International Journal of Research and Review
Vol. 10; Issue: 11; November 2023
Website: www.ijrrjournal.com
Research Paper *E-ISSN: 2349-9788; P-ISSN: 2454-2237*

Assessment of the Prevalence of Hepatitis B Virus Co-Infection and Its Risk Factors Among Pregnant Women Attending Antenatal Clinics in Jaling and Takum Local Government, Taraba State, Nigeria

Obadiah S Y[1], Usman DD[1], Akwa VY.[1], Adamu R.C.[1], Lipana D.B.[1]

[1]Department of Biological Sciences, Taraba State University, Jalingo, Taraba State, Nigeria.

Corresponding Author: Obadiah S.Y

DOI: https://doi.org/10.52403/ijrr.20231162

ABSTRACT

Hepatitis B Virus (HBV) infections are co-endemic throughout most of the tropical and sub-Saharan Africa and both present a major threat to public health. This study was conducted to determine the prevalence of Hepatitis B Virus co-infection in pregnant women attending antenatal clinics in Jalingo and Takum Local government Areas, Taraba State, Nigeria. The study was conducted in Jalingo and Takum Local Governments Areas between September 2018 to December 2018.A total of five hundred and twenty (520) pregnant women were screened on antenatal day. Hepatitis B surface antigen (HBsAg), test was carried out using WONDFO(R)HBsAg test strips and use of ante-sera for blood group. A questionnaire was also prepared to collect demographic data and some risk factors. The prevalence of HBV in Jalingo (12.3%) and Takum (15.2%).co- infection HBV in Jalingo (11.9%) and Takum (15.3%). Hepatitis B infection in relation to age group showed that age group 26 - 30 had the highest infection (21.3%) while age group 16-20 had the least infection(8.2%). This result showed no significant difference between age distribution of Hepatitis B infection based on Educational status showed those without Formal Education had the highest prevalence (88.8%) and (19.4%) for Hepatitis B. Occupational related prevalence showed that Traders had the highest prevalence of (86%) and (17.2%) for Hepatitis B χ^2= 10.346 (P.>0.5).pregnancy status also showed varied infection rates , those in their first trimester had the highest prevalence(84.2%) for Hepatitis B virus infection but there was no significant difference (P>0.5) between pregnancy status and Hepatitis B. Relationship between Hepatitis B risk factors on the other hand showed a closer association with Blood transfusion (O.R=1.179), sharing of towel (O.R=1.079), Multiple sex partners (O.R=2.989) and use of unsterilized syringe (O.R=3.163). Hepatitis B control in pregnancy is necessary so as to reduce the incidence of adverse pregnancy complications. The Hepatitis B screening should be incorporated into the routine antenatal screening on their first day of booking.

Keywords: Hepatitis B infection, antenatal, pregnant women, Jalingo and Takum, Nigeria.

INTRODUCTION

Hepatitis B is an infectious inflammatory illness of the liver caused by the hepatitis B virus (HBV) that affects hominoidea, including humans. The virus is transmitted by exposure to infectious blood or body fluids such as semen and vaginal fluids (Ndams *et al.*, 2008; Adeleke *et al.*, 2013). Hepatitis B virus (HBV) infection is also a preventable viral infection that affects the liver and can cause both acute and chronic liver disease. It is endemic in region of the world including sub-Saharan Africa (Anaedobe *et al.*, 2015).

HBV is a small, double-shelled virus in the family Hepadnaviridae. Other Hepadnaviridae include duck hepatitis virus, ground squirrel hepatitis virus, and

woodchuck hepatitis virus. The virus has a small circular DNA genome that is partially double-stranded (CDC, 2011). HBV contains numerous antigenic components, including HBsAg, hepatitis B core antigen (HBcAg), and hepatitis B e antigen (HBeAg). Humans are the only known host for HBV, although some non-human primates have been infected in laboratory conditions. HBV is relatively resilient and, in some instances, has been shown to remain infectious on environmental surfaces for more than 7 days at room temperature (Purcelland Emerson 2008; Willis *et al.*, 2010).

The complications of hepatitis B Virus infection are more pronounced among immune -compromised patients such as pregnant women and HIV infected individuals. These infectious diseases cause similar adverse pregnancy outcomes which include spontaneous abortion, still birth or death of the pregnant women (W.H.O, 2015).Therefore, early diagnosis of these deadly infections through screening among the pregnant women is crucial to the ongoing efforts and campaign on the reduction of maternal and child mortality in Nigeria.

HBV stimulates a potent pro-inflammatory Type 1 immune response (Th1), which is of paramount importance for Plasmodium clearance; however, it is also incriminated in disease severity (Gasimand Adam2015). Whilst challenging, data on the effects of HBV on the clinical presentation of malaria are scarce.

Globally, Hepatitis B virus causes the major and common infectious diseases of the liver (W.H.O., 2016; Jill, 2019). The investigation of Hepatitis B e antigen (HBeAg) imply that patients are at high risk for transmission of the disease (Fattovich *et al.*, 2008).In countries where there is high HBV endemicity, particularly developing countries; intrauterine transmission is the major way of HBV transmission from positive pregnant mothers to their fetus/newborn (Desalegn *et al.*, 2016)..An estimated 2 billion persons worldwide have been infected with HBV, and more than 350 million persons have chronic, lifelong infections. HBV infection is an established cause of acute and chronic hepatitis and cirrhosis. It is the cause of up to 50% of hepatocellular carcinomas (HCC) (Noubiap *et al.*, 2015; Schillie *et al.*, 2018).

Hepatitis B virus (HBV) is a global public health problem. It is reported that 2 billion people are exposed and 350 million people chronically infected with HBV (WHO, 2018). The chronic infection further lead to cirrhosis and hepatocellular carcinoma (HCC), resulting into one million deaths worldwide annually (Kew, 2010).

Statement of the Problem

Hepatitis B is responsible for higher incidence of low birth weight and pre-matured birth, gestational diabetes mellitus, ante-partum hemorrhage and preterm delivery. It also causes bleeding to the pregnant woman especially during the second trimester or during labor. These conditions become more complicated when both organisms are in a pregnant woman. The study on hepatitis B co-infection virus among pregnant women attending ante-natal clinics in Jalingo and Takum Local Government Areas, Taraba State, was undertaken to find means of reducing maternal mortality among pregnant women and also to create awareness to the women on the danger of the diseases in pregnancy. This study would be beneficial for public health authorities to know the prevalence of Hepatitis B Virus among pregnant women in Jalingo and Takum LGAs. The study will also give base line information to other researchers on the prevalence and risk factors associated with HBV on pregnant women in Jalingo and Takum.

Epidemiology of Hepatitis B Virus

Hepatitis B virus (HBV) is a major cause of liver disease morbidity and mortality worldwide, accounting for over 360 million cases of chronic hepatitis and 620,000 deaths per year (Musa *et al.*, 2015). It is hyperendemic (i.e.>8% of the population infected) in Sub-Sahara Africa (SSA) and a major cause of chronic liver disease (Prins *et*

al., 2014; Bakarey *et al.*, 2018). An estimated 44% of cirrhotic liver disease and 47% of hepto-cellular carcinoma cases in SSA are attributed to HBV. 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 (Musa *et al.*, 2015). Further, community misconceptions have hindered increasing coverage rates (Tafuri *et al*, 2014). The United Nations Children's Fund (UNICEF) and the World Health Organization (WHO) estimated that only 41% of Nigerians were vaccinated against HBV in 2013 (Harris *et al.*, 2014).

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 (Musa *et al.*, 2015). Investigators have reported varying national and risk group-specific estimates. Prior reports suggest a prevalence of 10-15% in the average risk Nigerian population (Elikwu *et al.*, 2016). In Nigeria, investigators have found high HBV prevalence among surgeons (25.7%), voluntary blood donors (23.4%) and infants (16.3%) (Abiodun *et al*, 2017; Bakarey *et al.*, 2018). Hepatitis B is the commonest cause of chronic liver disease in Nigeria. In southern parts of the country, up to 58.1% of patients with chronic liver disease were found HBsAg positive (Iloh *et al.*, 2013; de Martel *et al.*, 2015).

