Prevalence of Hepatitis B Surface Antigen (HBsAg) Seropositivity in Sickle Cell Anaemia Patients in Benin City, Mid-Western Nigeria

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Abstract

Background*: Conditions that may require regular blood transfusion are particularly prone to acquiring transfusion transmissible infections.*

Objective: *To determine the prevalence of HBsAg seropositivity among sickle cell anaemia (SCA) patients.*

Subjects and Methods*: Ninety-six (SCA) patients age range 1–69 years, and 92 age-matched controls were screened for exposure to Hepatitis B virus (HBV) using, solid base wet ELISA test kits (Monolisa® from Sanofi diagnostics). All the participants were further stratified into those with a prior history of transfusion and those without, the prevalence of HBsAg was compared in the two groups.*

Results*: The prevalence rate of HBsAg was 29.2% in SCA patients, while it was 27.2% in the controls. The difference was not statistically significant (P>0.05).*

The overall risk of HBV infection in SCA patients was not clearly increased by blood transfusion, even though the Relative risk (1.4%), compared to that of the control population (1.2%) and Attributable risk (8.4%), compared to that of the control population (6.6%) were increased.

Conclusion*: Transmission of hepatitis B virus infection from blood transfusion does not appear to contribute significantly to the high prevalence of seropositivity in our population of SCA patients. Universal vaccination of these subjects against hepatitis B virus is advocated as a way to possibly reduce this prevalence.*

Key words: Sickle cell anaemia, prevalence, HBsAg, seropositivity.

Introduction:

Sickle Cell Disease (SCD) has a high prevalence in sub-Saharan Africa. The prevalence of the S gene in Nigeria is 25-30%.[1] Hepatitis B is one of the most common infectious diseases globally. It was estimated that approximately 2 billion people have serological evidence of past or present HBV infection. More than 350 million are chronic carriers of HBV.[2] Benin City and indeed all sub-Saharan Africa are highly endemic for this disease.[2]

Hepatitis B is associated with a chronic carrier status, which can now be managed with recombinant human alpha interferon (IFN-α) and nucleotide analogues (NA) with a reasonable degree of success.[3] It is epidemiologically correlated with

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hepatocellular carcinoma, and leads to more cases of liver cirrhosis than alcohol consumption. It is second only to tobacco among human carcinogens.[2] This being the case, it becomes very important that health care professionals must find the best and cheapest means to avoid this complication especially in sickle cell anaemia patients, by preventing its transmission.

Theoretically, because of the increased frequency of exposure to blood not screened for HBsAg in the hospitals where this work was done, and a proneness to infection caused by SCD (due to a defect in the immune system).[4] Patients with sickle cell anaemia would be expected to have a higher prevalence of HBsAg seropositivity than the normal population.

This study aimed to report the prevalence of HBsAg seropositivity among sickle cell anaemia (SCA) patients and how this was influenced by blood transfusion.

Subjects and Methods:
Ninety-six (96) confirmed sickle cell anaemia patients between the ages of 1-69 years were drawn from sickle cell anaemia clinics in the University of Benin Teaching Hospital, Central Hospital and a private hospital (Salvation Clinic), all in Benin City, Mid-Western Nigeria. Ninety-two (92) control patients, genotypes – AA, were randomly drawn from the General Practice Clinic of the University of Benin Teaching Hospital.

All the participants were informed verbally and consent was obtained for the study. A questionnaire was used to obtain personal information such as age, ethnic group, religion and occupation, place of domiciliation, Hepatitis B vaccination status, marital status, haemoglobin type, history and frequency of blood transfusion.

Participants who had been previously immunized with anti-hepatitis B vaccine were excluded from the study.

5mls of blood was collected from each participant by venipuncture, 2mls were put into EDTA (Ethylene Diamine tetra-acetic acid) specimen bottles and the haemoglobin phenotype was obtained by doing haemoglobin electrophoresis using the alkaline cellulose acetate method. 3ml was captured in plain bottle, allowed to clot and serum extracted by centrifugation at 5000 rpm for 5 minutes for HBsAg testing by solid base wet enzyme linked immunoabsorbent assay (ELISA) Kits: Monolisa® from Sanofi diagnostics. The methodology and technique detailed in the information inserts provided with these kits were strictly adhered to and each test kit had in built procedural controls. Results were however based on single determinations because of cost.

The results were subjected to statistical analysis by Chi Square, student t-test, z-test and Spearman's correlation coefficient, as appropriate. Level of significance was taken as $p<0.05$.

Relative risk (RR) and Attributable Risk (AR) of contracting Hepatitis B virus (HBV) infection from blood transfusion were assessed for both HbSS and control populations following standard methods.[5]

Results:
The HbSS patients were made up of 47 males and 49 females. Their mean age was 19.41 ±9.55 years. Most of them were aged between 11-30 years (77.2%). There were 47 males and 45 females in the control group. The mean age of the control was 14.80 ±11.34 years.

The prevalence of HBsAg in the SCA patients was 29.2% while it was 27.2% in the control group. There was no statistical difference in the prevalence between the two groups (x^2 =0.04, df=1, p>0.05), (Table 1). The prevalence of HBsAg in female HbSS patients was 36.7% while it was 21.7% in males. The difference was not statistically significant (x^2 =2.758, df=1, p>0.05). In the control group, females had a prevalence of 24.4%, while males had 29.8%. The difference was not statistically significant (x^2 =0.354, df =1, p>0.05).

