Seroprevalence of Hepatitis B Surface Antigen amongst Patients in Selected Hospitals in Kaduna Metropolis, Nigeria

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Abstract: Hepatitis B virus (HBV) infection has been identified as one of the most common infectious diseases of major health concern globally. The common method for detecting hepatitis B infection is to detect the presence of hepatitis B surface antigen (HBsAg).This research work was undertaken to determine the seroprevalence and possible risk factors of hepatitis B surface antigen amongst patients in selected hospitals in Kaduna metropolis, Kaduna State, Nigeria. Two hundred (200) blood samples were collected from patients who presented themselves for HBV screening and tests were carried out for one hepatitis B virus serological marker: HBsAg using Agary HBsAg test kits. Information was obtained for risk factors using structured questionnaire. There was an increased number of females (55.5%) compared to males (44.5%) recruited for this study. An overall seroprevalence of 9.5% for HBV infection was obtained from this study. About 5.4% and 14.6%of the female and male patients respectively were HBsAg positive. There was significant association between patients with hepatitis B family history (χ^2 =25.319;*p*=0.001), intravenous drug use (χ^2=7.707;*p*=0.006), tribal marks/ tattoos (χ^2 =3.879;*p*=0.049) and traditional barbers (χ^2 =12.604;*p*=0.001). Other risk factors studied were not significantly associated with HBsAg seropositivity. The highest and lowest frequency of HBsAg infection was observed in age group; 35-44 years (19.2%) and 15-24 years (5.3%) respectively. The high occurrence of HBsAg in this study calls for an urgent intervention strategy that place emphasizes on the need for enlightenment and massive vaccination against HBV.

Key words: Hepatitis B virus, HBsAg, Risk factors, Seroprevalence

INTRODUCTION

Hepatitis B virus is among the common viral infectious agents of public health importance globally. An estimated two billion people are infected worldwide with approximately 350 million others suffering the chronic form of the disease and over one million people die each year as a result of acute fulminate liver disease or HBV induced cirrhosis and liver cancer (Erena& Tefera, 2014, MacLachlan & Cowle, 2015; Waje*et al*., 2016; Itodo *et al*., 2016; Eustace *et al.,* 2019).

Hepatitis B virus (HBV) infection is a serious health problem worldwide with substantial human morbidity and mortality predominantly through the consequences of chronic infection.

In Africa, more than 50 million people are chronically infected, with mortality risk of about 25%. The carrier rates of the virus in Sub-Sahara Africa range from 9% - 20%. Once chronic infection is established, HBV may persist in the liver for lifetime, which not only causes severe HBV-related sequalae such as cirrhosis and hepatocellular (MacLachlan & Cowle, 2015; Eustace *et al.,* 2019). Hepatitis B surface antigen (HBsAg) is a marker for viral infection caused by the hepatitis B virus, and is usually an indication of chronic hepatitis infection (Waje *et al*., 2016). Complications that arise as a result of hepatitis B virus infection include; Cirrhosis (which is inflammation of liver leading to extensive liver scarring), Liver cancer, and Liver failure (the vital functions of the liver can be interrupted which can necessitate liver transplant to sustain life) (Itodo *et al*., 2016; Waje *et al*., 2016; Sadoh &Sadoh, 2014).

Hepatitis B virus is an enveloped virus containing a partial or incomplete double-stranded circular DNA genome. It belongs to the family *Hepadnaviridae*. It is 42nm long and composed of a 27nm nucleocapsid core surrounded by an outer lipoprotein coat containing the hepatitis B surface antigen (Ado *et al*., 2010).

Hepatitis B virus invades the body through a break on the skin or mucus membrane or by injection into the blood, after which they migrate to the liver cells (hepatocytes) where the core protein alone enters the cell nucleus initiating self-multiplication of the viral genome. On average, the virus incubation period is 90 days but can vary from about 30 to 180 days. HBV may be detected 30 to 60 days after infection and persist for widely variable periods of time (Eustace *et al.,* 2019). However, the incubation period of HBV in man can extend from 2 to 6 months before the development of clinical disease (Ndako *et al*., 2012). HBV can survive outside the body for at least 7 days. During this period, the virus can still cause infection if it enters into the body of an uninfected person.

