



Seroprevalence of Hepatitis C Virus amongst Blood Donors in Parts of North Central Nigeria

E. I. Bigwan^{1,2*}, H. I. Inabo¹, S. A. Ado¹ and E. D. Jatau¹

¹Department of Microbiology, Ahmadu Bello University, Zaria, Kaduna State, Nigeria.

²Department of Medical Laboratory Science, University of Jos, P.M.B. 2084, Jos, Nigeria.

Authors' contributions

This work was carried out in collaboration between all authors. Author EIB designed the study, performed the statistical analysis, wrote the protocol, wrote the first draft of the manuscript and managed literature searches. Authors HII, SAA and EDJ managed the analyses of the study and literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/BMRJ/2016/26530

Editor(s):

(1) Alok K. Upadhyay, Fox Chase Cancer Center, Philadelphia, Pennsylvania, USA.

Reviewers:

(1) H. M. Prakash, Vinayaka Missions University, India.

(2) Tulika Chandra, King George medical University, Lucknow, India.

Complete Peer review History: <http://sciencedomain.org/review-history/15090>

Original Research Article

Received 22nd April 2016
Accepted 27th May 2016
Published 21st June 2016

ABSTRACT

Background: Hepatitis C virus is one of the blood borne transmissible infections of public health significance. It can easily be transmitted to a wider population through transfusion of contaminated blood or blood products.

Aim: To determine the seroprevalence of HCV antibodies amongst potential blood donors in the study area.

Materials and Methods: Seven hundred and ten (710) samples were collected from consented blood donors in the study area and were examined for anti-HCV antibody using a third generation enzyme-linked immunosorbent assay (ELISA) Test kit (Autobio Diagnostics, China) based on the manufacturer's instructions. Structured questionnaires were administered to the participants and results were analyzed using SPSS version, 23.0 statistical software package.

Results: Of the 710 samples of voluntary blood donors examined, 7.0% were positive for anti-HCV antibody. Male participants had a higher prevalence of 7.1% than females who had 6.7% ($p = .88$). The age group 41-50 years had the highest seroprevalence of 10.9%, followed by age groups 10-20, 21-30 and 31-40 with a prevalence of 8.8%, 7.7%, 4.7% respectively, while the age groups above 50 showed no evidence of HCV antibodies ($p = .46$).

*Corresponding author: E-mail: emabigwan@yahoo.com;

Conclusion: The seroprevalence of HCV infections is evident amongst potential blood donors and this call for health care providers and policy makers to ensure that there is proper screening for HCV in all health facilities in the area before any blood transfusion in order to minimize the spread of the infection in the area and Nigeria at large.

Keywords: Prevalence; anti-HCV antibodies; blood donors; Nigeria.

1. INTRODUCTION

Hepatitis C virus (HCV) is a single stranded ribonucleic acid (RNA) virus; approximately 9.5 kb which belongs to the Flaviviridae family [1]. HCV has a single stranded, positive sense genome of approximately 9.6kb. The genome contains one long open reading frame (ORF) encoding a polyprotein of approximately 3011 amino acids, flanked by 5' and 3' noncoding regions [2]. Hepatitis C is a disease with a significant global impact. According to the World Health Organization there are 130-170 million people infected with the hepatitis C virus (HCV), corresponding to 2-2.5% of the world's total population. There are considerable regional differences. In some countries, e.g., Egypt, the prevalence is as high as 22% [3].

In Nigeria HCV infection has been reported by various researchers from different parts of the country amongst blood donors. Alao et al. [4] reported 5.4% among blood donors in Makurdi, North-central Nigeria, Olokoba et al. [5] reported 2.4% among blood donors in Yola, North-eastern Nigeria, while Afolabi et al. [6] reported 1.4% among blood donors in Ibadan, South-western Nigeria.

