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Research Article

Prevalence of Hepatitis B Virus Infection Among Patients and Pregnant Women that Visited David Umahi Federal University Teaching Hospital Uburu, Ohaozara L.G.A Ebonyi State, Nigeria

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ABSTRACT

Background: Hepatitis B virus (HBV) is a major cause of liver disease, morbidity and mortality worldwide, accounting for 360 million cases of chronic hepatitis and 620,000 deaths per year. It is hyper-endemic in sub-Sahara Africa (SSA) and a major cause of chronic liver disease and 47% of hepatocellular carcinoma cases in Sub-Sahara Africa are attributed to HBV. In southern parts of the country, up to 58.1% of the patients with chronic liver dieases were found to be HBsAg positive. Several authors report on the prevalence of HBV among subpopulations in Nigeria estimated variable prevalences which is dependednt on the population of study and the method used.

Aims: This study is carried out to determine the current seroprevalence of hepatitis B virus using the analysis of its surface antigen in the blood of patients and pregnant women that visited David Umahi Federal University Teaching Hospital Uburu, Ebonyi state between January 2023 to December 2023.

Methodology: Two to five milliliter (2-5ml) of venous blood was drawn from the patients, ensuing standard precaution into an appropriately labelled ethylene diamine tetra acetic acid (EDTA) bottle and temporary stored in cold box. Blood samples were centrifuged at 4,500 rpm for about 3minutes to separate plasma from the red cells. Commercial quantitative and qualitative HBsAg ELISA kit (CTK Biotech) was utilized, with strict compliance to the manufacturer's instructions in the manual and the standard operating procedure. Sensitivity and specificity of the ELISA kit were 100% and 100% respectively. Two to three (2-3) drops of plasma specimen were pipetted into the circular groove of the cassette and incubated at 37°c for 15minutes, results were read.

If both C and T bands developed on the HBsAg groove, it was read as positive, if C was visible and T band was not visible the result was read as negative and if no red bands appeared or control line fails to appear, the result was interpreted as invalid and was retested.

Result: Out of the 413 people examined, 17 persons were reactive giving an overall seroprevalence of 4.1%, while 396 (95.9%) participants were negative to HBV surface antigen. Out of the 17 persons with reactive results, male had 8 (1.9%) and female 9 (2.2%). All the reactive female participants are the non- pregnant female. No pregnant female among the 54 participants was positive. There is no significant association in prevalence with respect to sex. There is a significant association in the prevalence according to age as ages 31-40 years has the highest prevalence followed by ages 21-30 year

Conclusion: The findings of 4.1% prevalence of HBV in this research when compared to 1% WHO universal target for 2020 (WHO, 2016) and 0.1% for 2030 (WHO, 2018) rate is alarming and looking at the age bracket involved. This therefore, calls for serious concern to the Government and health authorities at all levels. Considering the mortality, morbidity, social and economic effects of Hepatitis B virus infection on humanity.

Keywords

Seroprevalence, Hepatitis B virus, Liver disease, Sub-Sahara Africa.

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Introduction

Hepatitis B virus is a member of the family Hepadnaviridae and genus orthohepadnavirus, whose infection serves as a major global health problem causing severe liver disease such as cirrhosis and hepatocellular carcinoma. It is a circular, double stranded DNA virus with a lipid containing outer envelope with serological markers which includes hepatitis B surface antigen (HBsAg) and anti-HBs, anti-HBc IgM and IgG and hepatitis B e antigen (HBeAg) and anti-HBe [1]. Electron microscopy of hepatitis B positive serum reveals three morphological forms, namely: the spherical particles measuring 20nm in diameter, the filamentous forms of about $20 \times 200nm$ long and the plane particles measuring 42nm, which is the infectious form of hepatitis B virus [2]. Hepatitis B virus (HBV) is a major cause of liver disease, morbidity and mortality worldwide, accounting for 360 million cases of chronic hepatitis and 620,000 deaths per year [3]. It is hyper-endemic in sub-Sahara Africa (SSA) and a major cause of chronic liver disease and 47% of hepatocellular carcinoma case in Sub-Sahara Africa are attributed to HBV [4].