Modes of Transmission of Hepatitis B virus

The biological explanation for the higher risk of transmission for HBeAg-positive mothers is that, differently from HBsAg, maternal HBeAg could pass through placenta from mother to fetus and induce T-cell tolerance *in utero (*Wang *et al.*, 2015*)*. The intra-uterine infection of HBV, whose mechanism remains unclear, is the major cause of unsuccessful immunological blockade. High levels of serum HBV DNA in pregnant women is the main risk factor for the occurrence of HBV intra-uterine infection: it correlates with the cord blood HBV DNA level and HBsAg titer (Yi *et al.*, 2016). It has also been demonstrated that HBV can infect all kinds of cells in the placenta (decidual, trophoblastic, villous mesenchymal, villous capillary endothelial cells) and that HBV DNA is present in all generations of spermatogenic cells and sperms in HBV-infected males, in follicular fluid and in ovary (cellular transfer) (Zhang *et al.*, 2004). The presence of the virus in the spermatogenic cells can have a role in the transmission of HBV infection to the newborn, as a high homology between the father's and the child's viral sequences in discordant couples has been found (Borgia *et al.*, 2012).

Perinatal transmission is a common mode of HBV transmission worldwide (Jonas, 2009). HBV infection in newborns is defined as hepatitis B surface antigen (HBsAg) positivity 6 months after birth. Antibody to hepatitis B e antigen (anti-HBe) and anti-hepatitis B core antigen cross the placental barrier and disappear in nearly all babies before 12 and 24 months of age, respectively. Therefore, they simply represent the transplacental maternal antibodies and are not indicators of HBV infection status (Hay, 2008; Jonas, 2009 ;Wang *et al.*, 2017;).

Without prophylaxis the risk of mother-to-child transmission is very high. It varies with the HBeAg/anti-HBe status of mothers, being 70%-90% for HBeAg-positive mothers, 25% for HBeAg-negative/HBeAb-negative mothers and 12% for HBeAg-negative/anti-HBe-positive mothers (Oladele *et al.*, 2014). Maternal screening programs aimed at identifying HBsAg-positive mothers are part of pregnancy routine examinations in most countries. Once HBsAg-positive mothers are identified, their babies receive passive-active immunoprophylaxis at birth to reduce vertical HBV transmission. Passive immunoprophylaxis consists of the administration of hepatitis B immune globulin (HBIG) whereas active

immunoprophylaxis is the administration of hepatitis B vaccine (Hay, 2008; Jonas, 2009). The maternal HBeAg-positive serological status and high viral load are associated positively with intrauterine transmission of HBV, especially through villous capillary endothelial cells. In fact, HBeAg can pass through the placenta *via* partial placental leakage or *via* the "cellular route". The absence of HBeAg expression is associated with lower levels of viral replication and with a significantly lower risk of intrauterine transmission of HBV (Fattovich *et al.*, 2008). The host's immune response to viral antigens is thought to be the cause of the liver injury in HBV infection (Borgia*et al.*, 2012). The cellular immune response, rather than the humoral immune response, seems to be primarily involved in disease pathogenesis. Induction of antigen-specific T-lymphocyte response is thought to occur when host T lymphocytes are presented with viral epitopes by antigen-presenting cells in lymphoid organs. These antigen-specific T cells mature and expand and then migrate to the liver. In acute HBV infection, most HBV DNA is cleared from hepatocytes through non-cytocidal effects of inflammatory byproducts of CD8+ T lymphocytes, stimulated by CD4+ T lymphocytes, notably interferon-gamma and tumor necrosis factor-alfa. These cause downregulation of viral replication, and trigger direct lysis of infected hepatocytes by HBV-specific CD8+ cytotoxic T cells (Rehermann,2013). In contrast, people with chronic HBV infection display weak, infrequent, and narrowly focused HBV-specific T-cell responses, and the majority of mononuclear cells in livers of chronic HBV-infected people are nonantigen-specific (Bauer *et al.*, 2011).

Both HBV and malaria represent key threats to public health. Malaria remains the most common cause of morbidity and mortality in Nigeria despite remarkable achievements by government and key stakeholders (Muhammed and Sharif 2015).

Pathogenicity of Hepatitis B Virus

Hepatitis B virus (HBV) is a global public health problem (W.H.O., 2018). It is reported that 2 billion people have been exposed and 350 million people chronically infected with HBV (McLauchlan *et al.*, 2002). The chronic infection further led to cirrhosis and hepatocellular carcinoma (HCC), resulting into one million deaths worldwide annually (Kew, 2010).

Cyto-adherence, the ability of parasites to adhere to the vascular endothelium, was recognized as early as 1892 by Marchiafava and Bignami (Autino *et al.*, 2012). Mature forms of parasites (asexual stage and gametocytes) can adhere to the vascular endothelium of several organs (lung, heart, brain, lung, liver, and kidney), the subcutaneous adipose tissues and the placenta. This feature of the disease *in vivo* has been related exclusively to *P. falciparum (*Autino *et al.*, 2012*)*. However, sequestration *in vitro* to some endothelial cell lines and placental cryosections has also been seen in reticulocytes infected with *P. vivax (*Totino and Lopes 2017*)*.

Life Cycle of Hepatitis B virus

The hepatitis B virus, as in the case of all other viruses, must first attach specifically onto a cell capable of supporting its replication (Greenwood *et al.*, 2012). Though the liver is the most effective cell type for replicating HBV, other extrahepatic sites have been found to be able to support replication to a lesser degree. HBV replicative intermediates and/or viral transcripts have been found in mononuclear cells (Liang, 2009; Bhatia *et al.*, 2014) bile duct epithelial, endothelial, pancreatic acinar cells, and smooth muscle tissue, as well as in adrenal glands, gonads, cultured bone marrow, kidneys, lymph nodes, spleen and thyroid glands of acute hepatitis B infected patients. Viral attachment often determines host and tissue specificity of a virus. However, for HBV, there are no cell-lines available that are able to support viral replication. Only primary duck hepatocytes, which are freshly explanted from the liver,

can support DHBV infection. Consequently, the initial steps of HBV entry are poorly understood. However, several differentiated and immortalized cell lines are capable of supporting viral replication if transfected with viral DNA. The availability of these cell systems has allowed for the elucidation of much of the hepatitis B lifecycle. Many proteins have been found associated with the various hepatitis B surface proteins (Gerlich, 2013). Attempts to define the receptor for HBV have yielded a plethora of candidates such as apolipoprotein H(apo-H), an altered form of apolipoprotein H(alt. apo-H), poly-human serum albumin (pHSA), fibronectinand interleukin-6 (IL-6) (Brattig*et al.,* 2016). More recently, a protein (gp180) has been identified to interact with the preS1 domain in DHBV. Also, an 80kd protein has been found to bind onto human HBV which has yet to be identified.Despite these findings, the proteins and mechanism of HBV entry into cells has yet to be well

Acute Hepatitis B Virus infection

Clinical manifestations — Approximately 70 percent of patients with acute hepatitis B virus (HBV) infection have subclinical or anicteric hepatitis, while 30 percent develop icteric hepatitis. The disease may be more severe in patients co-infected with other hepatitis viruses or with underlying liver disease (Hollinger, 2008).

Fulminant hepatic failure is unusual, occurring in approximately 0.1 to 0.5 percent of patients. Fulminant hepatitis B is believed to be due to massive immune-mediated lysis of infected hepatocytes. This explains why many patients with fulminant hepatitis B have no evidence of HBV replication at presentation (Spearman *et al.*, 2017).

Chronic Hepatitis B Virus infections

Chronic HBV infections are a well-documented cause of liver cirrhosis and hepatocellular carcinoma (Baffy *et al.*, 2012). Nevertheless, extra-hepatic manifestations are often forgotten even though they may be associated with significant morbidity and mortality. The prevalence of these manifestations is low (10% to 20% of patients) and has even declined in recent years. Extra-hepatic manifestations are sometimes difficult to diagnose because they can be atypical and have no clear temporal relationship with the symptoms of hepatitis. They also may occur in patients who have no evidence of chronic liver disease. The pathophysiology of these manifestations has still not been fully elucidated, but the best accepted theories are that they are caused by circulating autoantibodies, deposition of immune complexes, local formation of immune-induced viral antigens, autoantibodies generated by the virus (which react against tissue), and/or development of a direct viral reaction at extra-hepatic sites. The most common extra-hepatic manifestations include polyarteritis nodosa, serum sickness-like reaction, essential mixed cryoglobulinemia, nephropathy, dermatologic manifestations, arthritis and neurological involvement (Liang, 2009).

Polyarteritis nodosa is a necrotizing vasculitis that occurs in up to 5% of chronic HBV infections. It manifests early in the first 6 months after infection and is a sudden, severe illness (Chen *et al.,* 2008). It results in hypertension, eosinophilia, abdominal pain, weight loss, polyarthralgia, and subsequent kidney, gastrointestinal and neurological involvement. Patients may present with palpable purpura on lower extremities which can progress into large ulcers. These are sometimes associated with painful subcutaneous nodules and livedo reticularis.

