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**Prevalence of Hepatitis B Surface Antigen and Its Effects on Some**  
**Haematological Parameters among Blood Donors in North-Western**  
**Nigeria**

**Ashafa, Mustapha Aliyu and Naibi, Mohammed**

Department of Microbiology, Faculty of Science, Federal University Gusau, Zamfara State

Corresponding Author's Email & Phone No.: sayfullah99@yahoo.com , +2348036397495

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**ABSTRACT**

Hepatitis B is one of the most common infectious diseases in the world and a major problem. In addition to the hepatic pathology, extra-hepatic abnormalities are not unusual. One of the most frequently identified extra-hepatic abnormalities often seen at the time of diagnosis of acute viral hepatitis is the haematological abnormality. This is because every patient with acute viral hepatitis of necessity will require a full blood count to exclude bacterial sepsis as a cause of liver disease. This study was carried out to determine the haematological abnormalities associated with viral hepatitis. About 5mls of blood was collected from each of the 450 blood donors recruited for the study across the three geo-political zones of Kaduna state, Nigeria. All 450 blood samples were screened for HBsAg and haematological parameters. The percentage prevalence for HBsAg was 14.2%. The result of the haematological parameters revealed that monocytes had statistical significance to HBsAg positivity ( $p = 0.02$ ). Leucopaenia was highly associated with the blood donors positive for HBsAg. The prevalence of HBsAg found from this study indicates that hepatitis B is still highly endemic in the study area despite the availability of an effective vaccine. The study also found that differential cells count has no statistical association with HBV infection though the infection influences the proliferation of these haematological cells. The study recommends that patients with leucopaenia should be followed for early detection of serious haematological complications even after recovery from the acute state.

**Keywords:** prevalence, hepatitis, antigen, haematological

## 1.0 INTRODUCTION

Hepatitis B virus (HBV), a DNA virus of the family *Hepadnaviridae* is the causative agent of hepatitis B. The virus is a Dane particle; a 42 nm partially double stranded DNA virus belonging to a group of agents called the Hepadna viruses (Arora, 2008). Hepatitis B is one of the most common infectious diseases in the world and a major problem. According to the World Health Organization, an estimated 2 billion people have been infected with the hepatitis B virus worldwide and more than 240 million have chronic (long term) liver infections with about 600,000 people dying every year due to the acute or chronic consequences of Hepatitis B (WHO, 2015). It has also been reported that 360 million people are chronically infected (HBsAg positives) and are at risk of developing HBV-related chronic liver disease (cirrhosis, hepatocellular carcinoma), with 500,000-700,000 deaths are recorded each year

worldwide (Aminu, 2012). Hepatitis B virus is a blood borne and sexually transmitted pathogen that is spread through contaminated blood or other body fluids (saliva, sweat, semen, vaginal secretions, breast milk, urine, and faeces) (Wiley *et al.*, 2013). Transmission can occur when using the same syringe as an infected person, from blood transfusions, having tattoos or body piercing, from mother to child during childbirth, during medical procedures, occupational exposure and during sexual intercourse. Hepatitis B virus also shares similar routes of transmission with HIV (Chang, 2007). Currently, there are four recognized modes of transmission which are; from mother to child at birth (prenatal), by contact with infected person (horizontal), by sexual contact and by exposure to blood or other infected fluids (WHO, 2015). In the Middle East and Indian subcontinent, an estimated 2-5% of the general population is

chronically infected while less than 1% of the Western Europe and North America is chronically infected (WHO, 2012). The prevalence of chronic HBV infection shows wide regional variation; ranging from high rates greater than 8% in Africa, Asia and the Western Pacific to intermediate rates of 2-7% in Southern and Eastern Europe, North America and Australia (Zaki *et al.*, 2003). The prevalence of HBsAg has been reported to vary substantially among African countries from less than 5% to up to 15% (Komas *et al.*, 2010). Sub-Saharan Africa is a region where the prevalence of anti-HBV antibodies and HBsAg is very high (Bekondi *et al.*, 2007). Most countries in Africa are HBV endemic with Nigeria classified among countries with high endemicity. About 1% of all adult deaths in Nigeria are attributed to HBV (FMOH Nigeria, 2003) and 75% of Nigerians are at risk of HBV infection at one time or the other in their life (Sirisena, 2002).

