Prevalence Of Antibodies To Hepatitis C Virus In Blood Donors In Nnewi, South-Eastern Nigeria; In Association With Blood Groups
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Citation

Abstract
Background: In spite of the fact that Hepatitis C virus (HCV) infection is a risk factor for hepatocellular carcinoma (HCC), non-Hodgkin’s lymphoma (NHL) and renal cell carcinoma (RCC); testing for antibodies to HCV is not yet mandatory in Nnewi, and most other centres in Nigeria. This work was done to determine the prevalence of antibodies to HCV among blood donors and assess if there is any association with the donor blood group, sex and age.

Materials and methods: Data from 1229 blood donors who presented to the blood bank of the Nnamdi Azikwe University Teaching Hospital between 2005 and 2009 were retrospectively studied. Donor blood was tested for antibody to HCV using rapid immunoassay that quantitatively detects this antibody using recombinant HCV antigen. ABO and Rhesus blood groups were determined using monoclonal antibodies according to standard protocol.

Result: The prevalence of HCV antibodies was found to be 2.0%. The age group 21-30 years was found to be the lowest risk group (1.4% seroprevalence). Seroprevalence increased after the age of 30 years, though not linearly, with the highest rate (3.2%) recorded in the 31-40 years and 51-70 years age groups. Among the blood groups, O Rh D positive had the highest number of donors and a seroprevalence of 2.4%; compared to A Rh D positive (1.3%), A Rh D negative (9.1%), and O Rh D negative (9.1%). Other blood groups did not have any case of HCV seropositivity. No significant correlation was found between HCV antibody status and blood group, age or gender. Gender however was found to be significantly correlated with age (p<.05).

Conclusion: The prevalence of HCV antibodies in blood donors in Nnewi, Nigeria is moderate; age and gender of donors seem to be important factors affecting it. Screening of all blood donors should be made mandatory in order to prevent the transfer of hepatitis C infection by blood transfusion.

INTRODUCTION
HCV was first discovered in 1989 and the antibody detection assay for screening was introduced in 1990. Prior to this, the risk of acquiring HCV through blood transfusion in the U.S.A. was 1 in 200 units. Following the improvement in HCV antibody testing, including the introduction in 2002 of nucleic acid testing, the risk has fallen dramatically to 1 in 2 million donations. Prior to adequate testing techniques for HCV infection, 10% of transfusion recipients, according to some studies, acquired the infection. This made it the commonest cause of transfusion related hepatitis.

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% depending on locality. However, routine screening for hepatitis C in blood donors is only carried out in major public health institutions in Nigeria today; because of unavailability of screening kits and trained manpower in smaller health institutions. This has obvious grave short and long term health implications on the populace; considering that chronic hepatitis C is a progressive disease which leads to death through liver failure or hepatocellular carcinoma (HCC) and also predisposes to non-Hodgkin’s lymphoma (NHL), multiple myeloma (MM), and renal cell carcinoma (RCC). It is not known whether blood group, age or sex constitute risk factors or are correlated with HCV seropositivity among apparently healthy individuals. Studies have been done which agree with or refute the above.
This study is intended to look at the prevalence of this potentially morbid illness amongst blood donors in Nnewi and assess its association with the blood group, age, and sex of these donors; bringing to light the possible public health implications to guide government planners and policy makers.

MATERIALS AND METHODS
DONOR SELECTION
This is a retrospective study in which the records of a total of 1229 donors who reported to the blood bank of Nnamdi Azikiwe University Teaching Hospital, a government hospital located in the south-east of Nigeria were examined. Donors who reported between 2005 and 2009 were included, excepting those who had incomplete data. The age range for the donors included was 17 – 70 years; 1001 (81.4%) were males, while 228 (18.6%) were females with the M: F ratio of 4:1. Ethical approval was obtained from the hospital ethics board for the study.

LABORATORY ANALYSIS
Blood was collected by routine phlebotomy and was tested for antibodies to Hepatitis C Virus (HCV) after written informed consent. This test was performed using a one step HCV test strip which is a rapid chromatographic immunoassay that qualitatively detects these antibodies using recombinant HCV antigen. This diagnostic kit was made by Acumen labs and diagnostic centre, Bagalore, Asklaila, India and has a relative sensitivity greater than 99%; relative specificity is 98.6% and accuracy is 99.3%. A self control is built into each test. ABO and Rhesus blood groups were determined using monoclonal antibodies; Anti-A, Anti-B, Anti-AB and Anti-D (Clas Technology, Down Patrick, UK) according to standard protocol15.