Serum sickness-like reaction is a condition that can occur in 10% to 30% of patients in the prodromal phase of HBV infection. It can result in arthritis and arthralgia with generally symmetrical distribution but which especially affects the small joints of the hands and feet. Occasionally, it is asymmetrical, affects only one joint, or affects large joints. Macular petechial, outbreaks of rashes, and purpura may develop. In addition to palpable purpura, other possibilities include Henoch-Schonlein

purpura, multiform erythema, toxic erythema, angioneurotic edema and lichenoid dermatitis (Ling, 2016).

Complication of Hepatitis B Virus

In less than 1 in 100 cases, short-term (acute) hepatitis B can lead to a serious problem called fulminant hepatitis B. This is where the immune system attacks the liver and causes extensive damage to it (Pawlotsky *et al.*, 2015). It can lead to symptoms such as: confusion, collapsing, swelling of the tummy caused by a build-up of fluid and severe jaundice. Fulminant hepatitis B can cause the liver to stop working properly and is often fatal if not treated quickly.

Effects of Hepatitis B virus on pregnant women

In most cases, acute or chronic HBV infection in pregnancy is similar to that in the general adult population: HBV infection does not increase the mortality and it does not yield teratogenic effects. However, a higher incidence of low birth weight and prematurity has been reported during acute infection than in the general population (Silasi *et al.*, 2015), whereas gestational diabetes mellitus, ante-partum hemorrhage and preterm delivery are more frequent in chronic maternal HBV infection than in the general population. Acute infection must be differentiated from other acute liver diseases that occur during pregnancy such as intrahepatic cholestasis (Jonas, 2009)

MATERIALS AND METHODS

Study Area

The study was conducted among pregnant women attending antenatal clinic in Jalingo and Takum Local Government Areas of Taraba State, Nigeria. Jalingo Local Government Area sis the capital city of Taraba State. It was created out of the former Gongola State in the year 1991, it lies roughly between latitude 8°53′37.2 N and longitude 11°21′346 E. Jalingo has a population of 118,000(National Population Commission 2019) making it the biggest city in Taraba State. It is connected by road to Yola and Wukari.Districts within Jalingo are Kona ward, Suntali,Turaki A, Turaki B Mayo-gwoi, Majidadi, Yelwa, Barade, Kachalla Sembe and Sarkin Dawaki. The major ethnic groups in Jalingo are Kona, Hausa - Fulani and Mumuye. The major occupation of the people includes farming of crops such as groundnuts, maize, rice, sorghum, millet, cassava, and yam which are also produced in commercial quantity. Trading and rearing of cattle, sheep and goats are also known occupations in the area. Similarly, the people undertake other livestock production activities like poultry production, rabbit breeding and pig farming in fairly large scale. Other occupational activities such as pottery, cloth-weaving, dyeing, mat-making, carving and blacksmithing are also carried out in Jalingo. Takum is a Local Government Area in Taraba State, Nigeria. Its headquarter is in the town of Takum. It was created out of Wukari Local Government in 1975, at 7°16′00″N9°59′00″E. Takum borders the Republic of Cameroon in the South, Ussa Local Government to the West, Donga Local government to the North, District within Takum are Kwambai, Jenuwa, Rogo, Dutse, Kashimbila, Bete, Chanchanji and Bika. The majo rethnic / tribes in Takum are Jukun, Kuteb, Chamba, Tiv, Ichen and Hausa, etc. It has an area of 2,503 km² and a population of 135,349 (National Population Commission, 2019). The climate of the area is tropical with vegetation characterized by a typical guinea savannah. There are two distinct seasons, the wet and dry seasons.

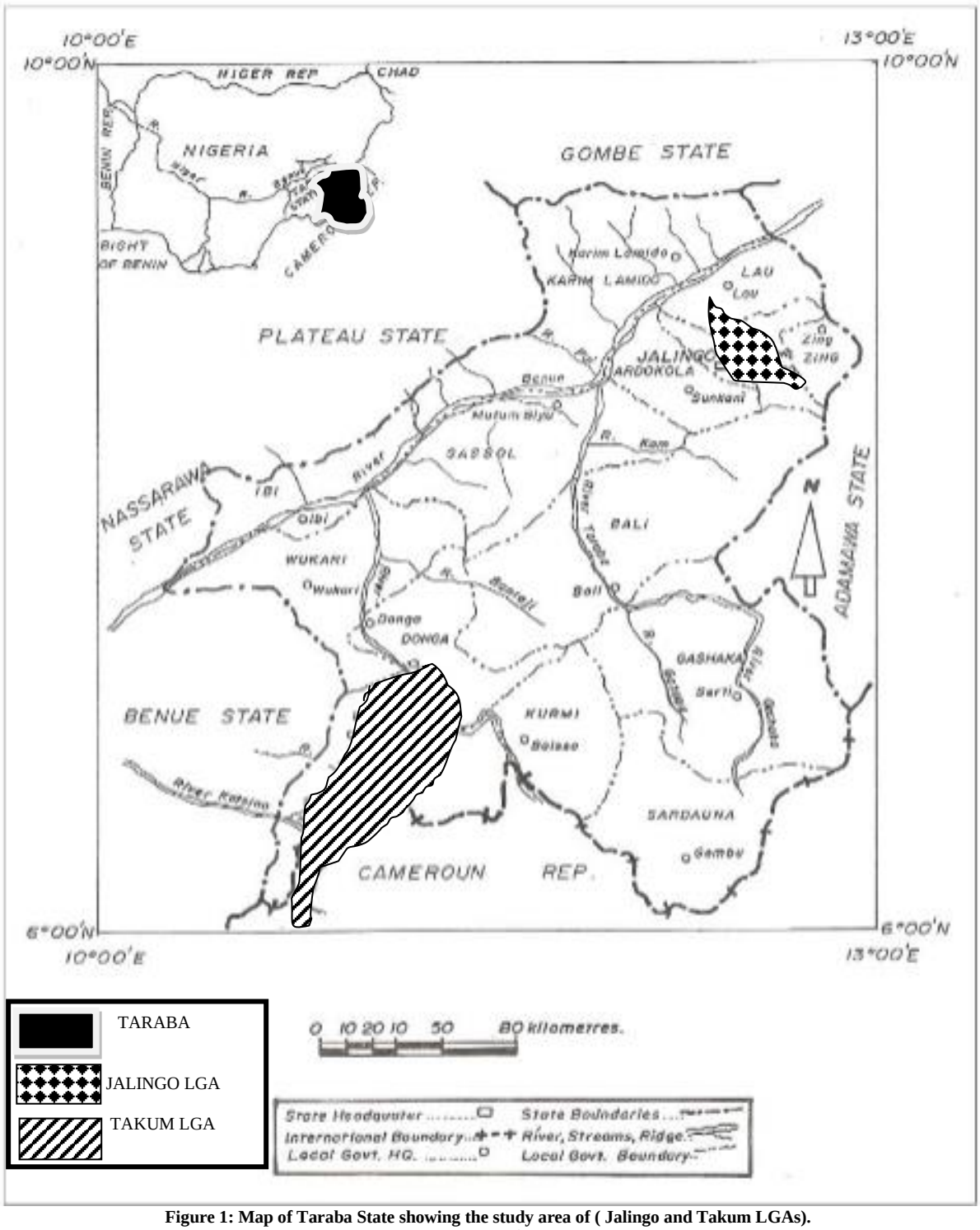

Figure 1: Map of Taraba State showing the study area of (Jalingo and Takum LGAs).
Source: Taraba State Ministry of Lands and Survey,2019.

Study Design

This is a cross sectional study carried out among pregnant women attending antenatal session at Jalingo and Takum hospitals and clinics in Taraba State, North-East, Nigeria. All pregnant women who consented were screened for the study.

Permission for the Study

Introductory letter for the study was obtained from Taraba State University, Department of Biological Sciences. Permission was sought from the Management of the Clinics and informed consent was also sought and obtained from the women.

Data Collection

Questionnaires were administered to the participants to obtain information on their age, educational status, occupational status, pregnancy status, marital status, blood group and some risk factors of Hepatitis B. After the questionnaire administration, sterile disposable syringes were used to collect blood (about 5ml) from the veno-punctured vein under aseptic conditions.

All the specimens were tested,serological kits for Hepatitis B and the use of anti sera for blood group.

Study Population

The study population comprised of all consenting pregnant women attending the 8 antenatal clinics on their first booking clinic day and also those that came for routine checkup that have not been screened were enrolled.

