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Prevalence of Hepatitis B and C among Blood Donors in Makurdi, Benue State, Nigeria

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Abstract:
Hepatitis B and C are important causes of chronic liver disease. They can be transmitted by blood and blood products.
Aim: The aim of the study was to determine the prevalence of hepatitis B virus (HBV) and hepatitis C virus (HCV) among voluntary blood donors in Makurdi, Benue State, from January 2010 to April 2013.
Methods: This was a retrospective study of data from the Bishop Murray Medical Centre blood bank. Data was collected with the permission of the hospital and analyzed through descriptive statistics. The Statistical Package for Social Sciences (SPSS) version 19 was used for the analysis. All samples were tested by rapid diagnostic test kits produced by Pistis Diagnostic Limited.
Results: Out of 1256 samples of voluntary blood donors, 164 were positive for viral hepatitis, 102 were HBV positive only, 60 HCV positive only, while 2 were positive for both. The HBV prevalence among blood donors in Makurdi was found to be 8.12% while HCV prevalence was 4.77%.
Conclusion: The prevalence of HBV and HCV infections that spread through blood donations are significant and must be addressed on priority basis so as to reduce the disease burden of hepatitis in Nigeria.

Key words: *HBV; HCV; Blood donors; Makurdi*

1. Introduction

Hepatitis is one world's most common infectious disease, infecting two billion people including an estimated 400 million chronically infected cases (Krumah, Owusu, Frempong and Averu, 2011). According to the WHO, hepatitis affects hundreds of millions of people worldwide, causing acute and chronic disease and killing close to 1.4 million people every year (World Health Organisation, 2013). The estimated hepatitis B surface antigen (HbsAg) seroprevalence ranges between 0.1% –20% in different parts of the world (Lavanchy, 2004). In Nigeria, the prevalence rate of HBV is 10% and HCV is 2.1i% (Lavanchy, 2004).

HCV and HBV are common chronic blood borne infections. Infection occurs mainly with intravenous drug misuse, unprotected sexual contact, needle stick injury, blood transfusion and sharing of toothbrushes or razors (Innes, 2009). The prevalence of antibodies to HBV and HCV among blood donors varies across different countries and geographical locations within countries. The prevalence rate of infection in healthy blood donors is about 0.02% in northern Europe, 1–3% in southern Europe and 6% in Africa (Kumar and Clark, 2012). In emerging countries, the prevalence rates are higher as compared to the developed countries, as the primary sources of HBV and HCV infection remain infusion of inadequately screened blood and blood products and use of unsterilized injection equipment (Karmochkire, Carrat, Dos Santos, Cecoub and Ranguin, 2006). The strategy used to reduce transfusion transmitted infections includes improving donor selection, testing the donated blood for specific antibodies against infectious agents and using autologous transfusion (WHO Geneva, 1992; Glynn, Kleinman, Wright and Busch, 2002). However,

studies revealed that in sub-Saharan Africa (SSA) including Nigeria, there were several issues undermining blood safety, including low implementation of national policies for transfusion, impaired efficiency of organizational functioning, insufficient funding and lack of suitable blood screening equipment and resources (Tagny, Mbanya, Tapko and Lefrère, 2008). Along with these, international models and standards for organizing blood banks and blood donation are not affordable and might even be unsustainable in SSA (Allain, Owusu-Ofori, and Bates, 2004). Even though improvement has been achieved, many challenges remain unsolved to ensure blood safety; especially in rural areas (Fleming, 1997) which could be the reason for higher prevalence of HBV and HCV among the blood donors in such settings. Also, information is very limited on the prevalence of HBV among healthy blood donors in Nigeria. As a result of this dearth of information, guidelines and other adequate information on effective preventive and control measures are essentially lacking in many settings in Nigeria. Due to these shortcomings, measures are urgently needed to ensure blood safety, to avoid the spread of infectious agents and the deterioration of the health of both blood donors and recipients - a goal that should guide the formation, improvement and implementation of blood safety procedures in Nigeria.

