



Serological Markers of Hepatitis B Virus Infection among Truckers Transiting Gusau Town, Zamfara State, Northwestern Nigeria

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ABSTRACT: Hepatitis B virus (HBV) infection is one that attacks the liver and could result in both acute and chronic diseases. Hepatitis B serologic testing amongst the truckers will help identify asymptomatic HBV carriers towards assisting WHO global hepatitis strategy aimed at reducing new infections. The truckers as a result of long delivery routes often sleep away from home making them more prone to unhealthy reckless living. The objective of this work therefore was to evaluate serological markers of HBV infection among truckers transiting Gusau town, northwestern Nigeria using standard methods. Of the 264 truckers screened for different serologic markers of HBV infection, 55 (20.8%) of them were positive for HBsAg, 173 (65.5%) were susceptible to infection, 12 (4.5%) had previously healed HBV infection, and only 6 (2.3%) had received vaccination and thus immunized to the infection. Out of the 55 HBV positive cases, 30 (54.5%) were HBeAg-negative and anti-HBe-positive and are therefore inactive carriers with low infectivity. However, 10 (18.2%) were positive for HBeAg but anti-HBe negative indicating presence of active HBV replication and high infectivity. In fifteen (27.3%) of the HBV cases, HBeAg and anti-HBe were both absent and could be as a result of HBV mutants that are unable to secrete the pre-core protein (HBeAg). The large number of infectious (18.2%) and susceptible cases (65.5%) amongst the truckers calls for concerted efforts in upscaling public health campaigns and routine vaccination schedule aimed at elimination of the disease as a public health burden.

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Hepatitis B virus infection is a life-threatening liver disease that remains a significant public health concern of global dimension (WHO, 2022). Hepatitis B virus (HBV) impairs the liver functions of acutely and chronically infected individuals, with cirrhosis and hepatocellular carcinoma being the primary disease outcome from the long-term chronic infection (El-Serag, 2012). Globally, the GBD 2019 Hepatitis B Collaborators reported 4.1% prevalent rate for chronic HBV infection for all ages, implying 316 million people that are infected (GBD, 2022). The burden and

epidemiology of hepatitis B virus (HBV) infection varies with geographical region, with population prevalence, age at infection and route of infection acquisition, and the probability of advancement to chronic infection being mutually interdependent (MacLachlan and Cowie, 2015). HBV are transmissible vertically from an infected to her newborn during the childbirth, in the uterus or via childcare. The horizontal transmission is by infected blood or other body fluids, sexual intercourse or by unsafe injections (Drazilova *et al.*, 2020), but chronic

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infections acquired perinatally are responsible for large share of the case fatality and morbidity of the disease globally (Shepard *et al.*, 2006). Kissing, hugging, breastfeeding, coughing, ingesting food or water, sharing eating utensils or drinking glasses, or casual touching are not routes of contracting HBV infection (CDC, 1999). The epidemiology and prevalence of hepatitis B virus infection is describable with regards to the presence of serum HBsAg (the surface antigen in the serum) in a population with endemicity usually categorized as high (>8%), intermediate (2% -7%) or low (<2%) (CDC, 2008). About 45% of the world populations are domiciled in HBV highly endemic areas where prevalence of chronic HBV infection exceeds 8% among adults and that of resolved or chronic infection (that is anti-HBc positivity) being greater than 60% (Goldstein *et al.*, 2005). The areas of high endemicity include south East Asia, Sub Saharan Africa, the Pacific Islands and the Amazon basin (Sadoh and Sadoh, 2014). Nigeria is considered a highly endemic area for hepatitis B infection as she contributes significantly to the global burden of the infection with prevalence of 11% (FMHN, 2016). Delivery of safe blood, aseptic techniques, aseptic injection practices, and infection control have aided measures aimed at hepatitis eradication with an overall improvement in the health care system (Candotti *et al.*, 2017; Soi and Soman, 2019; AlJohani *et al.*, 2021). The introduction of hepatitis B vaccines birth dose to prevent mother-to-child transmission is a dramatic turnaround in the battle to phase out the disease, but these scientific giant leaps are not on par with the political will at various levels of government most especially in Africa regions.