520 samples were obtained from Jalingo and Takum with 260 sample from each LGA

The method of Fisher (1935) was used to determine the sample size at 0.05 significant levels.

$$n = \frac{z^2pq}{d^2}$$

Where,

n = Desired sample size

Z = Standard Normal deviate set at 1.96

P = expected prevalence or proportion (0.05)

q = 1 – p (either the patient have or does not have the characteristics)

d = degree of accuracy set at 0.05.

Therefore,

$$= \frac{(1.96)^2 \times 0.5\,(1-0.5)}{(0.05)^2} = \frac{3.816 \times 0.5 \times 0.5)}{0.0025}$$

The minimum sample size was 384.16≈384

Specimen Collection

After counseling, 2 ml of blood was put in a plane container, then centrifuge for 5 minutess in order to have a serum. Hepatitis B surface antigen test trip was deeped into the serum (Plane container) carefully in order not to reach the red blood cell (plasma) If the strip shows 2 lines it means the patient is HBV positive, if it shows 1 line it means the patient is negative, if it does not show any line then the test is invalid.

1ml of blood in a syringe was dropped on a slide in 3 places (A, B and C). Then a drop of anti sera in a pippitte was drop on each of the blood in the slide, anti sera A was drop in A, anti sera B was drop in B and anti sera D was drop in C.Mix each of the specimen using a stirrer,t hen the contents was moved slide backward and forward and observed agglutination. If all the anti seras agglutinated to all the 3-blood specimen it means the person is AB blood group, if only B and C blood specimen agglutinated, it means the person is B blood group, if only A and C blood specimen agglutinated it means the person is A blood group, and if only the C blood specimen agglunated it means the person is O blood group.

Data Analysis

All data generated from the different study sides were summarized using frequency tables. Data from questionnaire were coded, ranked and analyzed using SPSS version 20.1 and Chi-square were also used as the statistical tool.

RESULTS

Age related prevalence of HBsAg Jalingo and Takum LGAs

The age group within the range of 26 - 30 year old were highly infected with HBV with the infection rate of 24(21.2%), followed closely by age 21 - 25 year old with the infection rate of 18(9.3%) then 31 - 35 year old with the infection rate of 14(19.2%), followed by 36 - 40 year old with infection rate of 09(13.2%) , then 16 - 20 year old with the infection rate of 4(8.2%) and the least was 41> year old with the lowest infection rate of 03(13.0%). Chi square analysis reveals that there is no significant difference between age and HBV. (χ^2=5.391, p>0.4935.)

Table 1: Showing age related prevalence of HBsAg Jalingo and Takum LGAs

Age	Jalingo		Takum		Total	
	No. Examined	No.Infected with HBsAg. (%)	No. Examined	No.Infected with HBsAg. (%)	No.Examined	No.Infected(%)
16-20	21	2(9.5)	28	2(7.1)	49	4(8.2)
21-25	101	9(8.9)	93	9(9.7)	194	18(9.3)
26-30	54	10(18.5)	59	14(23.7)	113	24(21.2)
31-35	37	6(16.2)	36	8(22.2)	73	14(19.2)
36-40	36	5(13.9)	32	4(12.5)	68	09(13.2)
41>	11	0(0.0)	12	3(25.0)	23	03(13.0)
Total	260	32(12.3)	260	40(15.4)	520	72(13.8)

(χ^2=5.391, p>0.493, df 5)
Key HBsAg = Hepatitis B Virus

Co- infection Jalingo

Co- infection of HBV in Jalingo: out of the 260 pregnant women examined, Co-infection is 31(15.6%). Chi square analysis reveals that there is significant difference between Co-infection of HBV in Jalingo. (χ^2=2.851, P >0.243, df1).

Co- infection Takum

Co - infection of HBV in Takum: out of the 260 pregnant women examined in Takum ,Co- infection is 40 (15.4%) . Chi square analysis reveals that there is significant difference between Co- infection of HBV in Takum . (χ^2=2.929, p>0.246, df1).

Table 2: Showing distribution of Hepatitis B and Co-infection according to Age in Jalingo

Age	No. Examined		HBsAg +ve(%)	Co-infection (%)
16-20	21		2(9.5)	2(15.4)
21-25	101		9(8.9)	9(11.4)
26-30	54		10(18.5	10(23.3)
31-35	37		6(16.2)	6(16.2)
36-40	36		5(13.9)	4(18.8)
41>	11		0(0.0)	0(0.0)
Total	260		32(12.3)	31(15.6)

(χ^2=2.851, P >0.243, df1).

Table 3: Showing distribution of Hepatitis B and Co-infection according to Age in Takum

Age	No.Examined		HBsAg +ve (%)	Co-infection (%)
16-20	28		2(7.1)	2(10.0)
21-25	93		9(9.7)	9(12.0)
26-30	59		14(23.7)	14(28.6)
31-35	36		8(22.2)	8(27.6)
36-40	32		4(12.5)	4(14.8)
41>	12		3(25)	3(42.9)
Total	260		40(15.4)	40(15.4)

(χ^2=2.929, p>0.246, df1).

Prevalence of HBsAg among pregnant women in relation to educational status in Jalingo and Takum LG

Pregnant women with non- formal education had the highest prevalence rate of 36(19.4%), followed by primary education with the prevalence of 18(16.2%) and secondary education had the prevalence rate of 13(9.6%), while Tertiary Education had the least infection 105(5.8%). Chi square analysis reveals that there is significant difference between prevalence of HBV and Educational status. (χ^2=7.876, p<0.392).

Table 4: Showing prevalence of HBsAg among pregnant women in relation to educational status in Jalingo and Takum LG

Educational status	Jalingo		Takum		Total	
	No. Examined	No. Infected with HBsAg (%)	No. Examined	No. Infected with HBsAg (%)	No.Examined	No.Infected(%)
Non-Formal Edu	80	14(17.5)	108	22(20.4)	188	36(19.4)
Primary Edu	63	10(15.9)	48	8(16.7)	111	18(16.2)
Secondary Edu	75	7(9.3)	60	6(13.5)	135	13(9.6)

Tertiary Edu	42	1(2.4)	44	4(9.1)	86	05(5.8)
Total	260	32(12.3)	260	40(15.4)	520	72(13.8)

(χ^2 =7.876, p<0.392, df 3)

Sero-Prevalence of HBsAg among pregnant women in relation to Occupational status in Jalingo and Takum

The prevalence rate of infection was higher among traders with the prevalence rate of 42(17.2%), followed by house wife with the prevalence rate of 12(14.1%), then farmer had the prevalence 10(14.1%),the least infection was recorded among civil servant with the prevalence of 08(6.5%). Chi square analysis reveals that there is significant difference between prevalence of HBV and Educational status. (χ^2=7.957, p<0.398).

Table 5: Showing Sero-Prevalence of HBsAg among pregnant women in relation to Occupational status in Jalingo and Takum

Occupational status	Jalingo		Takum		Total	
	No. Examined	No. Infected with HBsAg (%)	No. Examined	No. Infected with HBsAg (%)	No. Examined	No.Infected(%)
Civil servant	55	3(5.5)	68	5(7.4)	123	08(6.5)
Farmers	20	3(15)	50	7(14)	70	10(14.1)
Traders	133	19(14.3)	111	23(20,7)	244	42(17.2)
House Wives	52	7(13.5)	31	5(16.1)	83	12(14.1)
Total	260	32(12.3)	260	40(15.4)	520	72(13.8)

(χ^2=7.957, p<0.398, df 3.)

Prevalence of HBsAg in relation to pregnancy status in Jalingo and Takum

The trimester distribution of the infection indicates that women in their first trimester had the highest prevalence of 38(14.6%), followed by those in their second trimester with the prevalence of 19(14.3%) while the least infection had been recorded in women in their third trimester with the prevalence of 15(11.8%). Chi square analysis reveals that there is no significant difference between prevalence of HBV and pregnancy status. (χ^2=4.669, p<0.265).

Table 6: Showing Sero-prevalence of HBsAg in relation to pregnancy status in Jalingo and Takum

Pregnancy status	Jalingo		Takum		Total	
	No. Examined	No.Infected with HBsAg (%)	No. Examined	No.Infected with HBsAg(%)	No.Examined	No.Infected(%)
First Trimester	134	16(11.9)	126	22 (17.5)	260	38(14.6)
Second Trimester	67	8(11.9)	66	11(16.7)	133	19(14.3)
Third Trimester	59	8(13.6)	68	7(10.3)	127	15(11.8)
Total	260	32(12.3)	260	40(15.4)	520	72(13.8)

(χ^2=4.669, p>0.265, df2).