Haematological studies are useful in the diagnosis of many diseases as well as investigation of the extent of damage to blood. Haematological studies are of ecological and physiological interest in helping to understand the relationship of blood characteristics to the environment (Etim *et al.*, 2014). However, the most frequent aetiological agents of acute viral hepatitis associated with high health burden in sub-Saharan Africa are Hepatitis B and C viruses. In addition to the hepatic pathology, extra-hepatic abnormalities are not unusual. One of the most frequently identified extra-hepatic abnormalities often seen at the time of diagnosis of acute viral hepatitis is the haematological abnormality. This is because every patient with acute viral hepatitis of necessity will require a full blood count to exclude bacterial sepsis as a cause of liver disease. The interpretation of the result will require an understanding of the frequency of detection of abnormal haematological results in these patients in relation to the disease. Patients with AVH unlike those with chronic hepatitis often present with non-specific symptoms which may mimic other more common infections seen in sub-Saharan Africa. These other infections like malaria and typhoid fever sometimes present with some degree of hepatic involvement. Alteration in the blood count may exclude to some reasonable extent the presence of these other infections. The knowledge of the frequency of haematological abnormalities will not

only underscore the need for a blood count in all patients with acute viral hepatitis, it will also help to identify those patients that will need to be followed up or require additional treatment. Viral hepatitis is a pan tropic disease with haematological manifestations. Alteration in haematological profile may predict those likely to have haematological complications even after recovery from the acute viral hepatitis (Fasola *et al.* 2009).

Therefore, this study was carried out to determine the haematological abnormalities observed in blood donors positive for viral hepatitis and also determine other risk factors associated with HBV infection.

## **2.0 METHODOLOGY**

### **2.1 Study Design**

The study was a cross-sectional study carried out on 450 asymptomatic consenting blood donors at blood donation units of selected hospitals in Kaduna state to investigate HBsAg prevalence between November 2013 and July 2014. Each participant completed a standard questionnaire, which included demographic information, history of blood donation, history of unprotected sex, number of sexual partners and other parameters. Consent of the blood donors within the age of 18years and above residing in Kaduna state, comprising of both male and female populations was sort by filling and signing of the consent form by the participant.

### **2.2 Ethical Issue**

Ethical clearance was obtained from the Research and Ethics Committee of Kaduna State Ministry of Health, Kaduna.

### **2.3 Sample Collection**

About 5mls of blood was collected from each donor into a sterile container free of anticoagulant or preservative, a thin film of the blood sample was immediately made on a grease free glass slide for haematological analysis. The remaining blood sample allowed to clot and centrifuged at room temperature at 3000rpm for 20minutes. The serum was transferred into a sterile screw capped vial and stored at freezing temperature until analyzed.

### **2.4 Laboratory Investigations**

All 450 serum samples were screened for HBsAg using a rapid diagnostic test kit (Fastep Polymade,

USA). The tests ran were validated and results were interpreted according to the manufacturer's instruction. The thin film slides were stained with Leishman's stain and the differential cell count was carried out by longitudinal technique.

### 2.5 Data analysis

Data collected were subjected to descriptive and inferential statistical analysis using SPSS version 20. The differences were considered to be statistically when p value obtained was <0.05.

### 3.0 RESULTS

The result of the haematological parameters revealed that neutrophils, lymphocytes and eosinophils were statistically non-significant with HBsAg positivity ( $p = 0.28, 0.50, 0.96$  respectively) except for monocytes where there was statistical significance ( $p = 0.02$ ) as presented on table 1. The result is shown in table 1. A slight increase in neutrophils and monocytes was observed among HBsAg positive blood donors compared to the HBsAg negative blood donors while a decrease in lymphocytes and eosinophils was observed among blood positive for HBsAg.

Of the 450 blood donors screened during the study, majority were females (263: 58.4%) while males were 187 (41.6%) with a male to female ratio of 1:1.4. The Mean $\pm$ SD was 28.1 $\pm$ 9.9. The percentage prevalence for HBsAg among the 450 blood donors

screened was 14.2% (64/450) of which 45.3% were males and 54.7% were females.

Table 2 shows that blood donors within age group 17-26years had the highest prevalence of 24.9% (41/165) for HBsAg while the lowest prevalence (5.9%:4/68) was observed among blood donors within age group 37-46years. HBsAg was not detected among blood donors within age group 47-56years. The difference in the distribution of the HBsAg across the age groups was statistically significant ( $\chi^2=33.90, df=4, p=0.001$ ).

As presented on table 3, the two widowed blood donors recruited for the study were positive for HBsAg while married blood donors had the least prevalence of 12.3%. the difference in the prevalence of these populations was statistically significant ( $\chi^2=12.986, df=2, p=0.002$ ). Monogamous families had higher prevalence for HBsAg (14.9%) than polygamous families (12.7%), though this difference was not statistically significant and has a weak relationship with an OR = 0.799. Self-employed blood donors had the highest prevalence rate of 20.7% (6/29) while civil servants had the least prevalence rate of 6.8% (6/88). This difference was not statistically significant ( $p=0.065$ ). Blood donors resident in urban areas had higher prevalence (14.5%) compared to those resident in rural areas (8.7%).