Hepatitis C virus is predominantly transmitted parentally and causes hepatic inflammation. Usually acute HCV infection passes un-noticed and majority of the persons remain asymptomatic or have mild symptoms. Individuals positive for HCV antibody are potentially infectious and 60-85% of them become chronically infected with the virus whereas 10-20% of them may develop cirrhosis and 1-5% may develop hepato-cellular carcinoma in 20-30 years time [7,8,9,10].

The risk factors associated with the transmission of HCV include: transfusion of blood and blood products, intravenous drug use, unprotected sexual exposures with infected partners, haemodialysis, organ transplants, child delivery by HCV infected mother, tattooing and contaminated hospital equipments [11-18].

There are slight variations in the criteria for blood donation from one country to the other. In Nigeria

donors must be between the ages of 16 and 65 years, weigh at least 50 kg, not have donated blood within the previous 56 days. The criteria, which are applied before a person can be accepted as a blood donor, are very strict. Not everyone can be a blood donor. The strict criteria applied to the selection of blood donors are designed to protect the health of the donor as well as the health of the patient who receives the blood [19].

Hepatitis C virus (HCV) is a major cause of liver disease worldwide and a potential cause of substantial morbidity and mortality in the future. The complexity and uncertainty related to the geographic distribution of HCV infection and chronic hepatitis C, determination of its associated risk factors, and evaluation of cofactors that accelerate its progression, underscore the difficulties in global prevention and control of HCV [20].

This study was designed to determine the seroprevalence of HCV antibodies amongst potential blood donors in the study area.

2. MATERIALS AND METHODS

2.1 Background of the Study Area

The North Central Nigeria is made up of six states and Abuja the capital of Nigeria. This study covered three states which comprised of Plateau State, Nasarawa State and Benue State. The States have a diverse range of indigenous ethnic groups. The main occupation in the rural areas is farming, while those in urban areas are civil servants, traders and students. The states have several tourist sites, institutions, hospitals, markets, hotels and brothels cut across the states. All these attract people from different parts of the country or the world, thus creating avenues for various social interactions which can contribute in the spread of the infection. The hospitals used for sampling were the major tertiary health facilities in the study area which serve as a referral centre to the other primary and secondary health care facilities for patients in the study area.

2.2 Study Design

The study was a hospital based cross-sectional study. Samples were collected randomly from patients from the study populations and examined for presence of disease with regards to the demographic data captured in the structured questionnaire.

2.3 Study Population

The study population focused on male and female blood donors attending Jos University Teaching Hospital (JUTH), Federal Medical Centre (FMC), Keffi and Federal Medical Centre (FMC), Makurdi.

2.4 Ethical Consideration

Ethical approvals were obtained from the Research Ethics Institutional Review Board of Jos University Teaching Hospital, Plateau State, Federal Medical Centre Keffi, Nasarawa State and Federal Medical Centre Makurdi, Benue State before the commencement of the work. Also, Informed consent of each participant was obtained prior to sample collection.

2.5 Sampling Method

A structured questionnaires and consent forms were administered randomly to subjects who gave their consent in order to obtain some demographic data.

2.6 Collection of Sample

Five milliliters (5ml) of blood was collected in an anti-coagulated tube. The plasma was separated and stored in a freezer at -20 until ready for use.

2.7 Inclusion and Exclusion Criteria

All those that consented, all those within age group 16- 65 years, and non- HIV patients within the study population were recruited. All those who declined their consent, those not within the age group and those infected with HIV were excluded.

2.8 Assay Procedure

The samples were all screened for antibody to HCV (anti-HCV) using a third generation ELISA Kit manufactured by Autobio Diagnostics, China. According to the manufacturer, the ELISA kit has a sensitivity of 100.0% and specificity of 99.5%.

2.9 Statistical Analysis

Data was subjected to statistical analysis using the statistical software SPSS version 23.0. Pearson chi-squares were calculated at a 95% confidence interval. P values < 0.05 were considered statistically significant.