Sero-prevalence of HBsAg infection according to marital status in Jalingo and Takum

The prevalence of HBV according to marital status l, out of the 520 patients examined, 434 were married, of which 57(13.1%) had been infected and 86 were not married of which 15(17.4%) had been infected. Chi square analysis reveals that there is no significant difference between prevalence of HBV and Marital status. (χ^2=1.902 p>0.132)

Table 7: Showing Sero-prevalence of HBsAg infection according to marital status in Jalingo and Takum

Marital Status	Jalingo		Takum		Total	
	No. Examined	No.Infected with HBsAg (%)	No. Examined	No.Infected with HBsAg (%)	No. Examined	No.Infected(%)
Single	49	6(12.2)	37	9(24.3)	86	15(17.4)
Married	211	26(12.3)	223	31(35.4)	434	57(13.1)
Total	260	32(12.3)	260	40(15.4)	520	72(13.8)

(χ^2=1.902, p>0.132, d1).

Sero-prevalance of HBsAg in relation to blood group Jalingo and Takum

The highest infection was recorded in pregnant women with blood group O (14.3%), followed by those with blood group A (17.1%) then those with blood group B (10.2%) while the least infection was recorded in those with blood group AB (14.5%). Chi square analysis reveals that there is no significant difference between prevalence of HBV and Marital status (χ^2 =2.823,p>0.263).

Table 8: Showing Sero-prevalance of HBsAg in relation to blood group Jalingo and Takum

Blood Group	Jalingo		Takum		Total	
	No. Examined	No.Infected with HBsAg(%)	No. Examined	No.Infected with HBsAg (%)	No. Examined	No.Infected(%)
A	46	8(17.4)	53	9(16.9)	99	17(17.1)
B	60	6(10)	68	7(10.3)	128	13(10.2)
AB	29	2(6.9)	26	6(23.1)	55	08(14.5)
O	125	16(12.8)	113	18(15.9)	238	34(14.3)
Total	260	32(12.3%)	260	40(15.4)	520	72(13.8)

(χ^2=2.823, p>0.263 df 3.)

Relationship between Hepatitis B Virus and risk factors in Jalingo and Takum

Hepatitis B infection was recorded moderately low in the study area, sharing of razor blade (12.9) sharing weaving needle (12.7), sharing of towel (12.5), hospital admission (7.7) receives blood (6.5) unsterilized syringe (4.0), sharing tooth brush (3.3), tooth extraction (1.9), catherization (1.2), surgery (1.2), multiple sex partners (0.8)

Odd ratio shows significant relationship among unsterilized syringe (O. R= 3.163) , multiple sex partners (O.R= 2.989), sharing tooth brush (O.R=2.851), received blood (O.R= 1.179), sharing of towel (O.R= 1.079). However, no significant relationship was observed between Hepatitis B infection and risk factors such as sharing of razor blade (O.R =0.917), catherization (O.R= 0.914) , hospital admission (O.R =0.809), tooth extraction (O.R =0.747), sharing weaving needle (O.R= 0.731) and surgery (.O.R= 0.604)

Table 9: Showing Sero-prevalence of HBsAg in relation to risk factors in Jalingo and Takum

Risk factors	No. Examined	Response		No.Infection with HBsAg (%)	O. R	P-Value
Unsterilized syringe	520	YES	57(10.9)	21(4.0)	3.163	0.987
		NO	463(89.0)	51(9.8)		
Multiple sex partners	520	YES	11(2.1)	04(0.8)	2.989	0.986
		NO	509(97.9)	68(13.1)		
Sharing Razor blade	520	YES	421(80.9)	67(12.9)	0.917	0.759
		NO	99(19.0)	05(0.9)		
Share tooth brush	520	YES	49(9.4)	17(3.3)	2.851	0.965
		NO	471(90.6)	55(10.6)		
Share Towel	520	YES	382(73.5)	65(12.5)	1.079	0.823
		NO	138(26.5)	07(1.3)		
Sharing of weaving Needle	520	YES	503(96.7)	66(12.7)	0.731	0.665
		NO	17(3.3)	06(1.6)		
Receive Blood transfusion	520	YES	186(35.8)	34(6.5)	1.179	0.812
		NO	334(64.2)	38(7.3)		
Hospital Admission	520	YES	294(56.5)	40(7.7)	0.809	0.675
		NO	226(43.5)	32(6.2)		
Tooth Extraction	520	YES	80(15.4)	10(1.9)	0.747	0.605
		NO	440(84.6)	62(11.9)		
Surgery	520	YES	57(10.9)	06(1.2)	0.604	0.585
		NO	463(89.0)	66(12.7)		
Catherization	520	YES	40(7.7)	06(1.2)	0.914	0.754
		NO	480(92.3)	66(12.7)		

DISCUSSION

Hepatitis B virus infection are endemic and life threatening diseases in this part of the world (Helegbe *et al*, 2018 and Anabire *et al*, 2019). This study presents 11.9% and 15.3% for co- infection among pregnant women

attending antenatal clinics of HBV in Jalingo and Takum Local Government Areas respectively. The sero-prevalence rate of 12.3% and 15.4% was recorded for HBV infection among pregnant women in Jalingo and Takum respectively, Taraba State, North-Eastern Nigeria. This study agrees with the findings of Pennap *et al*. (2017) in Keffi, Nassarawa State, who recorded 13.2 % prevalence among pregnant women. This is also consistent with the 12.6% recorded by Jombo *et al*., (2015) among pregnant women in Maiduguri, North-eastern Nigeria, and a rural community in North-central Nigeria, respectively, and contrast with the findings of George and Ewelike (2018) reported 9.3% in Akwa, Anambra State and Sule *et al*. (2010) who reported 11.0% in Anyigba, Kogi State. This figure is higher than the 2.9% found in pregnant women in Port Harcourt, South – South, Nigeria by Obi *et al*. (2016); Autino *et al.* (2012) and 1.0% found by Mbaawuaga (2017) among the pregnant women in Makurdi, North - Central Nigeria. Lastly, these study shows much lower prevalence with the study of Elkanah and Amuta (2017) who recorded 44.9% among patient attending Hospital and Clinics in Gboko, Benue State, it is also lower than the 63.3% found by Imade *et al.* (2014), in Jos, North - Central, Nigeria amongst pregnant Nigerian women. The reduction in trend as observed in this study may be due to adequate measures taken in hepatitis b prevention and prompt diagnostic measures.

Co-infection of malaria and HBV was significant with educational and occupational status of the participants. Co - infection was higher among the traders as well as among the non-educated. Education creates awareness in protecting one against diseases, the level of sexual transmission is usually high and can expose one to these infections irrespective of the educational status. People in certain occupations are exposed to the risk of malaria and HBV than others. Health workers, laboratory workers and researchers who handle human blood or other potentially infectious material are at increased risk of acquiring hepatitis B virus through accidental exposure to piercing objects (W.H O., 2018). Unvaccinated individual who sustain an accidental blood or potentially infectious material exposure from an infected source are at risk of infection. These high risk group of people are found among the civil servants and educated class of the society. High frequency of HBV infection was found among those in age group 26−30 years followed by those in 21−25 and 31−35 years. These findings agree with the report by Okonkwo, (2010); Gambo *et al* (2012); Elkanah and Amuta (2017) indicating the high rate of hepatitis B infection among age groups 25 - 34 and 35 - 44 respectively. This is because they constitute the sexually active population among the study group and they are at high risk of engaging in several practices through which one can contact the infection.

Majority of the pregnant women tested for HBV had Formal education. This may be because this study was hospital-based. Those with non- formal education had the highest rate of infection. There is inverse association between educational status and HBsAg positivity with less educated women showing the highest positivity.

Occupational related infection of HBV showed high prevalence among traders but low infection among house wives, farmers and civil servants. This is in agreement with the findings of Elkanah *et al*. (2013), Elkanah and Amuta. (2017). These groups of people engage in many harmful practices such as multiple sex partners, sharing of needle, etc, which exposes them to the risk factors. .

Trimester status shows that women in their first trimester had the highest HBsAg sero-positivity, followed by those in the second and third trimester. This may be because those in their second and third trimester that were positive before could have received treatment and were negative at the time of the research.

Marital status shows that married women had the highest number of infection with HBV, this may be because the study is on pregnant women.

In relation to blood group, this study agrees with the work of Emeribe and Ejezie, (2004), who reported a higher prevalence of HBsAg in donors of group 0. The study showed no association between ABO blood groups and hepatitis B.

In respect to the location, HBV is higher in Takum Local Government Area. This may be due to various cultural and environmental factors that modify HBV transmission in diverse ethnic groups and also their educational status.