Bishop Murray Medical Centre, one of the most famous secondary Health Institution in Makurdi (the capital of Benue, Nigeria) renders medical services to patients from all over the state. It provides blood transfusion as one of its routine services. Most of the donated blood is screened for HBV and HCV. The present study has become necessary due to the paucity of information regarding the seroprevalence of these common blood infections among blood donors in Makurdi, Nigeria.

To understand and evaluate the extent and dynamics of transmission of a disease in a community and for its control and prevention, the assessment and study of its prevalence is very important. Therefore, our objective was to determine the prevalence of HBV and HCV infection among voluntary blood donors, with the view to creating awareness regarding the disease burden of hepatitis in Nigeria.

2. Method

2.1. Study Area

The study was done in Makurdi metropolis, Benue state, Nigeria. Makurdi is located at longitude 60 28'E and latitude 70 14'N of the Guinea Savanna zone in central Nigeria.

2.2. Screening Procedure

2.2.1. Screening for HCV antibodies

Detection of HCV antibodies was carried out using commercially available One Step Rapid Test kits for HCV and HBV (PISTIS Diagnostic Ltd, USA), a rapid chromatographic immunoassay for qualitative detection of antibodies to HCV in serum or plasma. The manufacturer's instructions were strictly adhered to.

2.2.2. Test Procedure

Sera samples were removed from the -20ºC freezer and allowed to thaw and attain room temperature. Each strip with the arrow pointing downwards was removed from the pouch and immersed vertically into the sample. The strip was removed after 10 seconds and results read within 10 – 20 minutes.

2.3. Ethical Clearance

Permission was obtained from the authority of Bishop Murray Medical Centre, Makurdi

2.4. Study Design

This was a retrospective study among blood donors at a secondary health facility in Nigeria

2.5. Data Collection Tool

Data were obtained for voluntary blood-donors, from their blood bank record books.

2.6. Study Time Period

January 2010 to April 2013

2.7. Inclusion / Exclusion Criteria

All blood donors registered at the blood bank during the study period from January 2010 to April 2013 were included in the study

2.8. Data Analysis

Data on blood donors and the results of all performed tests on their blood were entered on Microsoft Excel 2007 spreadsheets. The data was analyzed using SPSS 19 software. Bivariate analysis was used to find the correlation between characteristics of donors and studied infections. The following indicators were assessed: (i) distribution of blood donors per age and gender; (ii) number and ratio of persons infected by HBV and HCV viruses; (iii) number and ratio of blood donors infected by HBV and HCV by age group and sex. Chi-square test was used to compare means and the difference was considered statistically significant for P value < 0.05. All data was aggregated to ensure confidentiality.

3. Results

3.1. Socio-demographic characteristics of the blood donors

Data for 1256 samples of voluntary blood donors were collected and evaluated. Among the total blood donors, 1248 (99.36%) donors were males while 8 (0.63%) donors were females. The age of blood donors varied from 18 to 52 years with a median age of 28 years. (Table 1)

	Age groups	Total number of blood donors	Total number of male blood donors in different age groups	Total number of female blood donors in different age groups
Age (in years)	18-24	76 (6.05%)	76 (6.08%)	0
	25-30	115 (9.15%)	113 (9.05%)	2 (25%)
	31-36	88 (7.0%)	88 (7.05%)	0
	37-42	44 (3.5%)	44 (3.52%)	0
	43-48	18 (1.43%)	18 (1.44%)	0
	49-52	4 (0.31%)	4 (0.32%)	0
	Adult*	911 (72.53%)	905 (72.51%)	6 (75%)
Total		1256	1248	8

Table 1: Demographic characteristics of the blood donors: Age and gender wise distribution of different age group among the blood donors

