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Detection of Hepatitis-B Surface Antigen (HbsAg) and Hepatitis C Virus (HCV) among Voluntary Blood Donors in Enugu.

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Abstract

The prevalence of Hepatitis B surface antigen (HBsAg) and Hepatitis C virus (HCV) was determined in the voluntary blood donors in Enugu, between April and December 2012. The blood donors were made up of students from different higher institutions in Enugu and also civil servants working in Enugu. A total of 290 blood samples were screened for HBsAg and HCV by rapid test kits. The overall prevalent rate of HBsAg and HCV were 5.17% and 1.03% respectively. The prevalence rate of HBsAg and HCV was higher in male (6.28% & 1.35%) than the female (1.49%). The study showed that the prevalence rate of HBsAg was also higher in blood donors between the age range of 28- 37 (7.14%) than those between the age range of 18-27(4.90%). HCV was also higher in blood donors with age range of 28-37(4.76%) than those between the age ranges of 18-27 years (0.41%). Hepatitis B surface antigen and HCV seropositivity were significantly associated with age, sex and states of origin of the blood donors ($p<0.05$). The prevalence of HBsAg in donors which are indigene of other states was 3.70% while indigene of Enugu state was 7.9%. HCV was found only on indigene of other states. Routine screening of blood donors for HBsAg and HCV are strongly recommended for blood donors in Enugu especially student in higher institutions.

Keywords: HBsAg, HCV, prevalence, blood donors

1. Introduction

The current blood banking system in Nigeria generally encourages non-remunerated or voluntary blood donation especially to relatives who are hospitalized. The serological screening for HBsAg, HCV in addition to HIV are now compulsory for all intending blood donors in most hospitals in Nigeria. Although in some parts of Enugu the blood transfusion service is still at its teething stage, is not yet fully equipped to cater for the extensive screening tests obtained elsewhere despite the high burden of viral infections among the people (Allain & Owusu-Ofori, 2006; Ekpo *et al*. 1995). HBsAg and HCV are still endemic in Nigeria with high prevalence in the blood donor population; blood transfusion may be one of the common means of transmitting these infections, especially in places where screening is not practiced (Bukbuk *et al*. 2005).

Studies had shown that HBsAg and HCV infections have drawn global attention owing to their grievous public health impact (Muktar *et al*. 2005; Umolu *et al*. 2005). The carrier rate of HBV among black Africans is 10.4% and 15% in young volunteer blood donors. Nigeria in which Enugu state is part of it remains one of the most populous nations in Africa with hyper endemicity for HBV infection. The prevalence rate of HBsAg in the replacement blood donors ranges between 1.2 % - 26% and 2.4% in voluntary donors (Olokoba *et al*. 2009; Tribedi 1994). Also prevalence of HBV varies between 2% in high income countries where the prevalence is low to 8% in low income countries where the infection is endemic with sex and age (Ejele *et al*. 2005).

HCV was first discovered in 1989 and in 1990 the antibody detection assay was introduced. Before 1990, the majority of cases of HCV infection in the U.S.A. and Europe were acquired through I.V. drug use and transfusions. Before the discovery of adequate testing techniques for HCV infection, almost 10% of transfusion recipients acquired the infection. This made it one of the commonest causes of transfusion related hepatitis (Imoru *et al*. 2003; Dodd *et al*. 2002). HCV infection is still endemic in Nigeria with varying prevalence rate in the different geographical states. The prevalence of hepatitis C and the commonest mode of transmission among Nigerians are unknown, but recent studies across the country among blood donors show a prevalence ranging between 0.4% and 10.4% according to locality (Kaote *et al*. 2005). Another study also reveals the prevalence rate of 0.5% to 12.3% (Olokoba *et al*. 2009). Yet, some centers in Nigerian have not started screening for anti – HCV before blood transfusion (Ahmed *et al*. 2007).

Routine screening for hepatitis C in blood donors is only carried out in major public health institutions in Nigeria; because of unavailability of screening kits. This has caused a serious short and long term health implications on the populace; knowing very well that chronic hepatitis C is a progressive disease that leads to

death through hepatocellular carcinoma and also predisposes to renal cell carcinoma (Tong *et al*. 1995).

Since the developmental status of a nation also reflects the health status of her people and the health status of all the voluntary blood donors in Enugu, this study was carried out to determine the prevalence of HBsAg and HCV among the voluntary blood donors in Enugu, southeastern Nigeria.