In relationship between HBsAg infection and the risk factors HBV infection was high among those sharing weaving needles, sharing of razor, those who have had Hospital admission and blood transfusion. Infection rate was low among caterization, surgery, tooth extraction, unsterilized syringe and sharing of tooth brush. This agrees with the findings of Schillie, (2018), who recorded high prevalence among sharing of cup, needles, towels, razor and also blood transfusion.

From the findings from the study, the major route of HBV transmission were through the use of unsterilized syringes, multiple sex partners, sharing of tooth brush, sharing of razor blades, sharing of towels and, blood transfusion tooth extraction, hospital admission and catherization. This is consistent with several Epidemiological studies of other researchers who consistently maintained that unsafe injection from unqualified medical personnel using HBV contaminated needles and syringes, sharing of syringes from drug users, transfusion of blood and blood socio- economic practices such as tribal marks, tattooing, circumcision are important routes or risk factors of HBV transmission (Chang, 2007; Pennap et al., 2010 Elkanah *et al.*,2013)

CONCLUSION

Hepatitis B surface antigen (HBsAg) test was carried out using WONDFO$^{(R)}$HBsAg test strips. Out of the 260 sampled examined in each of the local government, 11.9% and 15.3% co- infection of HBV in Jalingo and Takum, among pregnant women attending antenatal clinics. Most of the infected women were in the age among age groups 25-34 and 35–44years. This is because they constitute the sexually active population among the study group and they are at high risk of infection. Co- infection of Hepatitis B Virus infections seem very common among the Jalingo and Takum populace especially in areas where habits such as use of sharing of razor blades, unprotected sexual activity, unsterilized needle, ear-piercing, tooth extraction and blood transfusion are practiced. Despite the fact that the participants were healthy individuals, still HBV infections were recorded. This may be a health risk. Therefore, there is need for screening of all pregnant women and infants born to hepatitis B positive mothers.

Government and Non-governmental organizations should intensify efforts to enlighten the general population on the public health importance of the disease, and hepatitis screening should be incorporated into the routine antenatal screening it is good to screen individuals of these infections especially in the rural areas where there is still possibility of upholding some of these practices that encourage spread of these infections. The study also shows that co-infection had no profound effect on Blood group hence points to possibility of interaction between HBV that may lead to decrease severity of HBV infection thereby lowering morbidity and mortality.

Recommendations

From the findings of the study and the conclusion mentioned above, th
e study made the following recommendations:

1. Public enlightenment on the disadvantages and looming danger associated with HBV infection.
2. Hepatitis screening should be incorporated in to the routine antenatal screening on their first day of booking.
3. Provision of free treatment for all pregnant women that are tested positive for Malaria HBV.

4. Organize public health education classes/ campaigns on the risk factors of HBV among pregnant women in Jalingo / Takum metropolis.

Recommendation for further research

1. It is recommended that details of these infections be investigated so that appropriate control strategies be instituted.
2. The findings also recommend that the exercise of public enlightenment, administration of childhood immunization and screening of pregnant women should be adopted to interrupt transmission of the parasites in the communities.

Declaration by Authors

Acknowledgement: None
Source of Funding: None
Conflict of Interest: The authors declare no conflict of interest.

REFERENCE

1. Abiodun, O., Shobowale, O., Elikwu, C., Ogbaro, D., Omotosho, A., Mark, B. and Akinbola, A. (2017). Risk perception and knowledge of hepatitis B infection among cleaners in a tertiary hospital in Nigeria. *Global HealthJournal*.Vol 4.(7) :45
2. Akaninwor, J. O., Essien, E.B., Chikezie, P.C., Okpara, R.T. (2013). Hematologic and biochemical indeces of Plasmodium falciparum infected inhabitant.S*cientific Journal of Biomedical Sciences.* 2(8): 167-175.
3. Alikor,E.A. and Erhabor, O.N. (2017). Seroprevalence of Hepatitis B Surface Antigenaemia in Children in a Tertiary Health Institution in the Niger Delta of Nigeria. *Nigeria Journal Medicine.* 16: 250-251.
4. Anabire, N.G. Aryee, P.A., Abdul-Karim ,A., Quaye, O.and Awandare ,G.A. (2019). Impact of malaria and hepatitis B co-infection on clinical and cytokine profiles.*Infectious Diseases Journal*,14(4)67.
5. Anaedobe, C. G., Fowotade, A., Omoruyi, C. E.and Bakare, R. A. (2015). Prevalence, socio-demographic features and risk factors of Hepatitis B virus infection among pregnant women . *The Pan African Medical Journal*, 20(3)219.
6. Anjorin, A. A., Oyefolu, A. O. B., Laguda, L. M.and Akinyemi, K. O. (2018). Detection of Hepatitis B surface Antibodies (Anti-HBs), *Nigeria Journal Medicine 16:15-18.*
7. Bakarey, A., S., Jabaru, O.and Olayiwola, O. (2018). Seroprevalence of hepatitis B surface antigenemia and viral infectivity among liver cancer patients. J*ournal of Immunoassay and Immunochemistry*,5(3): 1-11.
8. Bauer, T., Sprinzl, M. and Protzer, U. (2011).Immune control of hepatitis B virus. *Journal of Microbiology*, *29*(4): 423-433.
9. Bhatia, S. N., Underhill, G. H., Zaret, K.S.and Fox, I. J. (2014).Cell and tissue engineering for liver disease, *Translational MedicineJournal*, 6(245)234.
10. Borgia, G., Carleo, M. A., Gaeta, G.B. and Gentile, I. (2012).Hepatitis B in pregnancy. *World Journal of Gastroenterology*, 18(34): 4677.
11. Bzowej, N. H. (2010). Hepatitis B Therapy in Pregnancy.*Journal of Microbiology*, 9(4):197–204.
12. CDC(2011). Immunization of health-care personnel. Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR
13. Centers for Disease Control and Prevention. Fourth Report on Human Exposure to Environmental Chemicals, Updated Tables, (March 2018). Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.
14. Chang, M.,H. (2017). HepatitiS B virus infection. Foetal.*Neonatal Medicine Journal*,12: 160- 167
15. Chen, K. R.and Carlson, J., A. (2008).Clinical approach to cutaneous vasculitis. *American Journal of Clinical Dermatology*, 9(2): 71-92.
16. Chen, H., L., Lee, C., N., Chang, C., H., Shyu, M., K., Chen, S., M.and Lai, M., W. (2015). *Efficacy of maternal tenofovir disoproxil fumarate in interrupting mother-to-infant transmission of hepatitis B virus*. *Hepatology Journal*, 62(2),: 375-386.
17. Cohen, J., Nussenzweig, V., Vekemans, J.and Leach, A. (2010). From the circumsporozoite protein to the RTS, S/AS candidate vaccine. *Human Vaccines*, 6(1): 90-96.