**Table 1: Relationship of hematological profile of blood donors with hepatitis B virus infection**

Parameter	HBsAg Mean $\pm$ SD		
	HBsAg positive	P-value	HBsAg negative
Neutrophils	57.16 $\pm$ 13.7	0.28	55.23 $\pm$ 8.75
Lymphocytes	41.61 $\pm$ 15.12	0.50	42.92 $\pm$ 8.2
Eosinophils	1.16 $\pm$ 1.57	0.96	1.17 $\pm$ 1.93
Monocytes	1.105 $\pm$ 1.24	0.02	0.731 $\pm$ 1.16

**Table 2: Prevalence of HBsAg among blood donors in Kaduna state based on age group**

Age Group (yrs)	No. Examined	HBsAg positive (%)	HBsAg negative (%)
17-26	165	41 (24.9)	124 (75.2)
27-36	183	12 (6.6)	171 (93.4)
37-46	68	4 (5.9)	64 (94.1)
47-56	20	0 (0.0)	20 (100.0)
≥57	14	1 (7.1)	13 (92.9)
<b>Total</b>	<b>450</b>	<b>64</b>	<b>386</b>
<b>p-value</b>		<b>0.001</b>	

**Table 3: Prevalence of HBsAg among blood donors based on some demographic factors**

Demographic factor	HBsAg			OR
	No. Examined	Positive (%)	p-value	
<b>Marital Status</b>				
Single	228	35 (15.4)	<b>0.002</b>	
Married	220	27 (12.3)		
Widowed	2	2 (100.0)		
<b>Family type</b>				
Monogamous	316	47 (14.9)	<b>0.391</b>	<b>1.2</b>
Polygamous	134	17 (12.7)		
<b>Occupation</b>				
Civil servant	88	6 (6.8)	<b>0.065</b>	
Self employed	29	6 (20.7)		
Unemployed	333	52 (15.6)		
<b>Place of residence</b>				
Urban	427	62 (14.5)	<b>0.44</b>	<b>1.78</b>
Rural	23	2 (8.7)		
<b>Level of formal education</b>				
Primary	11	2 (18.2)	<b>0.000</b>	
Secondary	90	25 (27.8)		
Tertiary	316	29 (9.2)		
None	33	8 (24.2)		
<b>Total</b>	<b>450</b>	<b>64 (14.2)</b>		

#### 4.0 DISCUSSION

The findings of this study revealed 14.2% prevalence for hepatitis B surface antigen among blood donors in Kaduna State. This prevalence is higher than 9.3% obtained by Okwesili *et al.* (2014) among blood donors in Sokoto state, 8.3% (Luka *et al.*, 2008; Anaedobe *et al.*, 2015) and 12.5% (Aba and Aminu, 2016) obtained among pregnant women in Zaria and Ibadan, and tertiary institution students in Zaria respectively. The prevalence of this study is also higher than the 9.2% obtained among patients presenting with malaria symptoms in Zaria (Aminu and Aminu, 2012), 9.2% among students of a tertiary institution in Zaria (Isa *et al.*, 2015), 9.4% (Samaila and Aminu, 2012) among secondary school students in Funtua, Katsina state and 12.0% obtained among out-patients in Kaduna state (Edia-Asuke *et al.*, 2015). However higher prevalence rates of 18.2% (Japhet *et al.*, 2011) and 21.3% (Otegbayo *et al.*, 2003) among blood donors in Osun state and Ibadan, Oyo state respectively have been reported.

The prevalence rate obtained in this study is higher than 10.79% obtained by Dongdem *et al.* (2012) in Ghana and 5.49% in Shenyang, China (Ding *et al.*, 2013) both obtained among pregnant women. Though a prevalence rate of 35.8% have been reported among patients with chronic liver disease in Addis Ababa, Ethiopia (Ayele and Gebre-Selassie, 2013) which is higher than the prevalence obtained in this study. The high prevalence of 14.2% obtained for HBsAg in this study among blood donors shows that hepatitis B is still highly endemic in the study area and could be easily transmitted to patients when transfused. This may explain the high endemicity of the virus in the country, since the blood donors are not properly screened for HBsAg marker. The variations in prevalence might be due to difference in study area, study population or sample size.

The high prevalence of HBsAg observed among blood donors within age group 17-26years explains that blood donors at their adolescent or youthful age are more susceptible to hepatitis infection probably due to their immune status and lifestyle pattern. This finding is similar to that observed by Edia-Asuke *et al.* (2015) in Kaduna state, HaSam *et al.* (2010) in Ethiopia and Lavanya *et al.* (2012) in India where

HBsAg was found to be more prevalent among youths than older individuals. This observation could be because of the high promiscuity and risky lifestyles among youths that predispose them to hepatitis B infection. These lifestyles could be sexual activities, sharing of contaminated sharp objects, tattooing and intravenous drug use. Other lifestyles such as men sleeping with men, heterosexuals with multiple sex partners and constant close contact with infected persons have been found to predispose youths to hepatitis B infection (Aba and Aminu, 2016). The difference in the prevalence of the marker was shown to be significantly associated with age implying that younger age is a risk factor for acute hepatitis B infection since this marker is the prime indicators of hepatitis B infection.