** Exact age for those donors were not indicated they were only indicated to be adults*

3.2. Prevalence of Hepatitis B and C among Blood Donors

Out of 1256 samples of voluntary blood donors, 164 were positive for viral hepatitis, 102 were HBV positive only, 60 HCV positive only, while 2 were positive for both. The HBV prevalence among blood donors in Makurdi was 8.12%, HCV prevalence was 4.77% and that of co-infection with HBV and HCV was 0.15 %. (Table 2)

	Number of blood donors detected positive for hepatitis	Percentage of blood donor s detected positive for hepatitis
Hepatitis B	102	8.12
Hepatitis C	60	4.77
Co-infection of hepatitis B and C	2	0.15
Hepatitis infection (Total)	164	13.05

Table 2: Prevalence of positive cases of HBV, HCV and co-infection of HBV and HCV among blood donors

As detailed information around demographics were present for only 345 blood donors, data from only these 345 blood donors were included for the detailed analysis. The overall prevalence of HBV and HCV among males was 10.72% and 5.53%, respectively. The prevalence of HBV among females was 50% and it was seen only in age group of 25-30 years. No HCV cases were detected among females. Among males, the prevalence of HBV was highest in the age group of 49-52 years followed by 43-48 years and 31-36 years of age, while the prevalence of HCV was highest in the age group of 37-42 years, followed by 25-30 years and 31-36 years. (Table 3)

Age in years	Total number of blood donors	Total Male blood donors	HBV positive Male blood donors	HCV positive male blood donors	Total Female blood donors	HBV positive Female blood donors	HCV positive female blood donors
18-24	76	76	9 (11.84%)	2 (2.63%)	0	0	0
25-30	115	113	10 (8.84%)	10 (8.84%)	2 (%)	1 (50%)	0
31-36	88	88	12 (13.63%)	3 (3.4%)	0	0	0
37-42	44	44	2 (4.54%)	4 (9.09%)	0	0	0
43-48	18	18	3 (16.66%)	0 (%)	0	0	0
49-52	4	4	1 (25%)	0	0	0	0
Total	345	343	37 (10.72%)	19 (5.53%)	2	1 (50%)	0

Table 3: Prevalence of HBV and HCV positive cases among different age groups and gender in blood donors

Although statistically not significant, the overall seroprevalence of HBV antibodies was higher in females (50%) than males (10.49%) (Chi square = 3.24, p= 0.07). However, the prevalence of HCV antibodies was higher in males (5.53%), compared to

zero prevalence among females. (chi square = 0.11, p = 0.73). (Table 4). As the sample size of women donors was very low, the results for women might not be reflective of the situation in the area.

	Hepatitis B			Hepatitis C		
Sex	**Positive**	**Negative**	**Total**	**Positive**	**Negative**	**Total**
Male	36 (10.49%)	307 (89.50%)	343 (100%)	19 (5.53%)	324 (94.46%)	343 (100%)
Female	1 (50%)	1 (50%)	2 (100%)	0	2 (100%)	2 (100%)
Total	37 (10.72%)	308 (89.27%)	345 (100%)	19 (5.50%)	326 (94.49%)	345 (100%)
Chi-square	3.241			0.1172		
P value	0.071816			0.732043		

Table 4: Gender based sero-prevalence of HBV and HCV infections among blood donors

As compared to the other age groups, the rate of HCV positivity was significantly lower ($P < 0.05$), and the rate of HBV positivity was significantly higher ($P < 0.05$), in the age groups 18-24 years and 31-36 years, respectively. The rate of HBV positivity was 25% in the age group 49 to 52 years, this was higher than individuals aged 18 to 48 years; whereas the rate of HCV positivity was 9.09% in the age group of 37-42 years of age which was higher than individuals aged 18-36 years. (Table 5)