3. RESULTS

Of the 710 samples examined amongst blood donors in the study area, 7.0% (n= 50) had evidence of HCV antibodies. The seroprevalence of antibodies to HCV in respect to gender shows that males had the highest seroprevalence of 7.1% (n= 44) than females who had the least seroprevalence of 6.7% (n= 6) as shown in Table 1. This showed a statistically no significant association ($P= .88$).

Table 1. Gender-related seroprevalence of HCV antibodies among blood donors in the study population

Sex	No. examined	No. positive (%)
Male	620	44(7.1)
Female	90	6(6.7)
Total	710	50(7.0)

$\chi^2= 0.022$; $DF= 1$; $P= .88$

Of the 710 blood donors examined in the study population 7.0 % (n= 50) were sero-positive for anti-HCV. The result of the study indicates that the age group 41 – 50 years had the highest prevalence of 10.9% (n= 7), followed by age group 10 - 20 years with a prevalence of 8.8% (n= 5) and age groups 51 -60 years and 61- 70 years had the least with no detectable anti-HCV as shown in Table 2. However, no statistically significant difference ($P= .46$) was recorded in the prevalence in relation to age.

Table 2. Age -related seroprevalence of HCV antibodies among the participants in the study population

Age group	No. examined	No. positive (%)
10 - 20	57	5(8.8)
21 – 30	365	28(7.7)
31 - 40	212	10(4.7)
41 - 50	64	7(10.9)
51 - 60	11	0(0.0)
61- 70	1	0(0.0)
Total	710	50(7.0)

$\chi^2= 4.625$; $DF= 5$; $P = .46$

4. DISCUSSION

Gender-related seroprevalence in this study shows that the prevalence was higher amongst males (7.1%; n= 44) than among females (3.9%; n= 35). This is in agreement with the findings of Vardas et al. [21] in a similar study in Namibia reported that males had higher prevalence (1.6%; n=13) than females (0.4%; n=5); Udeze et al. [22] in Ibadan, South-western Nigeria reported that males had the highest prevalence of 8.2% while the females had the lowest with 6.3%; Olokoba et al. [5] in a study in Yola, North-eastern Nigeria reported that males had the highest seroprevalence of 96.0% while females had 4.0%. However, Afolabi et al. [23] reported a higher prevalence in females than males in Ibadan, South-western Nigeria. The result obtained in this study reveals that gender did not show any statistical significant association with the seroprevalence of Hepatitis C Virus ($P= .88$). This may be attributed to the fact that both the males and females lived in the same area and are involved in virtually the same activities or shared the same facilities that can predisposed them to the infection. This implies that gender differences can not be used as a determinant for the transmission of the viral infection in the study area.

Of the 710 blood donors examined in the study population as shown in Table 2 reveals that 7.0 % (n= 50) were sero-positive for HCV antibodies. This finding is in consonance with the report of Chukwurah et al. [24] who reported a seroprevalence of 7.6% amongst blood donors at University Teaching Hospital, Enugu, South-eastern Nigeria; Sheyin et al. [25] reported a seroprevalence of 7.7% among blood donors in Kaduna State, Northwestern Nigeria, while Afolabi et al. [23] reported a much lower seroprevalence of 1.4% amongst blood donors in Ibadan, South-western Nigeria. The variation in the seroprevalence of Hepatitis C Virus in this study area and the other studies may be due to differences in socio-cultural, religious beliefs and the sample size used in the various studies from the different parts of the country.

The result of the study among blood donors indicates that the age group 41 – 50 years had the highest seroprevalence of (10.9%; n= 7), followed by age group 10 - 20 years with (8.5%; n= 5) and age groups above 50 years had the least with no detectable HCV antibodies (0.0%; n= 0). However, no statistically significant difference ($P= .47$) was recorded in the prevalence in relation to age. The entire trend of

the seropositivity decreases with increase in age except in the age group 41 – 50 years which recorded the highest and this may be due to the low sample size of those recruited within that age group. Earlier findings recorded a highest seroprevalence within age groups below 40 years which coincided with the most productive years [5,22,23,26].