2. Materials and Methods

2.1 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 one of the states in the eastern part of Nigeria. The state shares borders with Abia State and Imo State to the south, Ebonyi State to the east, Benue State to the northeast, Kogi State to the northwest and Anambra State to the west. The city is characterized by high level of environmental sanitation, moderate planned housing, portable water supply and proper management of wastes especially in the Enugu urban.

2.2 Study population

Two hundred and ninety voluntary blood donors are randomly selected during the National blood transfusion blood drive in the higher institutions in Enugu. The higher institution includes Enugu State University of Science & Technology, Institute of Management and Technology, Federal Cooperative College Oji River, Enugu State College of Education Technical, Enugu and Federal School of Dental Technology Enugu. All were screened for HBsAg and HCV by immunochromatographic method. This study was done from April 2012 to December 2012.

2.3 Sample collection

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

2.4 Detection of HBsAg and HCV

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. The test was also done based on this principle "Wondfo one step HBsAg serum/Plasma test strip is a rapid Immuno-chromatographic test for visual detection of hepatitis B virus surface antigen (HBs Ag) in serum/plasma samples. The membrane is pre-coated with anti-HBV anti-bodies on the test line region of the strip. During testing, the specimen reacts with the particle coated with the HBV antibody. The mixture migrates upwards on the membrane chromatographically by capillary action to react with anti-HBV antibodies on the membrane and generate a colored line. Presence of colored line on the test region indicates positive result. A procedural colored line on the control line region will always appear to serve as control". 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. The test was conducted using the stated principle "The HCV test strip is a rapid chromatographic immunoassay for the qualitative detection of anti-body to Hepatitis C virus in serum. During testing the specimen reacts with the protein-A coated particles. The mixture migrates upward on the membrane chromatographically by capillary action to react with recombinant HCV antigen on the membrane and generate a colored line. Presence of colored line indicates a positive result while its absence indicates a negative result. To serve as a procedural control, a colored line will always appear on the control line region showing that proper volume of specimen was added and membrane wicking occurred".

2.5 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, state of origin of donors, 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.

3. Results and Discussion

Two hundred and ninety voluntary blood donors were recruited for this study. Out 290, 281(96.90%) of them are students schooling in Enugu, 8 (2.76%) are civil servants working in Enugu and 1 (0.34%) was self employed individual residing in Enugu. Out of 281 students, 189 (67.26%) are indigene of other states of Nigeria, while 92 (32.74%) students blood donors are indigene of Enugu state. This study established the sero-prevalence of HBsAg and anti-HCV antibodies in 290 voluntary blood donors. In this study the overall sero-prevalence of HBsAg and HCV was 5.17% and 1.03% respectively. The HBV infection rate of 5.17% in this study is however higher than 4.1% reported by (Ugwuja & Ugwu, 2010) among apparently healthy adolescents in Abakaliki; 2.5% reported by (Okonko *et al*. 2012) among blood donors in Ibadan, but lower than 7.0% reported by (Okonko *et al*. 2012) among the attendees of ARFH center in Ibadan Nigeria. The prevalence of HBsAg was highest in blood donors between the age group of 28-37 years [3 (7.14%)] than those between 18-27 years [7 (4.90%)]. The same

applied to HCV.

The result of table 1 showed the prevalence of HBsAg and HCV according to the age of the donors.

Table 1: Age distribution of HBsAg and HCV among blood donors

Age group (years)	NO tested (%)	NO tested positive for HBsAg (%)	NO tested positive for HCV (%)
18-27	245 (84.48)	12 (4.90)	1 (0.41)
28-37	42 (14.48)	3 (7.14)	2 (4.76)
38-47	3 (1.03)	0 (0.00)	0 (0.00)
Total	290 (100.00)	15 (5.17)	3 (1.03)

Statistically, HBsAg and HCV sero-positivity were significantly associated with age group ($p<0.05$). In this study the prevalence of HBsAg and HCV was higher in those aged 28-37 years than those aged 18-27 years. This is similar to previous studies which observed that HBsAg & HCV prevalence rate increases with increase in age (Okonko *et al*. 2012; Alao *et al*. 2009). This finding is in line with the new strategy adopted by the international community to recruit blood donors less than 30years of age to ensure provision of safe blood (WBDD (2007). The implementation of this policy has been shown to reduce the prevalence of HBsAg and HCV (Lawal *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.*1990*).* Okonko et al reported 7.1% prevalence of HBsAg for age group 16-29 and 6.9% prevalence for 30years and above (Okonko *et al*. 2012). There is slight difference between the above study and the present study.

The result of table 2 showed the prevalence of HBsAg and HCV according to the sex of the donors.