The slight increase in neutrophils and monocytes and a decrease observed in lymphocytes and eosinophils among blood donors positive for HBsAg is supported by the finding of Eze *et al.* (2009) in Portharcourt, Nigeria where a similar trend was observed among pregnant women positive for HBV. Leucopaenia rather than leucocytosis is a more frequent finding in acute viral hepatitis, though leucocytosis is often associated with fulminant viral hepatitis (Fasola *et al.*, 2009). Leucopaenia was highly associated with the blood donors positive for HBsAg, this finding is supported by the discovery that leucocyte is another non-hepatic site for HBV replication and that the virus directly invade the marrow interfering with leucopoiesis (Fasola *et al.*, 2009). Despite the non-significant association between HBsAg positivity and abnormal differential cells count found in this study, HBsAg positivity can still lead to abnormal differential cells proliferation or down-regulation in response to the infection.

This study did not find any association between gender and HBsAg, though the prevalence of the markers was observed to be higher among male donors than female donors. This finding is supported by that of Japhet *et al.* (2011) in Ile-Ife, Osun state and Lavanya *et al.* (2012) in India where gender was found not to be statistically associated with the prevalence of the serological markers. Higher prevalence among male donors might be due to the promiscuous lifestyle among males than females.

Marital status was found to be associated with HBsAg with widowed and single donors having higher risk of contracting HBsAg though the population size of the widowed blood donors was too small which might affect the actual representation of the study. The finding of this study is similar to that of Edia-Asuke *et al.* (2015) and Isa *et al.* (2015) in Kaduna state where married individuals had lower prevalence rate for HBsAg compared to single and widowed individuals. This finding could be because married couples are more likely to be faithful to their partner compared to single or unmarried individuals.

This study could not establish significant association between family type, occupation and place of residence with HBsAg prevalence; however, blood donors in monogamous family type had higher prevalence of HBsAg. This observation contrasts that made by Isa *et al.* (2015) where individuals in monogamous family type had lower prevalence of HBsAg. The finding could be attributed to more extra-marital activities probably among monogamous families than the polygamous family members.

In this study, HBsAg was more prevalent among unemployed individuals, a finding that contrasts that of Ayele and Gebre-Selassie (2013), where civil servants had a higher prevalence than unemployed individuals. The finding of this study is however similar to that of Isa *et al.* (2015) where individuals with other occupation had higher prevalence of HBsAg than civil servants.

Blood donors who were resident in urban area had higher prevalence than blood donors resident in rural areas, and were almost 1.7 times likely to be infected than rural dwellers supporting the finding of Ayele and Gebre-Selassie (2013) in Ethiopia where urban dwellers were observed to have higher HBsAg prevalence than rural dwellers. This could be attributed to the lifestyle in the urban areas which predisposes urban dwellers to hepatitis B infection.

This study was able to establish a relationship between level of formal education and HBsAg reactivity. Those without formal education were observed to have the highest prevalence for HBsAg. This could be due to the level of awareness of hepatitis B infection and its mode of transmission,

hence prompting them to take precautionary measures to avoid being infected.

## 5.0 CONCLUSION

This study found a prevalence of 14.2% for HBsAg among blood donors in the study area. This indicates that hepatitis B is still highly endemic in the study area despite the availability of an effective vaccine. The study also found that differential cells count has no significant association with HBV infection

The study found an association between family history of HBV, blood donation and condom use with hepatitis B infection while blood transfusion and number of sex partners were found not to be associated with hepatitis B infection.

## 6.0 RECOMMENDATIONS

- a) In view of the high prevalence of HBsAg and anti-HBc obtained in this study, an appropriate vaccination programme for HBV should be implemented in Nigeria. The Federal Government should develop policies that would make it compulsory for all newborns in the country irrespective of their status to be vaccinated against the infection 12 hours after they are born.
- b) Patients with leucopaenia should be followed for early detection of serious haematological complications even after recovery from the acute state.
- c) Correct and consistent condom use should be promoted among sexually promiscuous age groups through campaigns in tertiary institutions and brothels. Integrated action to eliminate discrimination and gender violence and to increase access to medical and social services for vulnerable persons should be encouraged.
- d) There should be regular screening for hepatitis B while the government should provide free treatment for infected persons just as it did for people living with HIV/AIDS.

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