THE BURDEN OF HEPATITIS B AND C VIRUS INFECTIONS IN PATIENTS WITH SICKLE CELL ANAEMIA IN JOS – NIGERIA

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ABSTRACT

BACKGROUND: Sickle cell anaemia (SCA) is an important public health problem in Nigeria associated with frequent blood transfusion. Patients with this disease are at increased risk of contracting hepatitis B and C virus through blood transfusions.

OBJECTIVE: The study aimed at determining the burden of hepatitis B and C virus infections in patients with sickle cell anaemia and the role of blood transfusion in these infections acquisition in Jos.

MATERIALS AND METHODS: This was an observational cross-sectional study conducted on patients with SCA attending the Haematology Out-patient Clinic of Jos University Teaching Hospital, between November 2014 and August 2015. Consenting patients with SCA had their blood screened for anti- HBV and HCV antibodies using fourth generation Elisa techniques after completing a questionnaire.

RESULTS: One hundred and eleven patients with SCA participated. Antibodies to Hepatitis B virus (HBV) was detected in 21 (18.9%) while that to Hepatitis C virus (HCV) was found in 16 (14.7%). Seventy six (68.5%) of the participants had history of blood transfusion while 35 (31.5%) were never transfused. 22.4% and 15.8% of those transfused were positive for HBV and HCV antibodies respectively. There was no significant difference in the proportion of those positive for anti HBV or HCV with respect to their transfusion status (p=0.24 and 0.81 respectively).

CONCLUSION: The proportion of our patients with SCA that were anti HBV and anti-HCV positive was high. Blood transfusion did not significantly influence their positive status. Strategies aimed at controlling these viral infections in these patients and the general population should be enforced after public awareness campaigns and advocacy are instituted.

KEYWORDS: Sickle Cell Anaemia, burden, Hepatitis B Virus, Hepatitis C Virus, infection, Blood Transfusion.

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INTRODUCTION

Sickle cell anaemia (SCA) is an inherited chronic haemolytic anaemia and the most common heritable haematologic disease affecting humans.[1, 2] The chronic nature of the anaemia as a result of the unique pathologic defect has made blood transfusion a critical component of its management.

Blood transfusion is however associated with risk of contracting transfusion transmissible infections (TTIs) such as hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency viral infection amongst others.[2]

Research has estimated that approximately 8% of African Americans carry the sickle cell gene and about 0.15% are homozygous (HbSS) resulting in sickle cell anaemia with its attendant morbidity and mortality.[3] Nigeria has a sickle cell anaemia prevalence rate of 1-3% and is considered to be among countries with the highest population of patients with this disease in the World.[4,5] It has been reported that twenty four percent of Nigerians are carriers of the sickle cell gene resulting in the birth of about 150,000 children with sickle cell anaemia annually.[4,5] A sizeable proportion of the children born with the disease are at risk of receiving blood transfusion. Furthermore, the complications associated with sickle cell anaemia, such as haemolytic, aplastic and sequestration crises increase the demand for blood transfusion in the care of these patients. These also increase their susceptibility to contracting TTIs.

The incidence of TTIs has been on the downward trend in recent years due to more effective donor screening

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methods, though the risk of acquiring TTIs is yet to be completely eradicated. [6-8]

This is more profound in resource-constraint setting like ours with technical, economic and infrastructural challenges.[9-11] Studies have reported a higher prevalence rate of HBV and HCV infection in patients with SCD than the general population.[12, 13] The higher rate of HCV infection in patients with SCD was attributed to the late introduction of HCV donor screening in 1992. [14]

Studies have also indicated increased risk of development of hepatocellular carcinoma and chronic liver disease in multi-transfused individuals due to transfusion-related acquisition of HBV and HCV infection. [15,16]

This study aimed at determining the burden of HBV and HCV infections in our patients with SCA, it also investigated the role of blood transfusion in the acquisition of these viral infections in these patients and assessed the effectiveness or otherwise, of pre-donation screening methods used in the prevention of transfusion acquired HBV and HCV infection from this Centre.

MATERIALS AND METHODS

We conducted a cross sectional study at the Haematology Out-Patient Clinic (HOPC) of the Jos University Teaching Hospital (JUTH), Jos between November 2014 and August 2015. Ethical approval was obtained from the Human Research and Ethics Committee of JUTH.

Consenting adults with SCA attending the HOPC of JUTH were enrolled for the study. Non-consenting patients and other forms of anaemia and haematologic diseases were excluded.

Informed written consent was obtained from all the participants prior to the research procedure while maintaining strict confidentiality. Using a structured pre-tested questionnaire, personal data such as age, sex, marital status, history of blood transfusion, where transfused and number of units of blood received was obtained from each participant.

Participants had their blood samples collected and their haemoglobin electrophoresis determined using the cellulose acetate haemoglobin electrophoresis method at alkaline pH of 8.9 to confirm their sickle cell status. They were then screened for antibodies to Hepatitis B virus (HBV) and Hepatitis C virus (HCV) using the fourth generation ELISA kits, (GENSCREENTM Bio-Rad, Marnes-la-Coquette, France).