In Nigeria, hepatitis B virus is the commonest cause of chronic liver disease. In Southern parts of the country up to 58.1% of patients with chronic liver disease were found to be HBsAg positive [5]. Several authors report on the prevalence of HBV authors report on the prevalence of HBV among subpopulations in Nigeria estimated variable prevalences which is dependednt on the population of study and the method used. However, a highly effective and inexpensive recombinant DNA vaccine for hepatitis B has been available since 1982 and debuted in Nigeria in 1995. Unfortunately, vaccination programs in Nigeria have not received adequate attention or funding by the government. Further, community misconceptions have hindered increasing coverage rates [6]. The United Nations Children's emergency Fund (UNICEF) and the World Health Organization (WHO) estimated that only 41% of Nigerians were vaccinated against HBV in 2013 [7].

The risk of contracting HBV in Nigeria is substantial not only due to low vaccination rates but also given that as many as 75% of the population will be exposed [8]. Investigations have reported varying national and risk group specific estimates prior reports suggested a prevalence of 10-15% in the average risk Nigerian population [5]. It is transmitted by sexual, parenteral and vertical routes. Although exchange of body fluids either through sexual intercourse appears to be the major route of transmission, however, many health professionals are highly exposed to parenteral route of transmission of this virus. In Nigeria, investigators have found high HBV prevalence among surgeons (25.7%) [9], Voluntary blood donors (23.4%) [10] and infants (16.3%) [11].

A 2012 study in Kano Nigeria found that among 440 HIV positive patients, 12.3% were co-positive for HBV [12]. Pregnant women are generally considered of low risk for HBV infection, however, rates as high as 11% have been reported in Nigeria [13]. Prevalence of HBV varies from place to place as there is no acceptable uniformity in overall prevalence of HBV. For example, research done in Maiduguri revealed a prevalence of 11.6%, a prevalence predominantly reported among blood donors and pregnant women [14], Port Harcourt recorded 4.3% prevalence among pregnant women [15] Ilorin recorded 5.7% prevalence among mothers and their preschool children [16], Zaria 8.3% prevalence among pregnant women[17], Nassarawa recorded 17.1% from female sex workers [18], Yola 14.9% from apparently healthy blood donors [19] and 25.7% among surgeons in Lagos [10] respectively.

The study conducted in Abakaliki, Ebonyi State few years ago found that the prevalence of HBsAg antigenaemia among adolescents was 4.1%. The risk factors for HBV infection identified in that study focused on some common risk behavioral practices that characterize the lifestyle of contemporary adolescent subcultures with a view of determining their effect on HBsAg seroprevalence. These practices include, tattooing, body piercing, intravenous drug use, engaging in unprotected sex and communal use of sharp objects like razor blades, nail cutters and hair clippers [20].

In Ebonyi State, the study conducted between the years 2018 to 2021 showed significant difference in prevalence according to location in Local government areas and in occupations as follows: Out of 656 people that were positive in Ebonyi State, Abakaliki LGA had 58 (6.9%), Afikpo North 45 (5.3%), Afikpo South 52 (5.7%), Ebonyi 50 (8.5%), Ezza North 68 (8.5%) Ezza South 63 (8.0%), Ikwo 47 (5.2%), Ishielu 60 (8.6%), Ivo 25 (4.8%), Izzi 64 (11.1%) Ohaozara 38 (5.1%), Ohaukwu 55 (7.7%) and Onicha LGA 31 (4.9%) [21]. Following their occupation analysis, Applicants had 32 (2.7%), Artisans 105 (10.6%), Civil Servants 46 (4.5%), Clergy 6

(4.5%), Drivers 55 (10.5%), farmers 244 (8.0%) Health workers 22 (10.9%), Sex workers 0 (0%) students 22 (1.8%), Teachers 17 (7.2%) and Traders 107 (10.6%) [21].

In areas of high endemicity where at least 8% of the populations are chronic HBV carriers, HBV is mainly contracted at birth and early childhood [21]. About 90% are infected during the prenatal period, 30% are infected in early childhood, and 6% of infected persons after 5 years of age develop chronic infections [22]. Transmission of HBV among adults occur through contact with infected blood and body fluids such as semen, vaginal fluids, and saliva. It could also occur by other means of iatrogenic or horizontal transmission such as long-term household contacts with no sexual involvements in regions of high endemicity.

HBV infection is also recognized as an occupation health hazard for health- care practitioners [23]. HBV endemicity is divided into three categories; high, intermediate, low. China, South East Asia, Indonesia, and sub-Saharan Africa are regarded as highly endemic areas because chronic HBV infection is reported in more than 8% of the population [6]. Intermediate areas show chronic HBV infection rate between 2% and 7% of population, and include South America, South West Asia, Eastern and Southern Europe. Developed countries, such as North America and Western Europe are grouped as low endemic regions; in these areas, HBV prevalence rates range from 0.5% to 2% [1].

