HIV-2 in the blood. This method is immunochromatographic and qualitative in nature, it detects the presence of antibodies to HIV-1 and HIV-2 in human blood and can be read in-vitro. It has sensitivity and specificity of more than 99.9% and 99.75%. Test strips manufactured by ANTEC Diagnostic Ltd, 4848 San Felipe road, block 150, San Jose, CA 95135 was also used in screening the donors for HIV-1 and HIV-2. The test was performed and interpreted according to manufacturer's specification. Wondfo one step HBsAg test strips (manufactured by Guangzhou wondfo Biotech Co. Ltd; Wondfo Scientech Park, South China University of Technology, Guangzhou, P.R, China) was used for detection of HBsAg. It is a rapid immunochromatographic assay designed for qualitative determination of HBsAg in human serum. It is for in vitro diagnostic use with sensitivity of 96.2% and specificity of 99.3%. The test was performed and interpreted according to manufacturer's specification. ANTEC Diagnostics products Ltd, manufactured by ANTEC Diagnostic Ltd, 4848 San Felipe road, block 150, San Jose, CA 95135, which based on the principle of double sandwich immunoassay was used for determination of anti-HCV in serum.

### **DATA ANALYSIS**

The data was analyzed statistically using SPSS computer software version 17.0 for windows to determine if there is any significant relationship between infection rate, gender and age. The prevalence of HBsAg and HCV infection was calculated by using donors with positive samples as numerator and the total number of donors enrolled as denominator.

## **RESULTS**

Two hundred and eighty two voluntary blood donors were

**Table 1.**Prevalence of HIV, HBsAg and HCV in relation to age of the donors.

Age group	NO tested (%)	NO tested positive	NO tested positive	NO tested positive
(Years)		HIV (%)	HBsAg (%)	HCV (%)
18-27	243 (86.2)	6 (2.5)	12 (4.9)	1 (0.4)
28-37	37(13.1)	2 (5.4)	3 (8.1)	2 (5.4)
38-47	2(0.7)	0 (0.0)	0 (0.0)	0 (0.0)
Total	282 (100.00)	8 (2.8)	15 (5.3)	3 (1.1)

**Table 2.**Prevalence of HIV, HBsAg and HCV in relation to sex of the donors.

	NO tested (%)	NO tested positive	NO tested positive	NO tested positive
		HIV (%)	HBsAg (%)	HCV (%)
Male	216 (76.6)	8(3.7)	13(6.0)	3(1.4)
Female	66(23.4)	0(0.0)	2(3.0)	0(0.0)
Total	282(100.0)	8(2.8)	15(5.3)	3(1.1)

recruited for this study. The study subjects were all students schooling in different higher institutions in Enugu Township. Table 1 shows the age distribution and prevalence of HIV, HBsAg and HCV among donors. Of the donor cohort, 8 (2.8%) were positive for HIV, 15 (5.3%) were positive for HBsAg and 3 (1.1%) were positive for HCV. Eight six point two percent of the donors were aged 18-27years, while 37 (13.1%) of them aged 28-37years and the lowest number of donors were those aged 38-47years (0.7%). The prevalence of HIV was highest (5.4%) in age group 28-37years, followed by 2.5% in age group 18-27years. No HIV infection was detected in donors aged 38-47years. The highest prevalence for HBsAg was 8.1% in the 28-37years, followed by 4.9% in age group 18-27years. No HBsAg infection was detected in donors aged 38-47years. Similarly the prevalence of HCV was highest (5.4%) in 28-37years age group, followed by 0.4% in age group 18-27years. No HCV infection was detected in donors aged 38-47years. Table 2 shows the sex distribution of HIV, HBsAg and HCV among donors. Most of the donors were male (76.6%), while the lowest number of donors was female (23.4%). HIV and HCV infections were detected in male blood donors with prevalence rate of 3.7% and 1.4%. No infection was detected in female. The highest prevalence of HBsAg occurred in male blood donors (6.0%), while the lowest rate of 3.0% occurred in female blood donors.

## DISCUSSION

This study was conducted in Hematology and Immunology Department, faculty of Medicine, Enugu State University of Science and Technology Teaching Hospital Enugu. The hospital offers both primary and specialized health services for the people of Enugu and

its environment. It still serves as a major referral center for all the local government in Enugu State. This study established the sero-prevalence of HIV, HBsAg and anti-HCV antibodies in 282 voluntary blood donors. In this study most of the blood donors were males, 76.6% which differ from 98% found by Muktar et al. (2005). The overall prevalence rates of HIV, HBsAg and HCV in the study were 2.8%, 5.3% & 1.1% respectively. The HIV prevalence rate of 2.8% in this study was higher than 0.96% reported by Salawu et al. (2010) among blood donors in Ile-Ife and also 0.0% reported by Alli et al. (2010). The prevalence rate of 2.8% in this study was also slightly lower than 3.5% reported by Obara and Tahir, (1999) at Abuja. The HIV prevalence in this study also differs from the 6.0% rate reported by Egah et al. (2004) among 200 blood donors in Jos, Nigeria, 10.0% seroprevalence rate of HIV reported by Umolu et al. (2005) among blood donors in Benin city, Nigeria, the 3.5% prevalence rate reported by Chukwura and Nneli, (2005) in Enugu and 10.4% reported by Mustapha and jibrin, (2004) in Gombe, Nigeria. In this study gender distribution for HIV showed 3.7% prevalence for males while none in females. There is significant association between gender and HIV infection rate ( $p < 0.05$ ). The use of PCR for HIV testing has greatly reduced the residual risk of HIV infection to 0.003% in developed countries. Unfortunately this is not the case with Nigeria, which still depends on antibody screening methods. In this parts of the country, rapid test kits is still being used by both private and some government hospitals to screen donors before blood donation. In as much as, in this country that anti-HIV negative blood which may be HIV positive as result of antibody screening during the "phase of window period" is still being transfuse to patient, the residual risk of HIV may still be on increase in our donor population. This study established the sero-prevalence of HBsAg and anti-HCV antibodies in 282 voluntary blood donors. In this