Table 2: Gender distribution of HBsAg and HCV among the blood donors

Sex	NO tested (%)	NO tested positive for HBsAg (%)	NO tested positive for HCV (%)
Male	223 (76.90)	14 (6.28)	3 (1.35)
Female	67 (23.10)	1 (1.49)	0 (0.00)
Total	290 (100.00)	15 (5.17)	3 (1.03)

In relation to sex, the prevalence of HBsAg was highest in male [14 (6.28%)] than the female counterpart [1 (1.49%)]. The same applied to HCV. In this study gender distribution showed 6.28% prevalence for males and 1.49% prevalence for females. There is significant association between gender and infection rate of HBsAg ($p<0.05$). This is similar to what Okonko *et al* reported and Udeze *et al* who reported high prevalence of HBsAg in males than female (Okonko *et al*. 2012; Udeze *et al*. 2012). The reason for higher prevalence rate of HBV among male may be due to multiple sexual partner rampart among men especially in the campus (Okonko *et al*. 2012). Gender distribution showed 1.35% of HCV in males while female had none. The reason for this may be due to habits such as multiple sexual partners and intravenous drug use which is common in men (Lawal *et al*. 2009).

The result of table 1 showed the distribution of HBsAg and HCV according to the donor's state of origin.

Table 3: HBsAg and HCV prevalence according to the donor's state of origin

Donors State of origin	NO of donor according to their state of origin (%)	NO positive for HBsAg	NO positive for HCV (%)
Lagos	1 (0.34)	0 (0.00)	1 (100)
Kaduna	1 (0.34)	0 (0.00)	0 (0.00)
River	2 (0.69)	0 (0.00	0 (0.00)
Benue	26 (8.97)	2 (7.69)	1 (3.85)
Anambra	46 (15.86)	1 (2.17)	0 (0.00)
Delta	8 (2.76)	0 (0.00)	0 (0.00)
Imo	47 (16.21)	0 (0.00)	0 (0.00)
Akwaibom	1 (0.34)	0 (0.00)	0 (0.00)
Ogun	1 (0.34)	0 (0.00)	0 (0.00)
Ondo	1 (0.34)	0 (0.00)	0 (0.00)
Kogi	1 (0.34	1(100)	0 (0.00)
Enugu	101 (34.83)	8 (7.92)	0 (0.00)
Edo	1 (0.34)	0 (0.00)	0 (0.00)
Adamawa	1 (0.34)	0 (0.00)	1 (100)
Cross River	11 (3.79)	0 (0.00)	0 (0.00)
Abia	19 (6.55)	0 (0.00)	0 (0.00)
Gombe	1 (0.34)	1 (100)	0 (0.00)
Ebonyi	21 (7.24)	2 (9.52)	0 (0.00)
Total	290 (100)	15 (5.17)	3 (1.03)

Abbreviation

NO= Number, %= percentage

The prevalence of HBsAg was highest in Enugu state indigene [8 (7.92%)] than the indigenes of other states [7 (3.70%)]. HCV prevalence was seen among the indigenes of other states [3 (1.59%)]. Statistically, HBsAg and HCV sero-positivity were significantly associated with state of origin of the blood donors ($p<0.05$). This confirmed the results of other studies done in various parts of Nigeria showing that prevalence of HBsAg is still high in this country (Jeremiah *et al* 2008; Mustapha and Jibrin, 2004). The overall sero-prevalence of HCV in this study was 1.03%. This prevalence rate though low, confirmed that HCV infection is prevalent among healthy blood donors temporally residing in Enugu, Nigeria. It is lower than the prevalence rates of 5% and 12% reported in Port-Harcourt and Benin city respectively (Imoru et al. 2003). Reason for lower prevalence rate in this study may be because more than 90% of the blood donors are youth and university student who take proper care of their health (Udeze *et al*. 2012). The result of this study showed that 1.59% prevalence of HCV was present only in blood donors that are indigene of other states of Nigeria while indigenes of Enugu had 0.00%. This shows that travelling from one state to the other is one of the factors that contribute to spread of HCV infection.

5. Conclusion

This study confirmed the presence of HBsAg and HCV among voluntary blood donors in Enugu State. The study shows that risk factors associated with significant of HBsAg and HCV seropositivity were age, sex and travelling from one state to another. This study also showed that resource limited country like Nigeria are still lagging behind in term of achieving a remarkable reduction in HBsAg and HCV infection rate among our youth. There is need for general screening of HBsAg and HCV in all the student of higher institutions in Nigeria so that appropriate treatment will be commenced immediately.

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