

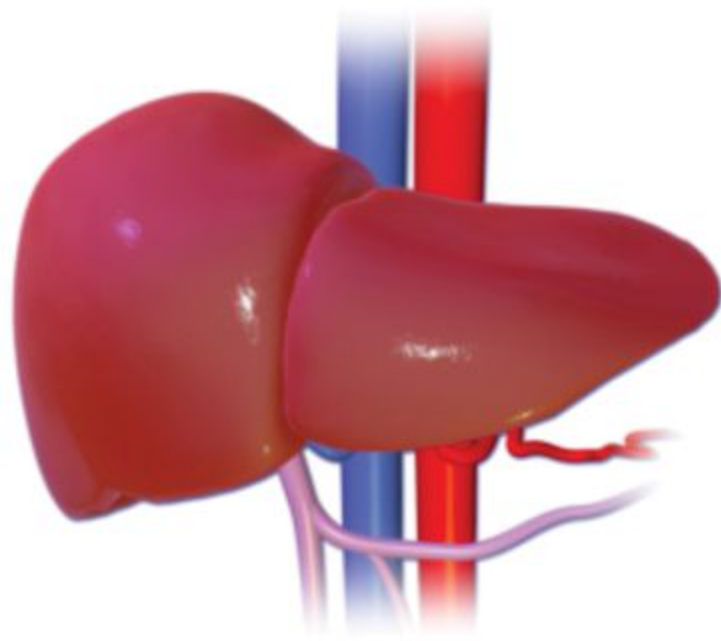
Hepatitis B Virus (HBV)

and

Hepatitis C Virus (HCV):

“Nigerian-American Immigrant’s
Awareness, Knowledge and Attitudes”

Juliana Chidimma Agubokwu



Normal Liver



Liver Cirrhosis

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Hepatitis B virus (HBV) and hepatitis C Virus (HCV): U.S. Nigerian immigrant awareness, knowledge, and attitude

About The Author

Juliana Agubokwu, MD/PhD, MSN, RN is an Assistant Professor and the lead faculty for Community /Public Health Nursing at Bowie State University, Bowie Maryland, USA. She taught at the University of Maryland and worked as a registered nurse for over two decades in community health, psychiatric nursing, and in other acute care settings. Dr. Agubokwu is the founder of GHEEN Services Inc. (Global Health Education and Economic Network), a 501 (c)(3) non-profit organization that focuses on Hepatitis B and C research, testing and community education. She has received several awards for speaking in conferences both locally and internationally. She is a recipient of the Presidential Humanitarian Award for Community Volunteer Services in 2018 and was featured in “Nigeria World News Headlines” as “The Good Woman of Nigeria,” in 2002 for her work in the community. Her latest research is titled “An Innovative Strategy for Students’ Engagement in Nursing Education: Smartphone Use in Active Teaching & Learning”.

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Abstract

Over 300 million people live with the Hepatitis B virus (HBV), and over 170 million live with the Hepatitis C virus (HCV) worldwide. In sub-Saharan Africa, Nigeria has over 21 million people living with HBV and/or HCV. Yet, most Nigerian people living with hepatitis are unaware that they have the disease. U.S. Nigerian immigrants are at high risk for HBV and HCV because they originate from Nigeria, which has an increased number of HBV and HCV infections. This study examined the knowledge, perception, and attitude of Nigerian immigrants living in the US towards HBV and HCV infections to create awareness of the disease for Nigerians in general. A quantitative survey was conducted using survey monkey questionnaires. Fisher exact tests were performed to compare the perceptions of HBV and HCV infections, infection behaviors, the perceptions of Western and traditional medicine use among Nigerians, and educational awareness of the disease. IBM® SPSS® statistical software was used to analyze the data. A total of 132 participants responded to the survey. Statistically significant interactions were found in the perception of HBV and HCV infections, educational awareness of HBV and HCV infections, infection behaviors between Nigerian men and women, use of western and traditional medicine, and Nigerians' education level. Perceptions of HBV and HCV infections between age, marital status, and socioeconomic status of Nigerian immigrants were equally significant.