study the overall sero-prevalence of HBsAg and HCV was 5.3% and 1.1% respectively. The HBV infection rate of 5.3% in this study is however higher than 4.1% reported by Ugwuja and Ugwu, (2010) among apparently healthy adolescents in Abakaliki; 2.5% reported by Okonko et al. (2012) among blood donors in Ibadan and 1.57% prevalence rate reported by Ejele and Ojule, (2004) among blood donors in Port Harcourt. The figure is also higher than the 1.1% reported by Ejele et al. (2005) in the Niger Delta region of Nigeria, 1.2% reported by Kagu et al. (2005) in North-Eastern, Nigeria. Muktar et al. (2005) also reported 4.2% HBsAg seropositivity rate among blood donors in Zaria, which was lower than the result of this study. This figure is lower than 7.0% reported by Okonko et al. (2012) among the attendees of ARFH center in Ibadan Nigeria, 8.3% reported by Muktar et al. (2005) in Tanzanian blood donors, 10.0% reported by Elfaki et al. (2008) in Sudanese blood donors, 10.6% reported by Esumeh et al. (2003) in South-south Nigeria and 13.2% reported by Fasola et al. (2009) in Ibadan, South-western, Nigeria. The 5.3% HBsAg prevalence rate found in this study is comparable to 5.4% reported by Umolu et al. (2005) among blood donors in Benin City, Nigeria. In this study gender distribution showed 6.0% prevalence for males and 3.0% prevalence for females. There is significant association between gender and infection rate ( $p < 0.05$ ). This is similar to what Okonko et al. (2012) reported and Udeze et al. (2009) who reported high prevalence of HBsAg in males than female. The reason for higher prevalence rate of HBV among male may be due to multiple sexual partner rampart among men especially in the campus Udeze et al. (2009). Okonko et al. (2012) reported 7.1% prevalence for age group 16-29 and 6.9% prevalence for 30 years and above. There is slight difference between the above study and the present study. The overall sero-prevalence of HCV in this study was 1.1%. Parameters such as donors age and sex were found to be in significant association with HCV prevalence rate ( $p < 0.05$ ). This prevalence rate though low, confirmed that HCV infection is prevalent among voluntary blood donors in Enugu, Nigeria. It is lower than the prevalence rates of 5% and 12% reported in Port-Harcourt and Benin City respectively (Jeremiah et al. 2008; Halim and Ajayi, 2002). The 1.1% prevalence reported in the study differs greatly from the 6% seroprevalence reported by Buseri et al. (2009). The 2.8% reported among blood donors in Ghana and 2.9% reported among blood donors in Port Harcourt Koate et al. (2005) slightly differ from 1.1% in this study. Also 8.0% HCV seroprevalence reported by Udeze et al. (2009) differ greatly from the result of this study. The result of this study on HCV prevalence is higher than the prevalence rate of 0.4% reported in Kano Imoru et al. (2003) and 0.0% reported by Alli et al. (2010). Reason for lower prevalence rate in this study may be because all the blood donors are youth and university student who take proper care of their health Udeze et al. (2009). Meanwhile, in Nigeria, studies have shown that HCV

infection is less prevalent compared to HBV (Jesse et al. 2008; Ojo et al. 1999). In this study the prevalence of HCV was higher in those aged 28-37 years than those aged 18-27 years. This is similar to previous studies which observed that HCV prevalence rate increases with increase in age (Okonko et al. 2012; Alao et al. 2009). The result of this work is strongly supporting the new strategy adopted by international community concerning the recruitment of blood donors less than 30 years in order to ensure safe blood for the people Jesse et al. (2008).

In conclusion the result of this study is relevant for the safety of blood donors and recipients as well. We also recommend that those voluntary blood donors that tested positive to HIV, HBV & HCV should be communicated of their result so that they will commence treatment. We are also suggesting the use of most sensitive method such as chemiluminescence and NAT for screening of every pint of blood in Nigeria.

## CONFLICT OF INTEREST

Authors declare no conflict of interest.

## AUTHORS' CONTRIBUTIONS

Ngwu Amauche Martina

- Conception and design, Acquisition of data,
  - Analysis and interpretation of data.
  - Drafting the article, Critical revision of the article.
  - Final approval of the version to be published
- Obi Godwin Okorie.
- Final approval of the version to be published
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