HBV is transmitted through exposure to infectious blood or body fluids (particularly semen and vaginal secretion). Although HBV has been detected in saliva, breast milk, tears, urine and sweat, there is minimal evidence of transmission through exposure to these fluids where no blood is present, and breast feeding has not been shown to increase risk of infection (MacLachlan & Cowle, 2015). Possible modes of transmission include but are not limited to blood transfusions, injecting drug use, re-use of contaminated needles and syringes, through sexual contact, through horizontal transmission to/between young children and vertical transmission from mother to child during childbirth. At the time of birth and without intervention, a mother who is positive for HBsAg confers a 20% risk of passing the infection to her offspring (Georing *et al*., 2013; Eustace *et al.,* 2019).Risk factors that increase chances of getting infected with HBV includes, unprotected sexual activity, multiple sex partners, sharing needles during intravenous drug use, history of sexually transmitted disease (STD), tattoo, skin piercing, living in close association with infected persons, having a job that exposes one to human blood and traveling to regions with high infection rates (Edie-Asuke *et al*., 2015). With the implementation of control measures, other routes of transmission, which have declined in frequency include unsafe medical practices and through contaminated blood or blood products; however, in both resource-poor and well-resourced settings, health care associated infection remains a significant concern (MacLachlan & Cowle, 2015).

The epidemiology of hepatitis B can be described in terms of the prevalence of hepatitis B surface antigen (HBsAg) in a population, broadly categorized into;low prevalence (<2%), intermediate prevalence (2%–7%) and high prevalence (>8%). These broad classifications are helpful in understanding the main patterns of transmission and outcomes for infection, as well as the relative population burden of the consequences of chronic hepatitis B, including liver cancer (MacLachlan & Cowle, 2015; World Health Organization, 2016).

Nigeria is hyper-endemic to the HBV infection and the highest in Sub-Sahara Africa because vaccination against the hepatitis B virus in Nigeria is lower than many Sub-Saharan African countries (Musa *et al.,* 2015). This is because in Nigeria, vaccination programs have not received adequate funding or attention by the government. Furthermore, misconceptions among some communities particularly in northern, Nigeria have also hindered increasing coverage rates. Musa *et al.* (2015), conducted a systematic review and Meta –analysis of the prevalence of hepatitis B virus infection in Nigeria from 2000-2013. From the review, the prevalence of HBV infection ranged from 0.5% to 46.8% amongst analysed studies. The pooled prevalence estimate for Nigeria was 13.65% (95% confidence interval [CI]: 11.5, 15.7%). The study also observed a decline in HBV prevalence in Nigeria which may be related to a gradual increase in HBV vaccination amongst children. In 2000-2005, HBV vaccination coverage was reported as zero by UNICEF, 18% in 2006, and peaked at 41% in 2013 reported by UNICEF & WHO (Musa *et al.,* 2015).

According to the recent Nigeria HIV/AIDs indicator and impact survey (NAIIS) report, 2020;Nigeria with an estimated population of 190 million people, has a hepatitis B prevalence of 8.1%. This gives an estimated number of about 19 million Nigerians living with hepatitis B. The large population and relatively high prevalence rates of hepatitis B suggest that Nigeria should be considered a key country for hepatitis elimination efforts.

There is therefore need to assess the current prevalence in the study area to know the HBsAg status of patients and also identify associated risk factors which will provide guide in undertaking effective preventive and control measures.

MATERIALS AND METHODS

Study Area

Kaduna Metropolis comprises two Local Government Areas: Kaduna North and Kaduna South. These are mainly populated by farmers, civil servants, traders, students and industrial workers. Kaduna State was founded by the British in 1913 and became the capital of Nigeria's former Northern Region in 1917. The population of Kaduna metropolis was 760,084 as at the 2006 Nigerian census. Rapid urbanization over the past decade has created an increasingly large population, now estimated to be around 1.3 million (Encyclopaedia Britannica, 2016).

Four hospitals were considered for this study and they are: Barau Dikko Teaching Hospital and Yusuf Dansoho Memorial Hospital located at Kaduna North of Kaduna Metropolis; General Hospital Sabon Tasha and Gwamna Awan General Hospital located at Kaduna South of the Metropolis.

Sample size

The sample size used was determined using the formula;

$n = \frac{Z^2 pq}{L^2}$ (Araoye, 2003).

Where;

n= Desired sample size, Z= Standard normal distribution at 95% Confidence Interval = 1.96, p= Known prevalence, L= Allowable error, q= 1.0 - p

n=?