In Nigeria, due to poor rail transportation system, haulage of goods and fuel are undertaken by the trucking industry. The haulage industry drivers and their assistants being a highly mobile population contribute immensely to infection disease spread due to their high risk sexual behavior such as multiple sex partner and non-use of condoms. Lethargy and mental fatigue which they easily develop from tiring working environment coupled with being-away-from-home stirs their bodily urge for sex (Essuon *et al.*, 2009). Since they are sexually active during their long driving hours, sexual impulses will be gratified with commercial sex workers or partners at any available transit park along travel routes.

The truckers and their assistants across the globe have been identified as a high-risk group for disease transmission and are good candidates to targets for prevention and education-based interventions (Malinga *et al.*, 2021). There are few reports on the

role played by the truck drivers in the epidemiology of the HBV infection in Nigeria. Therefore, the objective of this work was to evaluate serological markers of hepatitis B virus infection among truckers transiting Gusau town, northwestern Nigeria.

MATERIALS AND METHODS

Study Design: A cross-sectional study was conducted with a sample comprising of truckers in the metropolitan region of Gusau, the capital of Zamfara State, northwest region of Nigeria.

Participants and Samples: The study enrolled 264 truckers aged 20 years and above with major transit parks in Gusau metropolis. These transit parks are facilities with direct access from major transport routes used by the truck drivers during stopovers to rest and unwind.

Sample Size Determination: The following formula by Daniel (1999) was used to calculate the adequate sample size in epidemiological study.

$$n = \frac{Z^2 P(1 - P)}{d^2}$$

The sample size was calculated for the single population proportion, and a statistical power of 95% (d=5%) with a significance level of 95% ($\alpha=0.05$) and a prevalence rate of HBV of 9.5% in Nigeria, according to Ajuwon *et al.* (2021). Therefore, the minimum sample size needed to estimate the prevalence rate in the study population was 132 participants, which was multiplied by 2 to increase robustness of inference, totaling 264 study participants.

Ethical Clearance: Ethical approval for the study was obtained from the Health Research Ethics Committee, Ministry of Health, Zamfara State, Nigeria. The Health Research Committee assigned number is: ZSHREC19122022/109.

Data Collection: Every participant filled a risk factor questionnaire which included family history of HBV infection; history of sexually transmitted infections (STIs); tattooing and facial marks; haircut, manicure or pedicure in non-personal equipment; multiple sexual partners without condom; and intravenous drug injection. The questionnaire also contained socio-demographic characteristics such as role, age, educational and marital statuses. Following the questionnaire administration, 5 ml of blood samples were taken from each participant by trained laboratory technicians and was used for the analysis thereafter.

Analytical Procedures: The serum samples were tested for hepatitis B surface antigen (HBsAg), Hepatitis B Surface Antibody (Anti-HBs), Hepatitis B envelope Antigen (HBeAg), Hepatitis B envelope Antibody (HBeAb), and Hepatitis B Core Antibody (Anti-HBc). The OneStep HBV Combo RapiCard™ InstaTest (Woodland Hills, California, USA) was used for the detection of these HBV serological markers (99.9 % sensitivity and 99.4% specificity) in the serum according to the manufacturer’s protocols.

Data Analyses: Data were collected, summarized and presented in summary tables. The summary tables indicated the frequency, amount, or percentage of items in a set of categories. Excel 2010 Microsoft Office was used for the data analysis.

RESULTS AND DISCUSSION

This study included 264 consenting male truckers and assistants (T&A) with stopovers in Gusau metropolis. The mean age of the participating subjects was 38.7 ± 12.5 years with a range from 20 to 70 years, 54.2 % were drivers while 45.8 % truck assistants. Fifty-five (20.8%) of the participants tested positive for HBsAg. Most of the participants, 173/264 (65.5 %) are susceptible to HBV infection while 12 (4.5 %) had previous resolved HBV infection and only 6 (2.3) were priorly vaccinated. Eighteen (6.8 %) participants had only the core antibody (Anti-HBc) being positive (See Table 1). Anti-HBs positivity was identified in 6.8 % and anti-HBc positivity in 32.2 % of participants (Result not shown).