ANALYSIS OF DATA

Statistical analysis of data obtained from the study was done using EPI INFO version 7.1.3.0 (CDC Atlanta Georgia, USA). Results were presented in tables and graphs while chi-square and students' t-test were used to assess significant differences. Results with p-values < 0.05 was considered statistically significant.

RESULTS

One hundred and eleven (111) patients with sickle cell anaemia were studied. Forty-eight (43.2%) were males while 63 (56.8%) were females giving a Male: Female ratio of 1:1.3 (Table 1).The mean age of participants was 25.6 ± 6.7 years and an age range of 17-52 years. Majority (81.0%) of the participants were unmarried and aged between 20-34 years (Figure 1)

History of blood transfusion was recorded in 76 (68.5%) of the participants while 35 (31.5%) were never transfused. Amongst the participants transfused, 29 (38.2%) were males and 47 (61.8%) were females. Sixty-eight (68) of those transfused were able to recall the number of units they received at different times ranging from 1 to 20 units with a mean transfusion of 2.81± 2.75 units (Table 1).

Table 1- Socio-demographic Characteristics, transfusion, HBV and HCV status of adults with SCA studied at the Jos University Teaching Hospital, Nigeria between November 2014 and August 2015 (n =111)

Parameters	Frequency (%)
Mean age (years)	25.6±6.7
Sex	
Male	48 (43.2)
Female	63 (56.8)
Marital Status	
Single	90 (81.1)
Married	16 (14.4)
Separated	3 (2.7)
Divorced	1 (0.9)
Widow	1 (0.9)
Transfusion status	
Transfused	76 (68.5)
Not Transfused	35 (30.0)
Mean number of units transfused	2.81 ± 2.75

HBV Status	
Positive	21 (18.9)
Negative	90 (81.1)
HCV Status	
Positive	16 (14.7)
Negative	95 (85.3)

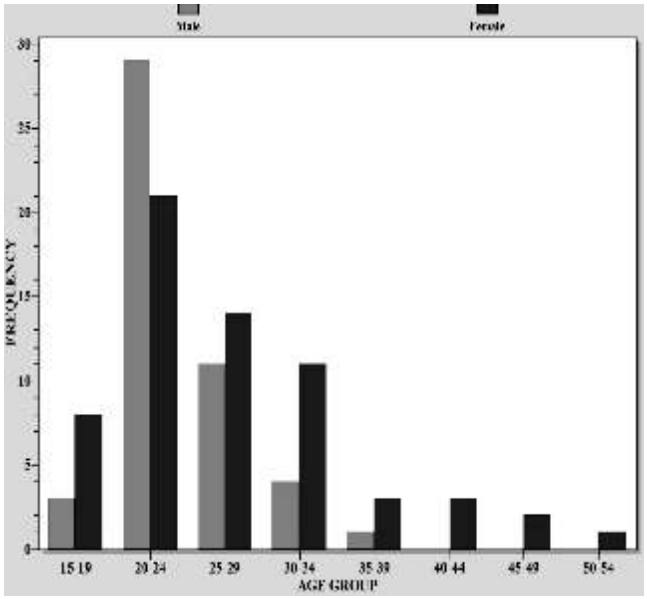

Figure 1. Age and sex distribution of adults with SCA studied at the Jos University Teaching Hospital, Nigeria between November 2014 and August 2015 (n =111)

Antibodies to Hepatitis B virus (HBV) was detected in 21 (18.9%) of the 111 participants comprising of 17 (81.0%) transfused and 4 (19%) non-transfused. 22.4% of the transfused patients with SCA were positive for HBV antibody. Hepatitis C virus (HCV) antibodies was found in 16 (14.7%) of the participants, of which 12 (75%) had blood transfusion while 4 (25%) had no history of blood transfusion. This implied that 15.8% (12/76) of those that had blood transfusion were HCV antibody positive. There was no significant difference in the proportion of those that tested positive to anti HBV or HCV antibodies for those transfused and non-transfused. The number of units of blood received had no influence on their viral antibody status. (Table 2). 61.9% and 50% of those positive for HBV and HCV antibodies respectively were females. This may be related to the number of female patients that participated in this study.

Table 2. Blood transfusion rate, Hepatitis B and Hepatitis C virus antibody status of adults with SCA studied at the Jos University Teaching Hospital, Nigeria between 2014 and 2015 (n =111)

Viral antibody status	Number of units of blood transfused; n (%)			p value
	None	< 10	≥10	
HBV: Positive	4(11.4)	14(21.5)	1(50)	0.24
Negative	31(88.6)	51(78.5)	1(50)	
HCV: Positive	4(11.4)	9(13.8)	-	0.81
Negative	31(88.6)	56(86.2)	2(100)	

DISCUSSION

Patients with sickle cell anaemia are generally predisposed to various systemic complications necessitating blood transfusion due to the sickling and vaso-occlusive phenomena associated with the disease. They are therefore at risk of viral hepatitis from the multiple blood transfusions they often receive for their medical care. The risk for acquisition of transfusion-related infections vary from one setting to the other depending on a number of factors such as availability of facilities for effective screening of blood and blood products, as well as trained laboratory personnel.