Z= 1.96

p= 9.33% or 0.0933 (Waje *et al*., 2016).

L= 0.05

q= 1.0 - 0.0933 = 0.9067

$$n = \frac{1.96^2 \times 0.0933 \times 0.9067}{(0.05)^2}$$

$$= \frac{3.416 \times 0.0933 \times 0.9067}{0.0025}$$

$$= \frac{0.3250}{0.0025}$$

n= 130

The desired sample size for a prevalence of 9.33% (Waje *et al*., 2016) is 130 blood samples. For even distribution and to rule out loss of sample during transportation, 200 blood samples were collected.

Study population

Two hundred (200) blood samples were collected from patients with an average of 50 samples per hospital.

Inclusion criteria

Consenting patients between the ages of five (5) and eighty- five (85) who presented themselves for HBV screening**.**

Exclusion criteria

Non consenting patients and patients below the age of five (5) and above the age of eighty- five (85) who presented themselves for HBV screening.

Ethical Clearance/ Consent

Ethical clearance was sought from Kaduna State Ministry of Health and granted after fulfilling all the ethical requirements for using humans as study subjects while informed consent was obtained as a response to the consent form issued to each patient recruited for the study.

Questionnaire administration

Consenting patients were administered well-structured questionnaires in order to obtain information on their socio-demographic, clinical data and other parameters that might link possible risk factors.

MATERIALS

Plain EDTA bottles, 2ml and 5ml syringes, HBsAg one step in - vitro rapid test strips, cotton swabs and 70% alcohol, centrifuge, hand gloves, disposable pipettes, face mask, refrigerator, discard jar and tourniquet

Collection of sample

About 3- 5 ml of blood was collected by a trained phlebotomist from the patients by venous puncture. The collected blood was dispensed in plain sample bottles appropriately labelled with patient's identification number. The collected blood sample was allowed to clot at room temperature. The clot was dislodged using a disposable pipette and the blood sample centrifuged at 1000 rpm for 10 minutes (Cheesbrough, 2006) to obtain serum. A clean pipette was used to obtain the serum and dispensed into another clean plain sample bottles already labelled appropriately. This was kept at a temperature of 4^{o}C and transported to the Microbiology Laboratory of Kaduna State University for further analysis. In cases where samples could not be screened immediately, they were preserved by freezing at -20^{o}C.

Detection of Hepatitis B surface Antigen

The detection of hepatitis B surface antigen was carried out using Agary rapid diagnostic test kits which contain HBsAg test strips, manufactured by Nantong Egens Biotechnology Co., Ltd, China.

Principle- HBsAg test strip is a rapid direct binding test for the visual detection of hepatitis B infection. It is based on the principle of sandwich immunoassay for determination of HBsAg in human serum specimen. Two monoclonal antibodies are employed to identify HBsAg specifically. This one step test is very sensitive and only takes 15-20 minutes. Test results are read visually without any instrument.

Procedure-The test strip was placed into serum such that the serum does not exceed the maximum line but impregnates the strip. The test strip was removed from serum and allowed to sit for 5 to 10 minutes and observed for appearance of coloured bands. Interpretation of these bands was done based on manufacturer's instructions to obtain valid results.

Data Analyses

Statistical packages for social sciences (SPSS), version 20 was used to analyse the data obtained from the questionnaire. The Pearson Chi-square (χ^2) test was employed to determine the association between socio-demographic, clinical data and other parameters that might link possible risk factors to hepatitis B infection. A 95% confidence interval was used and results with p-values less than 0.05 were considered significant. The results of the laboratory tests were analysed and presented in tables. The prevalence of HBsAg viral infection was determined from the proportion of seropositive individuals in the total population under consideration and expressed as a percentage.

RESULTS

Of the 200 blood samples analysed, 19 were positive for HBsAg giving an overall seroprevalence of 9.5%.

Table 1. Shows the sex distribution of HBsAg seroprevalence amongst patients in selected hospitals in Kaduna Metropolis. There were more number of females 111 (55.5%) compared to males 89 (44.5%) recruited for this study. About 5.4% of the female population and 14.6% of the male population were hepatitis B virus positive.