STATISTICAL ANALYSIS
This was done using the SSPSS statistical software package version 15. The chi square test was used to compare frequencies and generate p values. P values less than 0.05 were considered statistically significant. HCV antibody status associations with age groups, blood groups and sex were explored using the Pearson’s correlation test.

RESULTS
Of the 1229 blood donors screened in our center for HCV between 2005 and 2009, 25 were found to be seropositive giving an overall prevalence rate of 2.0%. There were 1001 males and 228 females with a male to female ratio of 4.4:1.

The mean age of the blood donors was 30.1±8.5 years and the median age was 28 years (range, 17-70 years). The prevalence of HCV in males was 2.0% and that in females was 2.2%. This difference was not statistically significant (OR = 0.91, p=0.85) (Table 1).

Figure 1
Table 1: Prevalence Of HCV Positivity According To Gender

<table>
<thead>
<tr>
<th>SEX</th>
<th>HCV STATUS (%)</th>
<th>TOTAL (%)</th>
<th>CHI Sq.</th>
<th>OR(95%CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MALE</td>
<td>20 (2.0)</td>
<td>981 (98)</td>
<td>1001 (100.4)</td>
<td>0.035</td>
<td>0.51(0.34-0.74)</td>
</tr>
<tr>
<td>FEMALE</td>
<td>5 (0.2)</td>
<td>228 (97.8)</td>
<td>228 (18.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>25 (2.0)</td>
<td>1229 (100)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

OR = Odds ratio, CI = Confidence interval

The blood donors were grouped by age. The numerically largest age group consisted of donors aged 21-30 years (662/1229=53.9%). However, the prevalence of HCV was found to be lowest in this group (1.4%). We noted that the prevalence of HCV increased after the age of 30 years with the highest prevalence (3.2%) recorded in those 31-40 years old and 51-70 years old respectively. Nevertheless, this increase was not linear and was not statistically significant (chi sq. = 4.054, p=0.4) (Table 2).

Figure 2
Table 2: HCV Antibody Status Among Different Age Group Of Blood Donors

<table>
<thead>
<tr>
<th>AGE (Years)</th>
<th>HCV STATUS (%)</th>
<th>TOTAL(%)</th>
<th>CHI SQ. VALUE</th>
<th>P-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>17-20</td>
<td>2 (2.0)</td>
<td>96 (98)</td>
<td>4.054</td>
<td>0.4</td>
</tr>
<tr>
<td>21-30</td>
<td>9 (1.4)</td>
<td>653 (98.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31-40</td>
<td>10 (2.1)</td>
<td>298 (97.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41-50</td>
<td>8 (2.3)</td>
<td>127 (97.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>51-70</td>
<td>1 (0.2)</td>
<td>30 (97.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>25 (2.0)</td>
<td>1229 (100)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The prevalence of HCV in relation to donors’ blood group is shown in table 3. Majority of the blood donors were O RhD-positive (66.9%). This was followed in descending order by
A RhD-positive (19.4%), B RhD-positive (8%), O RhD-negative (4.3%), A RhD-negative (0.9%), B RhD-negative (0.4%) and AB RhD-positive (0.2%). Most of the blood donors who were HCV positive were O RhD-positive (20 subjects), the others were A RhD-positive (3 subjects), A RhD-negative and O RhD-negative (1 subject each). However, the prevalence of HCV seropositivity was documented to be highest in blood group A RhD-negative donors (1/11=9.1%). HCV sero-positivity was not documented in donors who were B RhD-positive, B RhD-negative, and AB RhD-positive.

**Figure 3**

Table 3: Blood Group Distribution Of HCV Antibody Status

![Image of Table 3](image)

The results of Pearson’s bi-variate correlation showed no significant statistical association between HCV, gender, age group and blood group of donors (p>0.05) respectively. A significant correlation was observed between gender and age group of blood donors (p<0.05) (Table 4).