5. CONCLUSION

Of the 710 samples of voluntary blood donors examined, 7.0% were positive for anti-HCV antibody. Male participants had a higher prevalence of 7.1% than females who had 6.7%. The age group 41-50 years had the highest seroprevalence of 10.9%, while the least was amongst age groups above 51 years. The seroprevalence of HCV infections is evident amongst potential blood donors and this call for health care providers and policy makers to ensure that there is proper screening for HCV in all health facilities in the area before any blood transfusion in order to minimize the spread of the infection in the area and the country at large.

CONSENT

All blood donors who are within the age range of 16-65 years that gave written informed consent. The Consent form were filled and signed by all who participated in the study.

ETHICAL APPROVAL

Ethical approvals were obtained from the Research Ethics Institutional Review Board of Jos University Teaching Hospital, Plateau State (JUTH/DCS/ADM/127/XIX/5103), Federal Medical Centre Keffi, Nasarawa State and Federal Medical Centre Makurdi, Benue State (FMH/FMC/MED.108/VOL.1/112) before the commencement of the work.

ACKNOWLEDGEMENT

We would like to appreciate the authority of University of Jos and TETFUND for their financial assistance to this work. Our appreciation also go to all medical personnel who assisted us during collection of samples in all the hospitals used for this study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Choo QL, Kuo G, Weiner AJ, Overby LR, Bradley DW, Houghton M. Isolation of a cDNA clone derived from a blood-borne non-A, non-B viral hepatitis genome. *Scie*. 1989;244(4902):359–362.
2. Choo QL, Richman KH, Han JH, Berger K, Lee C, Dong C, et al. Genetic organization and diversity of the hepatitis C virus. *Proc of the National Acad of Scie USA*. 1991; 88:2451-2455.
3. World Health Organization. Hepatitis C; 2011. Available:<http://www.who.int/mediacentre/factsheets/fs164/en/index.htm> (Accessed 13 July, 2011)
4. Alao O, Okwori E, Araoye M. The seroprevalence of Hepatitis C Virus (HCV) infection among prospective blood donors in a Nigerian tertiary health institution. *The Int J Epidemiol*. 2009;7(2). DOI: 10.5580/1d2e
5. Olokoba AB, Salawu FK, Danburam A, Desalu OO, Olokoba LB, Wahab KW, et al. Viral hepatitis in voluntary blood donors in Yola, Nigeria. *Eur J Scientific Res*. 2009; 31(3):329-334.
6. Afolabi AY, Abraham A, Oladipo EK, Adefolarin AO, Fagbami AH. Transfusion transmissible viral infections among potential blood donors in Ibadan, Nigeria. *Afri J Clin and Exper Microbiol*. 2013; 14(2):84-87.
7. Attia MA, Zekri AR, Goudsmit J, Boom R, Khaled HM, Mansour MT, et al. Diverse pattern of recognition of hepatitis C virus core and non-structural antigens by antibodies present in Egyptian cancer patients and blood donors. *J Clin Microbiol*. 1996;2665-2669.
8. Armstrong GL, Alert MJ, McMullan GM, Margolis HS. The past incidence of hepatitis C virus infection: Implications for the future burden of chronic liver disease in the United States. *Hepatology*. 2000;31(3): 777-782.
9. Davis GL, Albright JE, Cook SF, Rosenberg DM. Pro-jecting future complications of chronic hepatitis C in the United States. *Liv Transpl*. 2003;9(4): 331-338.
10. Brown RS, Gaglio PJ. Scope of worldwide hepatitis C problem. *Liv Transpl*. 2003; 9 (Suppl 3):S10-13.
11. Alter MJ. Epidemiology of hepatitis C virus infection. *World J Gastroenterol*. 2007;13: 2436–2441.
12. Xia X, Luo J, Bai J, Yu R. Epidemiology of HCV infection among injection drug users in China: Systematic review and meta-analysis. *Pub Health*. 2008;122(10): 990–1003.
13. Tohme RA, Holmberg SD. Is sexual contact a major mode of hepatitis C virus transmission? *Hepatology*. 2010;52(4): 1497-1505.
14. Jafari S, Copes R, Baharlou S, Etmnan M, Buxton J. Tattooing and the risk of transmission of hepatitis C: A systematic review and meta-analysis. *International Journal of Infectious Diseases: IJID: Official Publication of the International Society for Infectious Diseases*. 2010; 14(11):e928–40. Available:www.ncbi.nlm.nih.gov/pubmed/20678951 (Accessed 12 May, 2015)
15. Wilkins T, Malcolm JK, Raina D, Schade RR. Hepatitis C: Diagnosis and treatment. *Amer Fam Phys*. 2010;81(11):1351–1357.
16. Nelson PK, Mathers BM, Cowie B, Hagan H, Des Jarlais D, Horyniak D, et al. Global epidemiology of hepatitis B and hepatitis C in people who inject drugs: Results of systematic reviews. *Lancet*. 2011; 378(9791):571–583.
17. Boesecke C, Wasmuth J. Hepatitis C epidemiology. In: Mauss, S., Berg, T., Rockstroh, J., Sarrazin, C., Wedemeyer, H, editors. *Hepatology: A Clinical Textbook*. Flying Publisher, Printed in Germany. 2013;46-56. Available:http://doctor-ru.org/main/1200/1245_1.pdf
18. Cottrell EB, Chou R, Wasson N, Rahman B, Guise JM. Reducing risk for mother-to-infant transmission of hepatitis C virus: A systematic review for the U.S. Preventive Services Task Force. *Ann of Intel Med*. 2013;158(2):109-113.
19. Blood Donor FAQ-NBTS. Available:<http://www.nbts.org.ng/index.php/faq> (Accessed 20 August, 2015)
20. Shepard C, Finelli I, Alter M. Global epidemiology of hepatitis C virus infection. *Lan Infect Dis*. 2005;5(9):558–567.
21. Vardas E, Sitas F, Seidel K, Casteling A, Sim J. Prevalence of hepatitis C virus antibodies and genotypes in asymptomatic, first-time blood donors in Namibia.