Table 2. Shows the age distribution with respect to number of HBsAg positive patients screened. Age group 35-44 years formed a large percentage (28.5%) of the total number of patients screened while the age group with the least number of patients screened was 65-74 years (2%). Age group 35-44 had the highest prevalence of 19.2%, followed by age groups 25-34 years with a prevalence of 18.9%, 45-54 years with a prevalence of 9.1% and 15-24 years with a prevalence of 5.3%.Age groups; 5-14, 55-64, 65-74 and 75-85years recorded zero positive HBsAg and hence, zero prevalence was recorded.

Table 3.Shows the risk factors based on socio- demographic and clinical data associated with HBsAg seroprevalence amongst patients in selected hospitals in Kaduna Metropolis. There was a significant association between patients with hepatitis B family history (χ^2 = 25.319; df = 1;*p*-value= 0.001), intravenous drug users (χ^2= 7.707; df= 1;*p*-value=0.006), tribal marks/ tattoos (χ^2= 3.879; df =1;*p*-value= 0.049) and traditional barbers (χ^2 =12.604; df = 1;*p*-value= 0.001).However, blood transfusion(χ^2 =2.005; df =1; *p*-value = 0.157), sexual partners(χ^2 = 3.344; df =3; *p*-value=0.342), marital status (χ^2 = 6.819; df = 3; *p*–value = 0.078), other surgery such as tooth removal (χ^2 = 1.671; df =1; *p*–value = 0.196), sharing hair clippers (χ^2 = 0.662; df = 1; *p*–value = 0.416), sharing toothbrushes (χ^2 = 0.223; df = 1; *p*- value = 0.637), sharing clothes/bedding (χ^2 = 0.672; df =1; *p*–value = 0.412), sharing shaving sticks (χ^2 = 0.090; df = 1; *p*–value = 0.764), occupation (χ^2 = 2.260; df = 4; *p*–value = 0.688), educational level (χ^2 =5.096; df = 3; *p* –value = 0.165)and age groups (χ^2 = 12.352; df = 7; *p*-value= 0. 090)were not significantly associated with HBsAg seropositivity

Table 1: Sex Distribution of HBsAg Seroprevalence amongst Patients Screened

Sex	Number screened	Number negative	Number positive
Female	111(55.5%)	105(94.6%)	6(5.4%)
Male	89(44.5%)	76(85.4%)	13(14.6%)
Total	**200(100%)**	**181(90.5%)**	**19(9.5%)**

Table 2: Age Distribution of HBsAg Seroprevalence amongst Patients Screened

Age group (Years)	Number screened	Number negative	Number positive	*P*- Value
5-14	32(16%)	32(100%)	0χ^2= 12.352	
15-24	57(28.5%)	54(94.7%)	3(5.3%)	df =7
25-34	53(26.5%)	43(81.1%)	10(18.9%)	p = 0.090
35-44	26(13%)	21(80.8%)	5(19.2%)	
45-54	11(5.5%)	10(90.9%)	1(9.1%)	
55-64	12(6%)	12(100%)	0	
65-74	4(2%)	4(100%)	0	
75-85	5(2.5%)	5(100%)	0	
Total	**200(100%)**	**181(90.5%)**	**19(9.5%)**	

Table 4: Risk Factors Associated with HBsAg Seroprevalence based on Socio-Demographic and Clinical Data amongst Patients Screened

Risk factor	Number positive	Number screened	*p*-value
Blood transfusion			
No	18	164	χ^2 =2.005; df =1; p = 0.157
Yes	1	36	
Organ transplant			
No	19	200	nil
Yes	-	-	
Hepatitis B family history			
No	1	155	χ^2 =25.319; df =1; p = <0.001
Yes	10	4	
Intravenous drug use			
No	12	174	χ^2 =7.707; df =1; p = 0.006
Yes	7	26	
Use of condoms			
No	19	145	nil
Yes	-	-	
Sexual partners			
None	3	69	χ^2 =3.344; df =3; p = 0.342
One	14	108	
Two	2	20	
>Three	0	3	
Tribal marks/ tattoos			
No	9	139	χ^2 =3.879; df =1; p = 0.049
Yes	10	61	
Marital status			
Single	4	95	χ^2 =6.819; df =3; p= .078
Married	15	96	
Divorced	0	6	
Widowed	0	3	
Other types of surgery			
No	18	167	χ^2 =1.671; df =1; p = 0.196
Yes	1	33	
Share Hair clippers			
No	12	144	χ^2 =0.662; df =1; p = 0.416
Yes	7	56	
Share Toothbrushes			
No	15	148	χ^2 = 0.223; df =1; p = 0.637
Yes	4	5	
Share Clothes/ bedding			
No	4	60	χ^2 = 0.412; df =1; p = 0.412
Yes	15	140	
Share shaving sticks			
No	17	183	χ^2 =0.090; df =1; p = 0.764
Yes	2	17	
Occupation			
Unemployed	4	57	χ^2 =2.260; df =4; p = 0.688
Business	8	65	
Civil servant	2	20	
Farmer	3	19	
Student	2	39	
Educational level			
Uneducated	3	34	χ^2 =5.096; df =3; p = 0.165
Primary	0	33	
Secondary	10	66	
Tertiary	6	67	
Traditional barbers			
No	11	176	χ^2 =12.604; df =1; p = 0.001
Yes	8	24	