In many regions of the world, such as Europe, the Americas, and Australia, there has been a downward trend in the prevalence of HBV infection due mainly to improved immunization against HBV and health-care practices. This includes screening of blood products before transfusion, injection safety, and infection control policies [24]. Of the five different types of hepatitis viruses (A, B, C, D, and E), hepatitis B virus (HBV) infects the liver more than other viruses. HBV is a DNA virus that replicates in the liver cells and causes acute and chronic infections of the liver. It is a major cause of chronic hepatitis, cirrhosis, and hepatocellular carcinoma. Most people are unaware of their infection with viral hepatitis and unknowingly transmit the infection to other people, so it is a silent epidemic due to its highly asymptomatic nature.

Although HBV has three surface antigen and expresses other serologic biomarkers upon infection of the liver, during the incubation period, HBsAg is the first serological marker to appear. Making it a vital and useful bio-antigen for the detection of the infection of the liver by the virus. This occurs 2 to 8 weeks before biochemical evidence of liver dysfunction or the onset of jaundice [2]. The antigen persists throughout the course of the illness and is usually cleared from the circulation during convalescence stage. In general, detection of HBsAg is used for the diagnosis of acute infection and the screening for carrier status. Anti-HBc is found in the serum 2 - 4 weeks after the appearance of the surface antigen and is always detectable during the acute early phase of the illness. It is possible to get cases where anti-HBs has disappeared whilst anti-HBc persists. It is also possible to have a situation where anti-HBs is present with no anti-HBc with no history of immunization. This may occur in a situation when the person is continually exposed to minute amounts of HBV which is insufficient to set up an infection. In this manner, the patient becomes immune to HBV.

Next to appear is the viral DNA polymerase and the e antigen. The e antigen is a distinct soluble antigen that is located within the core and correlates closely with the number of virus particles and the relative infectivity. HBeAg is used to assess the potential infectivity of carriers and antibodies to specific antigens indicate past infection and are of value in monitoring progress.

Core IgM become undetectable several months after the onset of uncomplicated acute infection, but core IgG persists for many years, possibly for life. Core IgM is of value in diagnosing recent infection in those who have lost detectable antigen and in whom antibodies have not become apparent (termed the diagnostic window). The presence of anti-e is associated with low infectivity of the serum. Anti-Hbs is the last marker to appear late during convalescence. The presence of the hepatitis B surface antigen (HBsAg+) indicates an acute (i.e., less than 6 months) or chronic HBV infection. Hepatitis B e-antigen (HBeAg+) positivity is associated with active viral replication, high HBV DNA viral load, and higher infectivity. In the absence of HBsAg, the existence of HBV core antibodies (anti-HBc IgG) may indicate that an individual was previously infected with HBV. The presence of HBV surface antibodies (anti-HBs) indicates that the individual has achieved immunity to HBV following an infection or from vaccination [8].

Aims: This study is carried out to determine the current seroprevalence of hepatitis B virus among patients and pregnant women that visited David Umahi Federal University Teaching Hospital Uburu, Ebonyi state between January 2023 to December 2023.

Objectives

1. To determine the age and sex of patients and pregnant women between January to December 2023 in David Umahi federal University Teaching Hospital Uburu.
2. To determine the prevalence of HBV virus in DUFUTH between January to December 2023.

Method

The Setting

This study was conducted in David Umahi Federal University Teaching Hospital Uburu (DUFUTH), Ebonyi state in the south eastern region of Nigeria. The inhabitants of the hospital community are predominantly Igbo who are mainly civil servants, traders, farmers, artisans and students.

Study Design

It was a descriptive cross-sectional study carried out using patients that attended the hospital that were screened for HBV Antigen between January 2023 to December 2023.

Inclusive Criteria
All the patients, and pregnant women that presented themselves for HBV screening were used in this study.

Exclusive Criteria
All the voluntary blood donors were excluded in the study.

Ethical Consideration
Approval for the study was given by the Chairman, Medical Advisory Committee of the hospital who was in charge of clinical services.

Methodology
Sample collection
Two to five milliliter (2-5ml) of venous blood was drawn from the patients, ensuing standard precaution into an appropriately labelled ethylene diamine tetra acetic acid (EDTA) bottle. The samples were temporary stored and were taken into the laboratory in a cold box.