	Hepatitis B			Hepatitis C			Chi-square	P value
Age groups	**Positive**	**Negative**	**Total**	**Positive**	**Negative**	**Total**		
18-24	9 (11.84%)	67 (88.16%)	76 (100%)	2 (2.63%)	74 (97.36%)	76 (100%)	4.8021	0.028426*
25-30	10 (8.69%)	105 (91.30%)	115 (100%)	10 (8.69%)	105 (91.3%)	115 (100%)	0.00	1.00000
31-36	12 (13.63%)	76 (86.36%)	88 (100%)	3 (3.4%)	85 (96.59%)	88 (100%)	5.9031	0.015114*
37-42	2 (4.54%)	42 (95.45%)	44 (100%)	4 (9.09%)	40 (90.9%)	44 (100%)	0.7154	0.397641
43-48	3 (16.66%)	15 (83.33%)	18 (100%)	0	18 (100%)	18 (100%)	3.2727	0.07044
49-52	1 (25%)	3 (75%)	4 (100%)	0	4(100%)	4 (100%)	1.1429	0.285049

Table 5: Seroprevalence of HBV and HCV infections according to different age groups among blood donors
** P value statistically significant as P value < 0.05*

4. Discussion

In our study, the prevalence of HBV among blood donors in Makurdi is 8.3%. The study results were higher than those reported among commercial blood donors in Benin, Nigeria (Umolu, Okoror and Orhue, 2005), and the blood transfusion unit of Ahmadu Bello University Teaching Hospital, Zaria, Kaduna State, Nigeria (Muktar, Suleiman and Jones, 2005), 1.4% among blood donors in Alexandria, Egypt (Wasfiand Sadek, 2011) and 4.2% among blood donors in Nairobi, Kenya (Abdalla, Mwanda and Rana, 2005).While the results appears lower than the prevalence of 14% found among the commercial blood donors in Nigeria. Studies reporting HBV prevalence among other groups besides blood donors in Nigeria include, 7.0% among attendees of Association of Reproductive and Family Health Centre in Ibadan, Nigeria (Okonko, Okerentugba, Akinpelu, 2012), 4.3% among pregnant women attending the antenatal clinic at the University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria (Akani, Ojule, Opurumand Ejilemele, 2005) and 3.9% among adolescents in Abakalaki, Nigeria (Ugwuja and Ugwu, 2010).

The prevalence of HCV reported as 4.9% from this study is higher than the 3.0% among blood donors from a teaching hospital in the South Western Nigeria (Opaleye, Zakariyahu, Tijani and Bakarey, 2010); 0.4% among blood donors in Kano, Nigeria (Imoru, Eke and Adegoke, 2003) and; 4.4% among HIV negative patients at Kenyatta National Hospital, Kenya (Karuru, Lule, Joshi and Anzala, 2005).

Reports from different parts of the world vary, with prevalence of HBV and HCV among blood donors being 0.66%-25% and 1.0%-13.3% respectively (Butashirili, Tsertsvadze, McNutt, Kamkamidze, Gvetzade, Badridze, 2001; Gupta, Kumar and Kaur, 2004; Matee and Mages, 2006). In Nigeria prevalence figures of 1.3%-1.49% and 6%-8.4% have been reported for HBV and HCV respectively (Ejele, Erhabor and Nwauche,2005; Chikwem, Mohammed, Okwara, Ukwandu, Ola, 1997; Egah, Mandong, Iya and Banwat, 2004; Ayolabi, Taiwo, Omilabu, Abebisi and Fatoba, 2006; Muktar, Suleiman and Jones, 2005; Uneke, Ogbu, Inyama, Njoku, Idoko, 2005). In developed countries, HBV and HCV infection risk was estimated at 1 in 3000 transfusions, which is very low. The reasons for this most likely are low prevalence in the general population, awareness among the general public and adequate health care facilities (Moradpour, Cerny, Heim and Blum, 2001). However, in comparison with the developed countries, emerging countries experience higher prevalence rates for HBV and HCV due to inadequate screening of the blood and blood products, improper injection safety practices, high risk sexual behaviors, socio-cultural practices like tattooing, scarification

and circumcision practices through the use of unsterilized instruments. Differences in prevalence can be most likely associated with variations in the geographic locations and the differences in the diagnostic kits or markers used in detection of HBV and HCV antibodies. Also, as there are the differences in the prevalence of HBV and HCV are reported among different population in the same town (Karmochkire, Carrat, Dos Santos, Cecoub and Ranguin, 2006; Fasola, Kotila and Akinyemi, 2009; Buseri, Muhibi and Jeremiah, 2009). Population selection is also a factor contributing to the variations in prevalence.