Key: There is statistical association when p-value ≤0.05
χ^2: Pearson Chi-square, df: degree of freedom

DISCUSSION

In this study, an overall HBV seroprevalence of 9.5% was recorded. This is a high prevalence according to WHO classification of assessing hepatitis B virus (HBV) in HBV endemic regions. WHO classifies a prevalence <2% as low, 2% -8% as intermediate prevalence and >8% as high prevalence (World Health Organization, 2016).

Hepatitis B virus prevalence obtained in this study is slightly higher than prevalence rates recorded in studies carried out in Nigeria by independent researchers who reported a prevalence rate of 9.33% amongst patients in public hospitals using an in vitro one step rapid test kits (ISO 13485 Certified Wondfo Biotech Co. Ltd. USA)(Waje *et al.,* 2016) , 9.2% in a tertiary institution in North central Nigeria using one step rapid test kits, although positives samples were confirmed using enzyme linked immunosorbent assay (ELISA) (Isa *et al*., 2016). However, Ndako *et al*.(2012) reported a prevalence of 30% among young adults and Ndako *et al.* (2011) reported prevalence of 18.4% in secondary school students. These prevalence are higher than the prevalence recorded in this study. Although standard ELISA technique was employed in their studies as against the rapid test kits used in this study. The variations observed between these prevalence rates could probably be due to the fact that infection tend to vary from one geographical region to another and in subpopulation depending on the associated risk factors (Isa *et al*., 2015). It could also be due to the test method employed, study design, sample size, level of care for the study facility, sociocultural practices, beliefs, education and level of development.

Women formed a high percentage of patients screened (55.5%) but they had a lower prevalence rate (5.4%) when compared to the number of males screened (45.5%) with a prevalence rate of 14.6%. The reason behind the high prevalence in males as compare to female may be due to the fact that males are more prone to high risk behaviors like sexual contact, violence and conflicts in which blood contact may occur.This trend was also observed in the study done by Ndako *et al.* (2012) where 200 samples were screened for the presence of HBsAg, more females (57%) were recruited compared to males (43%). Although the seroprevalence of HBsAg in males (13.5%) is lower than that of females (16%) as reported by Ndako *et al.* (2012). The variation could be due to difference in the target population, while the current study considered patients between the ages of 5 to 85years in hospitals, Ndako *et al.* (2012) targeted secondary school students between the age of 15 and 25 years. Moreover, this study agrees with findings by Pennap *et al*. (2011) who recorded a high prevalence in males than in females but disagrees with findings by Waje *et al*. (2016) who recorded high prevalence in females than in males. This could be due to the early exposure of males to social life and high risk behaviours than their female counterparts and also the target population.

Based on age distribution, the highest prevalence for HBsAg positivity was in the age group of 35-44 years (19.2%). This agrees with previous findings of Makuza *et al.* (2019) carried out in Rwanda where the highest prevalence (4.2%) was found in the 35–44-year-old group, although ELISA method was employed. This may have contributed to the low prevalence of 4.2 observed in Makuza et al., (2019) as against the 19.2 observed in this study. Standard ELISA technique eliminates the chances of obtaining false positive results. However, the study disagrees with previous findings done in Kaduna- Nigeria by Edie-Asuke *et al*. (2015) where age group 24-35 years had a highest prevalence of 14%, although the method used (Wondfo Diagnostic rapid test Kit {China}) is similar to the one used in this study. The difference in prevalence by age group may be due to the increased sexual activity in the age group 35-44years.