Table 1: The HBV serology of the truckers and their assistants

Marker	Result	Freq. (%)	Interpretation
HBsAg	Negative	173 (65.5)	Susceptible
Anti-HBc	Negative		
Anti-HBs	Negative		
HBsAg	Negative	12 (4.5)	Resolved HBV infection
Anti-HBc	Positive		
Anti-HBs	Positive		
HBsAg	Negative	6 (2.3)	Vaccinated
Anti-HBc	Negative		
Anti-HBs	Positive		
HBsAg	Negative	18 (6.8)	*See footnote
Anti-HBc	Positive		
Anti-HBs	Negative		
HBsAg	Positive	55 (20.8)	HBV infection (usually chronic)
Anti-HBc	Positive		
Anti-HBs	Negative		

*Only core antibody is positive and has more than one possible interpretation; 1. A resolved infection with depleted anti-HBs, 2. A false positive, 3. Occult infection, 4. A passively transferred anti-HBc to infant from an HBsAg-positive gestational parent.

The majority, 30 (54.5 %) of the HBV positive cases are inactive chronic carrier (HBeAg negative and HBeAb positive status). Eighteen point two percent (18.2%), that is 10 out of 55 HBV cases are considered highly infectious with active HBV replication. There are Fifteen (27.3%) HBeAg- and HBeAg-negative subjects in the 55 HBV cases. (Table 2).

Table 2: Profile of Hepatitis B e Antigen (HBeAg) and Hepatitis B e Antibody (HBeAb) of the fifty five (55) HBV cases

Marker	Result	Freq. (%)	Interpretation
HBeAg	Negative	30 (54.5)	Inactive carrier state
Anti-HBe	Positive		
HBeAg	Positive	10 (18.2)	Increased patient infectivity
Anti-HBe	Negative		
HBeAg	Negative	15 (27.3)	This could be as a result of selection of HBV mutants that are unable to secrete the pre-core protein (HBeAg)
Anti-HBe	Negative		

Globally, there is a decline in all-age prevalence of chronic HBV infection especially in children below 5 years of age as a result of introduction of hepatitis B vaccination (GBD, 2022). But in WHO African region, there is poor vaccine coverage estimated at 18 % that are occasioned by poor access to health care and poverty as the prevalence remains as high as 8.1 % with the disease constituting a major health burden leading to premature death (WHO, 2023b). It is highly worrisome that an estimated 80% of infected people do not know their status (WHO, 2023a), and are at risk of transmitting the infection to susceptible people in the communities. This study investigated the prevalence of HBsAg, anti-HBs, total anti-HBc, HBeAg and anti-HBe serological markers in Nigeria truckers during a time span of three months. This subgroup of the population are highly a mobile one and can serve as core group and effective drivers in infectious disease transmission. This study detected 20.8 % prevalence of HBV (positive HBsAg and anti-HBc) in the truckers and their assistants which is higher than 9.5 % found in the Nigeria general population (Ajuwon *et al.*, 2021). Other studies on HBV prevalence had shown much higher prevalence in specific groups than in the general populations. Dan-Nwafor *et al* (2021) found 13.7 % HBV seroprevalence in Kuje prison inmates in Abuja, Nigeria. In 2020, a systematic review and meta-analysis of hepatitis B data in Ghana by Abesig *et al.* discovered prevalences of 14.2 % (barbers) and 14.5 % (drivers) in these special occupational populations and 8.2 % prevalence in the general population. A study in Brazil indicated the prevalence of 18.9 % in their long distance truck drivers (Matos *et al.*, 2008), 11.9 % prevalence amongst their incarcerated

population from southern part of the country (de Gois *et al.*, 2022), 10.1 % prevalence was associated with recyclable waste collectors (Weis-Torres *et al.*, 2020) and 0.8% prevalence (HBsAg in combination with total anti-HBc) in people living in poverty (Guimarães *et al.*, 2019).