18. Cunha, B., A.and Halperin, J., J. (2008).Clinical approach in encephalitis. N***eurological Disease and TherapyJournal.*** 9(4):1.
19. Dawaki. S.,S, and Kawo, A .(2006). Seroprevalence of Hepatitis B surface antigen (HBsAg) in pregnant women attending an urban maternity hospital in Kano, Nigeria. *Nigeria Journal. Microbiology*. 20: 705-709.
20. De Clercq, E., Ferir, G., Kaptein, S,and Neyts, J. (2010). Antiviral treatment of chronic hepatitis B virus (HBV) infections.Viruses *Microbiology Journal* 2:1279 -1305.
21. de Martel, C., Maucort-Boulch, D., Plummer, M.and Franceschi, S. (2015). World-wide relative contribution of hepatitis B and C viruses in hepatocellular carcinoma, *HepatologyJournal*, 62(4): 1190-1200.
22. Demetris, A.,T., Eghtesad, B., Marcos, A., Ruppert ,K., Nalesnik, M.,A.and Randhawa, P. (2004). Recurrent hepatitis C in liver allografts: prospective assessment of diagnostic accuracy, identification of pitfalls and observations about pathogenesis,*American Journal of Surgical Pathology*.28:658–699.
23. Desalegn, Z., Wassie, L., Beyene, H., B., Mihret, A.and Ebstie, Y. A. (2016). Hepatitis B and human immunodeficiency virus co-infection among pregnant women in resource-limited high endemic setting, Addis Ababa, Ethiopia: implications for prevention and control measures. *European Journal of Medical Research*, 21(1): 16.
24. European Association For The Study Of The Liver. (2012). EASL clinical practice guidelines: management of chronic hepatitis B virus infection. *Journal of Hepatology*, *57*(1) : 167-185.
25. Ejike,B.U.,Ohaeri,C.C., Amaechi,E.C.,Ejike,E.N.and Okike-Osisiogu. (2017) Prevalence of malaria amongst pregnant women.*Nigeria Journal of Parasitology*38 (1)
26. Elikwu, C. J., Shonekan, O., Shobowale, E., Nwadike, V., Tayo, B., Okangba, C.and Adebiyi, O. (2016). Seroprevalence of hepatitis B surface antigenaemia among healthcare worker in a private Nigerian tertiary health institution. *International Journal of Infection Control*, 12(2) :47.
27. Elkanah,S.O., Okoye, A. L and Debby – Sambo (2013).Prevalence of Hepatitis-B surface Antigen (HBsAg) among Blood donors in Jalingo, Taraba State,Ngeria .*Nigerian Journal of Parasitology* 34(2) :119-122.
28. Elkanah,S.O. and Amuta, U. E.(2017) .Risk factors and seroprevalence of Hepatitis B surface Antigen among patient attending hospital and Clinics in Gboko Metropolis, Benue State, *Abstract of Parasitology and Public Health Society of Nigeria,Lafia*.
29. Emeribe, A.O.and Ejezie, G.C.(1992) ABO blood groups distribution in relation to hepatitis B surface antigen and the presence of lipoidophil anti-bodies. *East AfricaMedicine Journal*,69:146-8.
30. Erdman, L. K.and Kain, K. C. (2018). Molecular diagnostic and surveillance tools for global malaria control. *Travel Medicine and Infectious Disease*, 6(1-2): 82-99.
31. Ewald, D. R., & Sumner, S. C. (2016). Blood type biochemistry and human disease. *Wiley Interdisciplinary Reviews: Systems Biology and Medicine*, 8(6): 517-535.
32. Fattovich, G., Bortolotti, F.and Donato, F. (2008). Natural history of chronic hepatitis B: special emphasis on disease progression and prognostic factors. *Journal of Hepatology*, 48(2): 335-352.
33. Feng, K., Yan, J., Xia, F., Ma, K., Wang, S.and Dong, J. (2017). A randomized controlled trial of radiofrequency ablation and surgical resection in the treatment of small hepatocellular carcinoma. *Journal of Hepatology*, 57(4): 794-802.
34. Fischer, S. A., and Avery, R. K.(2009). Screening of donor and recipient prior to solid organ transplantation. *American Journal of Transplantation*, 9:7-8.
35. Fisher, R. A. (1935). The logic of inductive inference. *Journal of the Royal Statistical Society*, *98*(1) : 39-82.
36. Gambo, I.M., Rabiu, A.M., Muhammad, M.B.and Shugaba, I.(2012). Seroprevalence of HBsAg among Fulani nomads in Toro, North-Eastern Nigeria. *Global Advanved Research Journal of medicine and Medical Science*,1:214-7.
37. Gerlich W.H. (2013) Medical virology of hepatitis B: How it began and where we are now. *Virol Journal*,10:239.
38. Ghany, M. G., Strader, D. B., Thomas, D. L.and Seeff, L. B. (2009). Diagnosis,

management, and treatment of hepatitis C. *Journal of Hepatology*, 49(4): 1335-1374.
39. Greenwood, D., Slack, R. C., Barer, M. R.and Irving, W. L. (2012). Medical Microbiology E-Book: A Guide to Microbial Infections*: Pathogenesis, Immunity, Laboratory Diagnosis and Control.*. Elsevier Health Sciences.
40. Harris, J. B., Gacic-Dobo, M., Eggers, R., Brown, D. W. and Sodha, S. V. (2014).Global routine vaccination coverage. *Morbidity and Mortality Weekly Report*, 63(46):1055-1058.
41. Hay, J.E.(2008). Liver disease in pregnancy. *Journal of Hepatology*,47:1067–1076.
42. Helegbe, G.K., Aryee, P.A., Mohammed, B.S., Wemakor, A., Kolbila, D., Abubakari ,A.W., Askanda, S., Alhassan, R., Barnie, C., Donkoh, A.A. and Ofosu, E.(2018). Seroprevalence of Malaria and Hepatitis B Coinfection among Pregnant Women in Tamale Metropolis of Ghana: A Cross-Sectional Study. *Canadian Journal of Infectious Diseases and Medical Microbiology*, 15(1)8-9.
43. Hodges, G.R. and Ruppy, B.A. (2011). Hepatitis B: Perception, Knowledge and vaccine acceptance among high risk health care workers. *Microbiology journal*,11: 207–211.
44. Hollinger, F. B. (2008). Hepatitis B virus infection and transfusion medicine: science and the occult. *Transfusion*, 48(5): 1001-1026.
45. Iloh, G. U. P.and Ikwudinma, A. O. (2013).Sero-epidemiology of Hepatitis B surface antigenaemia among adult Nigerians with clinical features of liver diseases attending a primary-care clinic in a resource-constrained setting of eastern Nigeria. *North American Journal of Medical Sciences*, 5(4): 293
46. Imade G.E., Sagay,A.S., Ugwu,B.T. andThacher ,T.D.(2014). Seroprevalence of Hepatitis B and HIV infection in pregnant women in Niegria. *Journal of Medicine in the Tropics*,6(2):15-21.
47. Jill S.S. (2019) Everything you need about hepatitis B.*Medical new today Journal*,3(2)8-12.
48. Jonas, M.M.(2009) . Hepatitis B and pregnancy: an underestimated issue. *Journal of Infectious Diseases* ,29 (1):133–139.
49. Kew, M. C. (2010). Epidemiology of chronic hepatitis B virus infection, hepatocellular carcinoma, and hepatitis B virus-induced hepatocellular carcinoma. *Pathologie Biologie*, 58(4): 273-277.
50. Kochar ,D.K., Singh, P., Agarwal, P., Kochar. S.K., Pokharna, R . and Sareen, P.K. (2003).Malarial Hepatitis. *Journal Association of Physicians India*. 51:1069–72.
51. Kolasa, M. S., Tsai, Y., Xu, J., Fenlon, N.and Schillie, S. (2017). Hepatitis B surface antigen testing among pregnant women, United States . *The Pediatric Infectious Disease Journal*, 36(7):175-180.
52. Kumar ,M., Singh, T.and Sinha, S.(2012).Chronic hepatitis B virus infection and pregnancy. *Journal Clinical Experimental Hepatology*,3(4):366-381.
53. Kwak, M.S and Kim, Y.J. (2014). Occult hepatitis B virus infection. *World Journal Hepatol*ogy ,6(12):860–869.
54. Lampertico, P.and Maini, M. G. (2015).Optimal management of hepatitis B virus infection–EASL Special Conference. *Journal of Hepatology*, 63(5): 1238-1253.
55. Levrero, M., Pollicino, T., Petersen, J., Belloni, L., Raimondo, G. and Dandri, M. (2009).Control of DNA function in hepatitis B virus infection. *Journal of Hepatology*, 51(3): 581-592.
56. Liang, T. J. (2009). Hepatitis B: the virus and disease. *Hepatology*, 49(5)221.
57. Liu, L., Johnson, H. L., Cousens, S., Perin, J., Scott, S., Lawn, J. E.and Mathers, C. (2012). Global, regional, and national causes of child mortality. *The Lancet*, 379(9832): 2151-2161.
58. Lokoba, A.B., Adewumi ,C.T. and Olumide, I.T. (2010). Hepatitis B virus infection among pregnant women in Northern Nigeria. A call for action. *Nigerian Clinical Practitioners* 14: 1–5.
59. Loomba, R., Rowley, A., Wesley, R., Liang, T. J., Hoofnagle, J. H., Pucino, F.and Csako, G. (2008). Systematic review: the effect of preventive lamivudine on hepatitis B reactivation during chemotherapy. *Annals of Internal Medicine*, 148(7): 519-528.
60. Lucy, B., Carol, T. B., Childs, L., Mihigo, R., and Rania, T. (2017). The status of hepatitis B control in the African region. *The Pan African Medical Journal*, *27*(3).