HBV is transmitted through exposure to infectious blood or body fluids (particularly semen and vaginal secretion) (MacLachlan & Cowle, 2015). Risk factors that increase chances of getting infected with HBV includes, unprotected sexual activity, multiple sex partners, sharing needles during intravenous drug use, unhygienic practice (like sharing hair clippers, toothbrushes, clothes/beddings, shaving sticks) history of sexually transmitted disease (STD), tattoo, skin piercing, living in close association with infected persons, having a job that exposes one to human blood and traveling to regions with high infection rates (Edie-Asuke *et al*., 2015).

In this study, blood transfusion, hepatitis B family history, intravenous drug users, sexual partners, tribal marks/ tattoos, traditional barbers, marital status, other surgery such as tooth removal, sharing hair clippers, sharing toothbrushes, sharing clothes/bedding, sharing shaving sticks, occupation, educational level and age groups were the possible risk factors investigated. The study showed a significant association between patients with hepatitis B family history, intravenous drug users, tribal marks/ tattoos and traditional barbers. Other risk factors studied were not significantly associated with HBsAg seropositivity. This agrees with the findings by Ndako *et al*. (2011) where the possible predisposing factors observed in the population investigated were group into clinical history (blood transfusion, surgery, sexually transmitted disease, hepatitis B family history and vaccination) (χ^2=18.076; *df*=12; *p*-value = 0.113) and life style (sexual partner, exposure/sharing of sharp objects and alcohol consumption) (χ^2 =25.043; *df*=6; *p*-value = 0.000), although the degree of association was determined in group as against the one done in this study which was individually. However, intravenous drug users (sharing sharp objects) was a risk factor observed in both studies. The study also agrees with the findings of Isa *et al.* (2015) who found significant association between HBV infection and family history of students with HBV infection (χ^2= 15.722; df; *p*-value = 0.00). The significant association observed among patients with hepatitis B family history could be due to the close contact usually observed among family members particularly in Africa. The common characteristics in Africa, especially in Nigeria is sharing, as any individual who isolates from family members is seen as exhibiting social disregard, indifference behavior or disunity. This practice of sharing often increases the chances of contracting HBV infection through exposure to contaminated blood or body fluids. Furthermore, the significant association observed among intravenous drug users could be due to sharing of contaminated needles, contaminated blood and body fluids which is usually a common practice amongst this group of individuals.

In this study, there was significant association between HBsAg viral infection, tribal marks/ tattoos and traditional barbers. This contradicts the findings of Isa *et al.* (2015) who found no significant association between HBV infection and tribal marks/ tattoos and traditional barbers. The significant association observed in this study could be due to exposure to contaminated sharp equipment used for tattoos/ marks and clippers. These are often not sterilized because of lack of awareness of infection control practices, lack of resources for sterilization and the purchase of disposable equipment. Moreso, the study observed no significant association between HBV infection and the following risk factors; blood transfusion, sexual partners, marital status, other surgery such as tooth removal, sharing hair clippers, sharing toothbrushes, sharing clothes/bedding, sharing shaving sticks, occupation, educational level, age groups. This findings agrees with that of Isa *et al.* (2015) who found no significant associated between the risk factors listed above with the exception of occupation. Isa *et al.* (2015) found a significant association between HBsAg infection and student's occupation. Students who engaged in menial jobs/ petty trading had high chances of getting HBsAg infection.

The study also agrees with Ndako *et al*. (2011) who found no significant association between HBV infection and blood transfusion, surgery, sexually transmitted disease, but had significant associated between sexual partners, exposure/sharing sharp objects. These variations could be a reflection of the differences in sexual practices, socio-cultural practices / accessibility to healthcare, awareness of HBV infections and testing.

CONCLUSION

The Seroprevalence of 9.5% for HBsAg amongst patients in selected hospitals in Kaduna Metropolis implies that the virus is highly endemic amongst the patients based on WHO recommendation. From the results obtained, approximately one in ten persons in the study population was positive for HBsAg. There is also a significant association between patients with hepatitis B family history, intravenous drug users, tribal marks/ tattoos, traditional barbers and HBsAg infection.

RECOMMENDATIONS

1. Further studies are required using different diagnostic methods to explore the most effective method for detecting the presence of HBsAg
2. The high occurrence of HBV among this study population calls for an urgent intervention strategy.
3. There is need for emphasis on massive vaccination against the hepatitis B virus.
4. People should be enlightened on the complications that may arise from hepatitis B infection.

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