Our study also shows that the highest prevalence of HBV occurred between the ages of 49 to 52 while the highest prevalence of anti-HCV antibodies occurred between the ages of 37 to 43 years. This is consistent with the findings of the studies that supported that, in emerging countries, the prevalence of HBV was higher and distributed more generally through older populations than in the developed settings (Abdalla, Mwanda and Rana, 2005; Gupta, Kumar, Kaur, 2004). However, this is in contrast with the findings reported in previous studies in Nigeria (Erhabor, Ejele, Nwauche, 2006; Busari, 2011). One of the reasons could be that the elderly population had faced continued exposure to potential risk factors like transfusion of contaminated blood products and medical/ therapeutic procedures performed without systematic precautionary measures during most of the lives (Martins and Machado, 2013). Also, in Nigeria, the routine use of appropriate screening tests for blood transfusion which could reduce the burden of blood borne infections like hepatitis has been implemented only recently. It is probable that the results of our study reflect a higher exposure to contaminated blood before the commencement of standard precautionary measures for HBV and HCV screening. Also, the higher prevalence of HCV infection among the younger population might be related to higher sexual activity, increasing prominence of intravenous drug use and high unemployment rate among them leading to more high risk behaviors. Our results of the study reported that females had a higher prevalence (66.66%) of HBV than their male counterparts (9.86%). However, since the sample size is too low, no assumptions and conclusions can be derived from this sample size.

Blood borne infections like HBV and HCV infections continue to pose a great challenge to transfusion medicine, most particularly in Africa, because of a high transfusion demand (Fleming, 1997). Transfusion-transmitted infections in developed countries have been reduced by preventing unnecessary transfusions, preferring only regular voluntary donors, thereby avoiding donors with specific risk factors and systematic screening of all donated blood for infection. However, in many emerging countries none of these interventions are applied uniformly and the risk of transfusion-transmitted infections remains high (Gurol, 2006). Hence, strict selection of blood donors, public awareness on HBsAg, HCV infections and prevention strategies is a must for the emerging countries like Nigeria.

Based on the findings of the current study, it is recommended that blood donors should always be screened for HBV and HCV. Appropriate screening programs based on simple assay formats like agglutination should be encouraged. Consequently, international models and standards for organizing blood banks should be adapted to resource poor environments including locally relevant guidelines for counseling and management of HBsAg and HCV positive blood donors (Allain, Owusu-Ofori and Bates, 2004). Overall, there arises a need to create an awareness regarding HBV and HCV not only among the high risk population but also among the general population. Emphasis should be placed on these aspects through information education communication campaigns. The high disease burden of such blood borne infections demands formulation of government-supported prevention and control strategies for HBC and HCV, not only in blood banks but also in similar hospital settings. As varying results appear in different studies reported globally, it is recommended that similar studies have to be conducted with larger samples to assess the actual prevalence and evaluation of associated risk factors not only in Nigeria but also in emerging countries with similar socio-demographic profile and disease burden. Lastly, strategies that pay attention to the infected blood donors should be planned and implemented.

Our study has somelimitations which include that no additional confirmatory test was done on HBV and HCV positive samples to differentiate between active and resolved infection. Also, as the data was obtained from a blood bank, we were not able to meet or interact with donors or patients.

5. Conclusion

HBV and HCV infections are frequent among blood donors in Nigeria. The high rates of HBV and HCV infections risk the health of citizens and must be effectively paid attention to by the implementation of strategies to create awareness, combat and control them. Further, blood should be rigorously screened before transfusions to safeguard the health of recipients.

6. Conflict of Interests

The authors declare no conflict of interests.

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