The proportion of SCA patients positive for anti-HBV and anti-HCV antibodies in this study was 18.9% and 14.7% respectively. This was high compared to the finding of Khan et al and Asma et al in similar group of patients in Saudi Arabia and Turkey respectively.[17,18] It was also higher than the findings of Pennap et al in a community of apparently healthy individuals in Keffi, North-Central Nigeria.[19] This high burden of HBV and HCV infections in our SCA patients may be due to their exposure to blood transfusion, an established risk for transmission.

The finding of high anti-HBV in our patients was however similar to the findings of Egah et al and Adekeye et al in blood donors in Jos. They found a prevalence of 15.1% and 20.8% respectively for anti-HBV but a lower anti-HCV prevalence of 4.3% and 4.9% respectively.[20,21] Several researchers have reported varying seroprevalence of hepatitis infections among patients with SCA. This ranged from 3.0% to 39.0% for HBV and 4.5% to 21.0% for HCV.[22-24] The difference in these findings may be connected with the seroprevalence of these viral hepatitis among the general population in that region.

In relation to blood transfusion, those transfused had a

seroprevalence of 22.4% (17/76) for anti HBV and 15.8% (12/76) for anti HCV while those that never had blood transfusion had a seroprevalence of 11.4% (4/35) for both HBV and HCV. There was no significant difference between the transfused and non-transfused in this respect ($p>0.05$).

The seroprevalence of HBV and HCV in the transfused was higher than the non-transfused in this study, although no statistical significant difference was found. This seemed to have demonstrated clearly the risk of acquiring the hepatitis viral infections through blood transfusion. SCA patients being more vulnerable are likely to receive multiple blood transfusions which put them at increased risk of acquiring these hepatitis viral infections. However, additional risk factors may have contributed to the high HCV burden in our non-transfused SCA patients as previous studies reported lower HCV prevalence in blood donors from this Centre.[20,21]
The finding in this study of a higher seroprevalence of HCV in transfused SCA patients compared to prevalence of HCV in blood donors in previous study from this Centre, differed from a report by Adewuyi in Ilorin, Nigeria that did not find a significant difference in HCV prevalence between the multi-transfused sickle cell patients and regular blood donors.[25]

The proportion of our transfused SCA patients who tested positive to anti HBV and HCV antibodies was however lower than that documented in a study by Fasola and Otegbayi in Ibadan Nigeria, but higher than that reported in a study done in Ahvaz, South Western Iran and another study in Western Odisha, India. Ibadan study reported 23.6% and 19.8% for anti-HBV and anti HCV respectively, Iranian study reported 1.8% and 12.5% for anti HBV and anti HCV respectively while the Indian study documented 2.9% for HBV and 1.7% for HCV.[26-28]

The lower prevalence of anti HBV seen in Al-Ahsa and Odisha may not be unconnected with the advent of HBV vaccine and its use amongst the population in that region. This is unlike HCV whose vaccine is not yet available and donor screening for it only became mandatory in 1992.[14]

Reports from Western Europe and North America have shown that the prevalence of Hepatitis B virus infection has fallen to less than 1% among the general population after the introduction of its vaccine though it still remained as high as 10% in the developing countries.[29]

Contrary to the finding in our study, several researchers have reported increasing seroprevalence of these viral infections with increasing number of blood transfusion units received.[22-24] This calls for concerted effort in implementing all preventive measures against transfusion transmissible infection by improving blood transfusion protocol and their safety.

Although our study did not find any statistical difference between the transfused and non-transfused participants in association with HBV and HCV positive status, the high burden of these viral infections among transfused sickle cell anemia patients calls for concern and deliberate efforts targeted at reduction of these infections.

In this study, 84.4% of our patients had history of blood transfusion. This was similar to findings from elsewhere.[30-32] This confirmed the fact that SCA patients are prone to receiving blood transfusion due to the complications associated with the disease such as hyperhaemolytic, sequestration and aplastic crises.
There was no statistically significant difference in either anti-HBV or anti-HCV positive status between males and females in this study ($p = 0.59$ and 0.56 respectively). Statistical significant association was not also established between age groups, marital status and HBV and HCV positive status despite the fact that significant population of the participants (81.0%) were unmarried and aged between 20-34 years ($p>0.05$). This seems to support the fact that blood transfusion may be the most important risk factor for the acquisition of these viral infections in these patients with SCA. This calls for strategies aimed at further improving the safety of local blood supply through increased awareness of donating blood voluntarily.

CONCLUSION

The burden of HBV and HCV in our patients with SCA from this Centre is high. Blood transfusion is a vital component in the management of sickle cell anaemia and with this management modality comes the complication of HBV and HCV infections. Although the study did not show a significant role played by blood transfusion in the acquisition of HBV and HCV infections in our patients, there is still need for concerted effort in implementing all preventive measures against transfusion transmissible infections by improving blood transfusion protocol and their safety. Measures such as detection of viral genome in potential blood donors should be part of the panel of pre-donation tests for intending blood donors. Public enlightenment campaigns as well as vaccinations against HBV now and HCV when available should be made routine for all SCA patients and enforced in the general population to reduce these infections.

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