Sample Analysis
Blood samples were centrifuged at 4,500 rpm for about 3minutes to separate plasma from the red cells. Commercial quantitative and qualitative HBsAg ELISA kit (CTK Biotech) was utilized, with strict compliance to the manufacturer's instructions in the manual and the standard operating procedure. Sensitivity and specificity of the ELISA kit were 100% and 100% respectively. Two to three (2-3) drops of plasma specimen were pipetted into the circular groove of the cassette and incubated at 37°c for 15minutes, results were read.

Reading of Result
If both C and T bands developed on the HBsAg groove, it was read as positive, if C was visible and T band was not visible the result was read as negative and if no red bands appeared or control line fails to appear, the result was interpreted as invalid and was retested.

Follow up
Those subjects with positive test to HBsAg were confidentially counselled on the nature of HBV infection and the need for follow up in the gastroenterology clinic in David Umahi Federal University Teaching Hospital (DUFUTH) Uburu. Those subjects with negative results were also counselled on healthy lifestyle to avoid contracting the infection and the need to go for vaccination for those that had not been vaccinated against Hepatitis B virus.

Quality Control
The collected samples were temporary stored and taken in an ice box to the laboratory for centrifugation after which they were stored in the freezer at a temperature of -20°c. The ELISA kit and its reagents were stored in the refrigerator prior to use as directed by the manufacturers. The opened reagents that were not used immediately were refrigerated and brought to room temperature before use. Strict compliance to manufacturer's instruction for the test kits was ensured.

Data Analysis
Data was analyzed using the IBM statistical package for social sciences (SPSS) version 26 and Microsoft Excel S.

Results
General Result
Overall, 413 patients and pregnant women participated in HBV surface antigen screening at David Umahi federal university teaching hospital between January and December 2023.

Pregnant women made up to 54 (13%) of the participants while regular and admitted patients for various ailments make up 359 (87%).

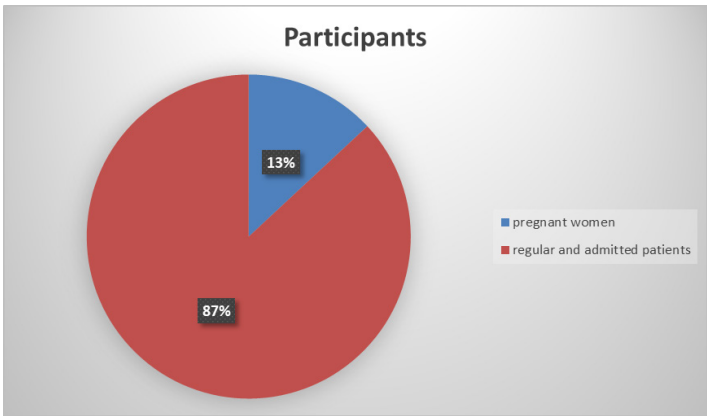

Figure 1: Showing the status distribution of participants.

Age and Sex Distribution
Out of the 413 patients and pregnant women that participated in this study, the age bracket of 1-10 years had 17 (4.1%) participants, 11-20 years 27 (6.5%) participants, 21-30 years 84 (20.3%) participants, 31-40 years 127 (30.8%) participants, 41-50 years 55 (13.3%) participants, 51-60 years 31 (7.5%) participants, 61-70 years 39 (9.5%) participants, 71-80 years 24 (5.8%) participants, 81-90 years 9 (2.2%) participants. On sex distribution, 180 (44%) were male, while female participants accounted for 233 (56%), out of which 54 are pregnant women while 179 are non-pregnant females.

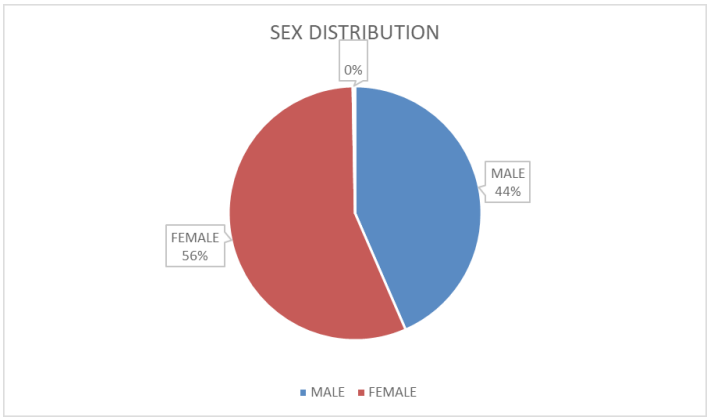

Figure 2: Sex distribution among the participants.