Table 1: Prevalence of HBsAg in HbSS and control populations

Subjects	HBsAg	
	Positive	Negative
HbSS	28 (29.2)	68 (70.8)

P>0.05 *[Percentages in brackets]*

TABLE 2: Relationship between prevalence of HBsAg and number of blood units given for different age groups.

SS Patients						CONTROL				
AGE (YRS)	**1-10**	**11-20**	**21-30**	**31-40**	**>40**	**1-10**	**11-20**	**21-30**	**31-40**	**>40**
Number Tested	16	38	36	4	2	8	37	40	6	1
Number positive for HBsAg	6	4	15	2	1	2	10	13	0	0
Percent positive for HBsAg	37.5	10.5	41.7	50	50	25	27	32.5	0	0
Range of unit of Blood given	0-14	0-15	0-31	0-5	3-10	0-1	0-2	0	0	0
Median Value	1	2	2	1.5	6.5	0	0	0	0	0

The prevalence of HBsAg increased with age in the HbSS population reaching 41.7% and 50% in the 21-30 and 31-40 year age groups respectively, (table 2). Similarly, the prevalence of HBsAg in the control population increased with age reaching the highest value of 32.5% in the 21-30 year age group (table 2).

The prevalence of HBsAg among HbSS patients who had not received blood transfusion was 23% while it was 31.4% among those who have had a previous transfusion. The difference was not significant (x^2=0.62, df=1, p>0.05). For the control population, the prevalence of HBsAg was 26.7% and 33.3% respectively for those who had not received transfusion and those who had. The odds ratio (relative risk) for becoming HBsAg positive with blood transfusion among HbSS patients was 1.4, while it was 1.2 for controls. The risk for becoming HBsAg positive, attributable to blood transfusion among HbSS was 8.4% while it was 6.6% among the controls. Similarly, the number of units of blood transfused did not show any significant relationship with the prevalence of HBsAg among the HbSS patients (x^2 =2.51, df=2, p>0.05), (Table 3)

Table 3: Relationship between the total number of blood units received and prevalence of HBsAg in HbSS and control population

No of Units	HBsAg			
	HbSS		CONTROL	
	Positive	**Negative**	**Positive**	**Negative**
0	6 (23)	20 (77)	23 (26.7)	63 (73.30)
1-3	10 (25)	30 (75)	2 (40)	3 (60)
>3	12 (40)	18 (60)	0 (0)	1 (100)

[Percentages in brackets]

Discussion

The age group distribution showed that the largest group attending the clinics where this work was carried out are the adolescents' and young adults' group between the ages of 11-30 years. They make

up 74% of the HbSS population. This is similar to the findings of Adegoke et al,[6] who reported a mean age of 25.3±6.7 years in their cohort of SCD patients in Ile-Ife, South-west Nigeria. This may thus be a reflection of the demographic profile of the population of the country and may portray the fact that life expectancy in HbSS patients is reduced. [7]

The prevalence of seropositivity for HBV among HbSS patients was found to be 29.2% while that for the controls was 27.2%. This is similar to the earlier report of Halim et al, in same centre, which noted a prevalence of HBsAg positivity of 29.3% among patients presenting to the accident and emergency department.[8] Lower prevalence rates of 4%, 7.4%, 10.3% and 25.4% have however been reported among blood donors in India,[9] the general population in Sana, Yemen,[10] Jos, Plateau state, Nigeria[11] and surgeons in Lagos, Nigeria,[12] respectively. The difference between the seropositivity in the control and HbSS population was not significant. This finding is in agreement with the report of Mutimer et al, who found a seroprevalence rate of 3.7% and 5.9% in HbSS and control patients respectively.[13] This seems to suggest that in the population studied, sickle cell anaemia patients may not be necessarily more prone to Hepatitis B virus infection than others in the general population despite their exposure to frequent blood transfusion, which is not screened for HBsAg.

The control population showed an increase in prevalence of seropositivity as age increased with the highest prevalence in the 21 – 30 year age group. This is in agreement with an earlier report by Halim et al[14] and tends to suggest an added horizontal mode of transmission in the 10 – 20 year age group and increasing sexual exposure (sexual transmission) in the 21 – 30 year age group. Indeed this represents the age of greatest sexual activity and experimentation. Multiple sexual partners have been found to be an important risk factor in the transmission of Hepatitis B virus.[2]

Importantly, the prevalence of HBsAg did not increase very much after the age of ten years; this may suggest that most of the chronic infections had occurred at this age, therefore resulting in the disappearance of the surface antigen from the serum.[2]

A similar trend was observed in the HbSS population, except for the age range of 11-20 years, where the prevalence was unexpectedly low; 10.5%. This seems to suggest a high mortality rate for SS individuals that are below ten years of age who are HBsAg positive.

It appears from this study, that the overall risk for HBV infection in HbSS patients is not clearly increased by blood transfusion. This can be explained by the fact that although the use of unscreened blood will expose some recipients to HBV for the first time. It is likely, however, that many blood recipients in this part of the world where HBV is endemic, will have had previous exposure to HBV, and be either immune or established careers prior to transfusion.[15] We therefore recommend that universal vaccination against HBV, as well as intense education on blood transmissible diseases become incorporated into the comprehensive management protocol of patients with SCD, including neonates and adolescent (the time of greatest sexual activity). More so, the establishment of a central blood transfusion service where blood must be screened for HBsAg using sensitive methods such as the Enzyme linked immunosorbent assay (EIA),[16] is also essential. The authors believe that the above strategies advanced in parallel will help to reduce the prevalence of HBsAg in HbSS patients and indeed the general population. These strategies have been shown to work by studies done in other populations.[2]

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