61. Mbaawuga EM, Ajadiku AC, Balisadi and Kashiba FD (2008). Hepatitis B virus (HBV) among pregnant women in Makurdi, Nigeria. Afr Biochem Res11: 155-159
62. Mbaawuaga, E. M. (2017). *Studies on the Prevalence and Co-Infection of Hepatitis B Virus (Hbv) and Human Immunodeficiency Virus (Hiv) In Benue State, Nigeria* (Doctoral dissertation).
63. McClure, E. M. and Goldenberg, R. L. (2009).Infection and stillbirth.*Fetal and Neonatal Medicine* , 14(4) 182-189 .
64. McLauchlan, J., Lemberg, M.K., Hope, G., and Martoglio, B. (2002). Intramembrane proteolysis promotes trafficking of hepatitis C virus core protein to lipid droplets. M*icrobiology Journal* 21: 3980-3988.
65. Muhammed, G. and Sharif,A.A.(2015). Prevalence of malaria and Hepatitis Bvirus infecton in febrile patients in kano.*International Journal of Current Research* ,7(9)61-65.
66. Murthy, G.L., Sahay, R.K., Sreenivas, D.V., Sundaram, C. and Shantaram, V. (2008) .Hepatitis in falciparum malaria. *Tropical Gastroenterol Journal*,19:1524.
67. Musa, B. M., Bussell, S., Borodo, M. M., Samaila, A. A.,and Femi, O. L. (2015). Prevalence of hepatitis B virus infection in Nigeria, 2000-2013: a systematic review and meta-analysis. *Nigerian Journal of Clinical Practice*, 18(2): 163-172.
68. Ndams, I. S., Joshua, I. A., Luka, S. A. and Sadiq, H. O. (2008). Epidemiology of hepatitis B infection among pregnant women in Minna, Nigeria. *Science World Journal*, 3(3)172.
69. Noubiap, J. J. N., Nansseu, J. R. N., Ndoula, S. T., Bigna, J. J. R., Jingi, A. M. and Fokom-Domgue, J. (2015). Prevalence, infectivity and correlates of hepatitis B virus infection among pregnant women in a rural district of the Far North Region of Cameroon. *BMC Public Health*, 15(1), 454.
70. Obi, R.K., Umeh, S.C.and Okurede, O.H. (2016). Prevalence of hepatitis B virus infection among Pregnant women in an antenatal clinic in Port Harcourt, *Nigeria. African Journal of Clinical and Experimental Microbiology* 7(2): 78-8
71. Odusanya, O .O., Alufohai, F .E., Meurice, F .P., Wellens ,R., Weil, J.and Ahonkhai, V.I. (2005) Prevalence of hepatitis B surface antigen in vaccinated children and controls in rural Nigeria. *International Journal of Infectious Diseases*,9:139-43.
72. Okonkwo, A.B., A. Soleye, J.A. Alli, M.O. Ojezele,A.O. Udeze, J.C. and Nwanze, O. Adewale (2010). Seroprevalence of HbsAg Antigenaemia among Patients in Abeokuta, South Western Nigeria. *European Journal of Scientific Re search*,1 (2). 40- 46.
73. Oladele, O. O., Saheed, S., Familua, F., Adekunle, O. O., Olusola, O., Samuel, B. O.and Adeyemi, O. J. (2014). Seroprevalence of Hepatitis B Surface Antigen and Antibody among Pregnant Women Attending a Tertiary Health Institution in Southwestern Nigeria. *Religion, 42*, 30.
74. Pawlotsky, J. M., Aghemo, A., Back, D., Dusheiko, G., Forns, X., Puoti, M.and Sarrazin, C. (2015).EASL recommendations on treatment of hepatitis C . *Journal of Hepatol*, 63(1): 199-236.
75. Pennap, R.G., Oti, B.V., Alaribe, A.G., Ajegena, S.A. and Galleh, P.R.(2017) Seroprevalence of hepatitis B and C viruses among human immunodeficiency virus infected patients . *Journal of Hepatol*, 52(1):78
76. Piratvisuth ,T., Han, G.R and Pol, S. (2016) Comprehensive review of telbivudine in pregnant women with chronic hepatitis B. *World Journal of Hepatol*, 8: 452–60.
77. Purcell, R. H. and Emerson, S. U. (2008). Hepatitis E: an emerging awareness of an old disease. *Journal of Hepatology*, 48(3): 494-503.
78. Raffetti, E., Fattovich, G, and Donato, F. (2016). Incidence of hepatocellular carcinoma in untreated subjects with chronic hepatitis B: a systematic review and meta-analysis. *Liver International*, 36(9): 1239-1251.
79. Raimondo, and Pollicino, T. (2016). Occult HBV infection. In *Hepatitis B Virus in Human Diseases.Medical journal*, 5 (277-301).
80. Rehermann, B. (2013). Pathogenesis of chronic viral hepatitis: differential roles of T cells and NK cells. *Nature Medicine* Journal, 19(7): 859.
81. Sarin, S. K., Kumar, M., Lau, G. K., Abbas, Z., Chan, H. L. Y., Chen, C. J.and Dokmeci, A. K. (2016). Asian-Pacific clinical practice guidelines on the management of hepatitis B:

a 2015 update. *Hepatology International*, 10(1) : 1-98.
82. Schillie, S., Vellozzi, C., Reingold, A., Harris, A., Haber, P., Ward, J. W. and Nelson, N. P. (2018). Prevention of hepatitis B virus infection in the United States: Recommendations of the Advisory Committee on Immunization Practices. *MMWR Recommendations and Reports*, 67(1): 1.
83. Silasi, M., Cardenas, I., Kwon, J. Y., Racicot, K., Aldo, P. andMor, G. (2015). Viral infections during pregnancy. *American Journal of Reproductive Immunology*, 73(3): 199-213.
84. Singh, G.and Sehgal, R. (2018). Transfusion-transmitted parasitic infections. *Asian Journal of Transfusion Science*., 4: 73-77.
85. Song, J. E. and Kim, D. Y. (2016).Diagnosis of hepatitis B. *Annals of Translational Medicine*, *4*(18), 338.
86. Spearman, C. W., de Lacy, R., and Goddard, E. (2017).Viral Hepatitis.in sub-saharan Africa, *Lancent Gastroenteral Hepatal Journal*,(2)900-909.
87. Sule, W.F, Okonko, I.O, Ebute, A.J, Donbraye, E, Fadeyi, A, Udeze, A.O, and Alli, J.A (2010). Farming and non farming individuals attending grimard catholic Hospital Anyingba Kogi State Nigeria, were Comparable in Hepatitis B surface antigen Seroprevalence. *Current Research Journal of Biological Sciences*,2(4): 278-282.
88. Tafuri, S., Gallone, M. S., Cappelli, M. G., Martinelli, D., Prato, R. and Germinario, C. (2014). Addressing the anti-vaccination movement and the role of HCWs. *Medical Journal* ,*32*(38): 4860-4865.
89. TerraultN. A. and Jacobson, I.M. (2007), Treating Chronic Hepatitis B Infection in Patients Who Are Pregnant or Are Undergoing Immunosuppressive Chemotherapy. *Medical Journal*,5(6)67.
90. Torre, L. A., Bray, F., Siegel, R. L., Ferlay, J., Lortet-Tieulent, J.,and Jemal, A. (2015). Global cancer statistics.J*ournal for Clinicians*, 65(2): 87-108.
91. Valsamakis, A. (2007).Molecular testing in the diagnosis and management of chronic hepatitis B. *Clinical Microbiology* ,20:426-39,
92. Wang, J.S., Chen, H and Zhu, Q.R. (2015) Transformation of hepatitis B serologic markers in babies born to hepatitis B surface antigen positive mothers. *World Journal Gastroenterol*.11:3582–3585.
93. Weatherall, D. J. (2010). The inherited diseases of hemoglobin are an emerging global health burden. . *World Journal Gastroenterol*.2(1) 7.
94. Willis, B.C., Wortley, P., Wang, S.A., Jacques-Carroll, L. and Fan- Zhang, F. (2010)Gaps in Hospital Policies and Practices to Prevent Perinatal Transmission of Hepatitis B Virus. *Pediatrics Journal*,125(4):704-711.
95. World Health Organization. (2015). *Guidelines for the Prevention Care and Treatment of Persons with Chronic Hepatitis B Infection: Mar-15*. World Health Organization.
96. World Health Organization. (2016). *Combating hepatitis B and C to reach elimination by 2030:*
97. WHO, 2018.*Intermittent preventive treatment in pregnancy (IPTp)*
98. Yi, P., Chen, R., Huang, Y., Zhou, R. R.,and Fan, X. G. (2016). Management of mother-to-child transmission of hepatitis B virus: propositions and challenges. *Journal of Clinical Virology*, 77, 32-39.
99. Zhang,.S.L, Yue ,Y.F., Bai, G.Q., Shi. L,and Jiang ,H. (2004)Mechanism of intrauterine infection of hepatitis B virus. *World Journal of Gastroenterol*.;10:437–438

How to cite this article: Obadiah SY, Usman DD, Akwa VY., Adamu R.C., Lipana D.B. Assessment of the prevalence of hepatitis b virus co-infection and its risk factors among pregnant women attending antenatal clinics in Jaling and Takum Local Government, Taraba State, Nigeria. *International Journal of Research and Review*. 2023; 10(11): 537-554. DOI: *https://doi.org/10.52403/ijrr.20231162*

******