Table 1: The Age distribution of the participants.

Age group	Male	Female	Total	%
1-10	9 (2.2%)	8 (1.9%)	17	4.1
11-20	10 (2.4%)	17 (4.1%)	27	6.5
21-30	26 (6.3%)	58 (13.6%)	84	20.3
31-40	56 (13.6%)	71 (17.2%)	127	30.8
41-50	26 (6.3%)	29 (7.0%)	55	13.3
51-60	17 (4.1%)	14 (3.4%)	31	7.5
61-70	18 (4.4%)	21 (5.1%)	39	9.5
71-80	13 (3.1%)	11 (2.7%)	24	5.8
81-90	5 (1.2%)	4 (1.0%)	9	2.2
Total	180 (44%)	233 (56%)	413	

Prevalenece of HBV Surface Antigen among Participants

Out of the 413 people examined, 17 persons were reactive giving an overall seroprevalence of 4.1%, while 396 (95.9%) participants were negative to HBV surface antigen. Out of the 17 persons with reactive results, male had 8 (1.9%) and female 9 (2.2%). All the reactive female participants are the non- pregnant female. No pregnant female among the 54 participants was positive. There is no significant association in prevalence with respect to sex.

Table 2: The overall Seroprevalence of Hepatitis B virus surface antigen.

Sex	Results	
	Non Reactive	Reactive
Male	172 (42.0%)	8 (2.0%)
Female	224 (53.8%)	9 (2.2%)
Total	396 (95.9%)	17 (4.1%)

Prevalence of HBV Surface Antigen with Sex Distribution

A total of 9 (2.1%) of females were positive to HBV surface antigen while 8 (2.0%) of males were positive. See table 2 above.

Table 3: The distribution of reactive results according to sex and age group.

Age group	Reactive Result		Total
	Male	Female	
1-10	0	0	0
11-20	0	1 (5.9%)	1 (5.9%)
21-30	1 (5.9%)	4 (23.5%)	5 (29.4%)
31-40	5 (29.4%)	2 (11.8%)	7 (41.2%)
41-50	0	2 (11.8%)	2 (11.8%)
51-60	1 (5.9%)	0	1 (5.9%)
61-70	0	0	0
71-80	1 (5.9%)	0	1 (5.9%)
81-90	0	0	0
Total	8 (47.1%)	9 (52.9%)	17 (100%)

Out of the 17 persons with reactive results, the age bracket of 11-20 years had female 1 (5.9%), and male 0 (0%), 21-30 years had male 1 (5.9%), female 4 (23.5%), 31-40 years, male had 5 (29.4%), female had 2 (11.8%), 41-50 years male had 0 (0%), female had 2 (11.8%), 51-60 years male had 1 (5.9%) female 0 (0%), 61-70 years male had 0 (0%) female 0 (0%), 71-80 years male 1 (5.9%) female 0 (0%), 81-90 years male had 0 (0%) female 0 (0%). Ages 1-10years had no reactive for both male and female participants. There is a significant difference between male and female in the age brackets 21-30 years and 31-40 years.

Prevalence of HBV Surface Antigen with Age Group Distribution

Out of the 413 people that were examined, the age bracket 1-10 years had reactive 0 (0%), non-reactive 17 (4.1%), 11-20 years had reactive 1 (0.2%), non-reactive 26 (6.3%), 21-30 years had reactive 5 (1.2%), non-reactive 79 (19.1%), 31-40 years had reactive 7 (1.7%), non-reactive 120 (29.1%), 41-50 years had reactive 2 (0.5%), non-reactive 53 (12.8%), 51-60 years had reactive 1 (0.2%), non-reactive 30 (7.3%), 61-70 years had reactive 0 (0%), non-reactive 39 (9.4%), 71-80 years had reactive 1 (0.2%), non-reactive 23 (5.6%), 81-90 years had reactive 0 (0%), non-reactive 9 (2.2%). There is a significant association in the prevalence according to age as ages 31-40 years has the highest prevalence followed by ages 21-30 years. See table 4 below

Table 4: The prevalence of HBV infection according to age group in the study.