Some of the underlying factors responsible for high vulnerability to infectious disease in special population subgroups include multiple lifetime sexual partners, low educational status, substance use, unprotected sex, in addition to risky behavior (Birku *et al.*, 2015; Villar *et al.*, 2015; Weis-Torres *et al.*, 2020). Our study revealed only 2.3% of the participants as being vaccinated against HBV (negative anti-HBc and positive anti-HBs) and are therefore immuned to the infection. This result is indicative of very poor vaccine coverage in the study population which is a far cry from the reported rate of 71.1 % among health workers in Nigeria (Issa *et al.*, 2023), 30.5% (for ≥ 3 doses) in public safety workers in Kaduna State of northwestern Nigeria (Ochu and Beynon, 2017), an estimated 24.7 % among health-care workers in Africa (Auta *et al.*, 2018) and 31.9 % in a Turkish general population (Tozun *et al.*, 2015). These disturbingly poor rates of vaccine coverage among this important core group in Nigeria calls for concern in a country already scourged by the silent epidemic. This lack of protection against the HBV infection in the core group can lead to high infectivity and heightened role in the transmission of the infectious disease. Despite the availability of several hepatitis B vaccines internationally, many Nigeria adults remain unprotected against this vaccine-preventable disease. Formulating strategies centered on expanded intervention in mass awareness, testing, vaccination and treatment could reverse the ugly trend and save the vulnerable population. It is not surprising that our study revealed that 65.5 % of the truckers and their assistants (HBsAg, Anti-HBc, Anti-HBs; all negative) are susceptible to HBV infection identifying only 6.8 % positivity for anti-HBs. The poor vaccine coverage coupled with low education attainment of the participants explains this result, thereby supporting the need for targeted interventions aimed at increasing awareness and enhancing detection and treatment. In a serological study conducted among prison inmates of Kuje prison of Abuja Nigeria, Dan-Nwafor *et al.* (2021) reported 55.4 % of the inmates being susceptible to HBV infection with only 10.3 % of them immuned to the disease. In another epidemiological study among recyclable waste collectors in Brazil, susceptibility to HBV infection was as high as 63.7 % which was attributed to low education level of participants (Weis-Torres *et al.*, 2020). Only 4.7 % of sampled truck drivers in Brazil had anti-HBs

suggesting immunity via vaccination (Matos *et al.*, 2008). A study in Thailand by Upala *et al.* (2020) found 19.2 and 18.9 % positivity for anti-HBs and anti-HBc respectively among her adults of hill tribe while Anti-HBs and anti-HBc positivity were identified in 31.9% and 30.6% of participants in a study in Turkey general population (Tozun *et al.*, 2015). This study reported 6.8 % cases of isolated anti-HBc serological pattern (negative HBsAg and anti-HBs but positive anti-HBc). We also ruled out the possibility of false positive as the test were repeated with another validated assay kits that gave same results. This serological pattern could be as result of healed HBV infection before the onset of anti-HBs proliferation (Moretto *et al.*, 2020). Our study also ruled out depleting anti-HBs immunity commonly seen in HIV infected individuals as all our subjects were HIV-negative screened. This could be explained as occult HBV infection resulting from mutant HBsAg undetectable on HBV standard testing (Chang *et al.*, 2018).

The explanation for occult HBV infection is not limited to isolated anti-HBc pattern but can be the association of HBsAg-negative with positive HBV DNA in the blood, liver or both (Kang *et al.*, 2010). Further analysis of the HBV-positive cases revealed that 54.5% were inactive chronic carriers (HBeAg negative and HBeAb positive status), indicating a lower risk of transmission. However, 18.2% (10 out of 55) of the HBV cases were considered highly infectious, with active HBV replication, posing a greater risk of transmission. Additionally, 27.3% of the HBV cases were HBeAg-negative, suggesting a state of lower infectivity. This study revealed high prevalence of serum hepatitis B infection among the truckers and assistants and could thus be categorized as high epidemic group. The high number of very infectious (18.2 %) cases and susceptible subjects (65.5 %) amongst the itinerant study population presents a significant public health threat and therefore requires urgent intervention. The findings underscore the need for targeted interventions, including vaccination campaigns and educational programs to mitigate the transmission of HBV in this high-risk population. To develop effective strategies, further research and surveillance are required in collaboration with healthcare authorities and stakeholders to arrest this ugly situation.

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