- Bull of the World Heal Org. 1999; 77(12):965-972.
22. Udeze AO, Okonko IO, Donbraye E, Sule WF, Fadeyi A, Uche LN. Seroprevalence of hepatitis C antibodies amongst blood donors in Ibadan, Southwestern Nigeria. World Appl Sci J. 2009;7(8):1023-1028.
23. Afolabi AY, Abraham A, Oladipo EK, Fagbami AH. Hepatitis C virus in potential blood donors in Ibadan, Nigeria. Glob Advan Res J of Microbiol. 2012;1(9): 155-159.
24. Chukwurah EF, Ogbodo SO, Obi GO. Seroprevalence of Hepatitis C virus (HCV) infection among blood do-nors in a South-Eastern State of Nigeria. Biomed Res. 2005;16(2):133-135.
25. Sheyin Z, Jatau ED, Mamman AI, Randawa AJ. Molecular epidemiology of Hepatitis C virus (HCV) in Kaduna State. Afri J of Clin and Exper Microbiol. 2012a; 13(2):61- 65.
26. Sheyin Z, Jatau ED, Mamman AI, Randawa AJ, Bigwan IE. Detection of Hepatitis C virus amongst pregnant women, in Kaduna state, Nigeria. Wud J of Med Scie. 2012b;1(2): 012-015.

© 2016 Bigwan et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

*The peer review history for this paper can be accessed here:
<http://sciencedomain.org/review-history/15090>*