Age group	Results		Total
	Reactive	Non-Reactive	
1-10	0 (0%)	17 (4.1%)	17 (4.1%)
11-20	1 (0.2%)	26 (6.3%)	27 (6.5%)
21-30	5 (1.2%)	79 (19.1%)	84 (20.3%)
31-40	7 (1.7%)	120 (29.1%)	127 (30.8%)
41-50	2 (0.5%)	53 (12.8%)	55 (13.3%)
51-60	1 (0.2%)	30 (7.3%)	31 (7.5%)
61-70	0 (0%)	39 (9.4%)	39 (9.4%)
71-80	1 (0.2%)	23 (5.6%)	24 (5.8%)
81-90	0 (0%)	9 (2.2%)	9 (2.2%)
Total	17 (4.1%)	396 (95.9%)	413

Discussion

The overall prevalence of hepatitis B virus infection in this study using HBsAg was found to be 4.1%. this value falls within the HBsAg prevalence range of 2-7% which is the definition of intermediate endermicity for HBV infection by the Centre for Disease Control and Prevention (CDC) [25]. However, the result of this study seems high with the overall prevalence of 4.1% especially when compared to 1% WHO universal target for 2020 (WHO,2016) and 0.1% for 2030 (WHO,2018) [26]. Considering the mortality, morbidity, social and economic effects of Hepatitis B virus infection on humanity, the prevalence rate is alarming and looking at the age bracket involved, this calls for serious concern to the Government and health authorities at all levels.

In comparison, the prevalence of 4.1% of HBV infection is considerably lower than the 10% prevalence reported by Aminu & Aminu et al. in 2012 among patients in Kaduna [9] and 6.9% prevalence reported by Chima C.O.D.C et al., among different Local Government Areas in Ebnyi State [21]. In further comparison, this 4.1% prevalence is above the prevalence of 3.38% reported by Omeje KN et al., among Secondary school students in Abakaliki [20] and 3.9% prevalence reported by Aba et al., in 2012 among

pregnant women [27]. The higher values reported above may be attributed to the difference in sample size participants. There are possible contributing factors to this prevalence in this study which may include multiple sex partners, lack of awareness campaign, lack of screening facilities in the rural areas especially before blood transfusion, child delivery, traditional circumcision and even before marriage. Considering the percentage prevalence based on sex, there is no significant increase in prevalence according to sex, male had 2.0%, and female had 2.2%.

In the percentage prevalence based on age group, the specific rate were 0.2% in the age bracket of 11-20 years. 1.2% for those within the age of 21-30 years, 1.7% for those within the age of 31-40years, 0.5% for those within the age of 41-50, 0.2% for those within the age of 51-60 years, and 0.2% for those within the age of 71-80 years. There is a significant increase in the prevalence according to age, people within the age group 31-40 years had the highest prevalence followed by the age group 21-30 years.

Age is an important factor in epidemiology study. Given the sexual transmission of HBV, the high sexual activity of individuals within those age brackets of 21-30 years and 31-40 years might explain this. Thus one can speculate that the major transmission mode in this participant might be sexual intercourse and possibly intravenous drug use. Therefore, the age groups 21-40 years shows that youth which are sexually active should be the target for HBV infection since sexual activity is one of the major risk factor associated with the infection. These significant rise in the prevalence of HBV infection within the participants as age increases from 21-40 years but declined from the age brackets of 41-80 years, could be attributed to the effect of the introduction of immunization program against HBV infection in Nigeria in the year 2004 and also in agreement with Yahaya Mohammed al., which indicated that the protective value of the vaccine decreases as age increase [6].

Conclusion

The findings of 4.1% prevalence of HBV in this research when compared to 1% WHO universal target for 2020 (WHO,2016) and 0.1% for 2030 (WHO,2018) rate is alarming and looking at the age bracket involved. This therefore, calls for serious concern to the Government and health authorities at all levels. Considering the mortality, morbidity, social and economic effects of Hepatitis B virus infection on humanity.

Although Nigeria has made notable gains along the four-prong strategy, for example by registering hepatitis –related cancer-cases, creating national guidelines for prevention of infection in health care workers, adopting universal vaccination, and screening all donated blood [5]. There is still need for health promotion awareness campaign to educate the general public on the danger, mode of transmission and the risk factor associated with HBV infection especially among youth population.

Recommendations

1. There is need for health promotion awareness campaign to educate the general public on the danger, mode of transmission and the risk factor associated with HBV infection especially among youth population.
2. Campaign is also necessary for HBV Vaccination.

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