**Figure 4**

Table 4 - Pearson’s Bi-Variate Correlation Between Variables Tested Among The 1229 Participant

![Image of Table 4](image)

*Correlation is significant at the 0.01 level (2-tailed)

As the age group of blood donors increases, the greater the frequency of male donors compared to female donors (Table 5).

**DISCUSSION**

Viral hepatitis is one of the common complications of blood transfusion. Hepatitis C has been described as a major cause of non-A non-B hepatitis since its characterization in 1989 with parenteral transmission especially through blood transfusion and intravenous drug use. This study conducted in Nnewi, a highly commercial city in Anambra state, south-east Nigeria, established the sero-prevalence of anti-HCV antibodies in 1229 blood donors evaluated between 2005 and 2009. The overall sero-prevalence of HCV was 2.0%. Parameters such as donor blood group, age and sex were found not to be significantly correlated with HCV status. Gender however, was found to be significantly correlated with age.

This prevalence rate though low, confirmed that HCV infection is prevalent among healthy blood donors in Nnewi, Nigeria. It is higher than the prevalence rate of 0.4% reported in Kano, North central Nigeria but lower than the prevalence rates of 5% and 12% reported in Port-Harcourt and Benin city, both in South-south Nigeria respectively. These two centers unlike our center depend mostly on commercial blood donors for blood replacement. Donation of blood in our center is mainly by family replacement. These families depend on voluntary blood donation from relations and friends and this may explain the lower prevalence rate documented from our study. Nevertheless, in Nigeria generally, studies have shown that compared to HBV infection, HCV infection is less prevalent and plays a minor role in the pathogenesis of Chronic liver disease.

In Africa, HCV sero-prevalence rates contrast sharply between West and North Africa. While very low prevalence rates were found among blood donors in Dakar Senegal (0.8%) and Ghana (0.9%), very high prevalence rates were reported among blood donors in Egypt (19.2%, 22.5%). Indeed, Egypt is reported to have the highest prevalence of HCV (predominantly genotype 4) in the world.
and this has been attributed to previous public health eradication schemes for Schistosomiasis. HCV seroprevalence rates from most developed nations are, not surprisingly, very low. The lowest prevalence rate was reported from England (0.1%) compared to Spain (0.3%), Germany (0.6%) and New York (1.8%).

The prevalence of HCV increased after the age of 30years with highest rates in those aged 31-40years and 51-70years. This is similar to previous observations that HCV prevalence rate increases with increasing age reaching a peak in persons above 30 years of age but at variance with a peak age prevalence of 21-30years reported by Jeremiah et al.

Although HCV is known to be transmitted by non-percutaneous modes such as sexual activity, transmission by this route is much lower than percutaneous modes through blood and injection drug abuse. The mean age of blood donors in this study is above 30years and it highlights the need to recruit younger donors even in centers were voluntary donation is the mainstay of blood replacement and to screen all blood donors irrespective of age. This proposal 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. The implementation of this policy has been shown to reduce the prevalence of blood transmissible infections such as human immunodeficiency virus (HIV) and hepatitis.

Blood group O rhesus positive was the most frequently encountered (822/1229, 66.9%). This finding is not unexpected as there is usually a high demand for blood group O which is the most common blood group in the general population.

Pearson’s bi-variate correlation showed a negative correlation between HCV sero-prevalence, sex, age and donor blood group, but these were not statistically significant (p>0.05). It seems from these findings that demographic and genetic factors which determine blood group does not influence HCV sero-positivity as was earlier reported by Busch et al. Interestingly, the relationship between age and gender of blood donors was statistically significant (p<0.05). Age, gender and donor category (not included in this study) had previously been documented by various authors to be important factors in controlling HCV sero-prevalence among blood donors. Our results agree with this deduction.

In conclusion, the results of this study showed that hepatitis C is prevalent among healthy blood donors in Nnewi though low compared to what has been reported in some regions of Nigeria. All blood donors should be screened for anti-HCV regardless of demographic indices such as age and gender.

ACKNOWLEDGEMENT

We are indebted to the donors and staff who presented or worked at the Nnamdi Azikiwe University Teaching hospital blood bank; and most of all to God who has made this work possible.

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