Keywords: hepatitis, Nigeria, Fisher exact tests, HBV, HCV

Author Note

I thank my mentor Dr. Oren Tulp, my husband Dr. Vincent Agubokwu and my children for their support and love.

I dedicate this study to my brother, Linus Ezenwa, whose heartbreaking death ignited my quest to work on this project and all those that are living with Hepatitis B and C.

Note: This research was completed in 2017.

Revised in 2023.

Dedication

I dedicate this book to my brother Mr. Linus Ezenwa whose heartbreaking untimely death from liver cancer ignited the quest to complete this work.

Abbreviations: ALT, aminotransferase; AST, aspartate aminotransferase; BOP, bureau of prisons; CDC, centers for disease control; DAA, direct acting Anti-Viral; EIA, enzyme immuno-assay; ESRD, end-stage renal disease; HAV, hepatitis A virus; HBsAg, HBV surface antigen; HBV, HBV virus; HCC, hepatocellular carcinoma; HCV, HCV Virus; HCWs, healthcare workers; IFN, interferon; IOM, institute of medicine; PegIF, PEGylated interferon; PWID, people who inject drugs; RIBA, recombinant immunoblot ; SBFA, safe Blood For Africa; SES, socioeconomic status; SOGHIN, society of gastroenterology and hepatology in Nigeria; SPSS, statistical package of social sciences; WHO, world health organization

HBV and HCV: U.S. Nigerian immigrant awareness, knowledge, and attitude

Hepatitis is the inflammation of the liver. Although there are different types of hepatitis, this research study is focused on viral hepatitis, particularly the HBV virus and HCV virus. Wiktor & Hutin¹ explain that HBV and HCV are very similar. The similarity lies in symptoms, transmission mode, and the resultant effects. The World Health Organization (WHO)² stated that cases of HBV and HCV have reached pandemic levels worldwide. It is estimated that over two billion people around the globe have experienced an acute or chronic issue of HBV in the past. Over 350 million people live with HBV infection worldwide, and it is estimated that 1.45million people will die annually due to the infection.

Additionally, over 170 million people are living with HCV, and an estimated 10,000 to 15,000 people will die annually.³⁻⁵ Nigeria is a country in sub-Saharan Africa with the highest number of HBV infections, with an estimated 35million people having the disease.⁴ Although HCV prevalence is increasing in Nigeria,⁶ Nigeria remains one of the countries in sub-Saharan Africa with the lowest treatment rate for HCV.⁷ This study aimed to assess the level of awareness, knowledge, and attitude of Nigerian immigrants living in the US about viral hepatitis, particularly HBV and HCV. This study explores participant knowledge and participant belief and perception about the disease. The study also explores the definition of hepatitis, the mode of transmission, the symptoms, the at-risk population, the methods of prevention, and the treatment options.

HBV is a deoxyribonucleic acid (DNA) virus that uses ribonucleic acid (RNA) during replication. HBV infection can lead to different types of liver disease, including chronic HBV, cirrhosis, and Hepatocellular Carcinoma (HCC). According to Liang⁸ and Aspinall et al.⁹ the infection can be acute or chronic. Acute cases of HBV infection can sometimes lead to liver failure without any history of liver disease.⁹ Few studies affirm individuals' knowledge of HBV and HCV.¹⁰ There is a lack of knowledge about HBV and HCV worldwide, including among Nigerians. The survey results in this study found that the Nigerian immigrants' knowledge and attitude toward hepatitis reflect their educational level.

Additionally, immigrant Nigerians in the US are at risk of viral hepatitis since they migrated from a country with a high occurrence of the infection.¹¹ There is limited literature on HBV and HCV among Nigerian immigrants in the US. The literature gap requires this study to be undertaken, especially as Nigeria has many viral hepatitis infections. There is an urgent need to study Nigerian immigrants' knowledge, attitude, and awareness levels

of HBV and HCV infections. Results demonstrate the need for creating awareness of this deadly public health ailment globally.

The study aims to reduce the morbidity and mortality of HBV and HCV infections among Nigerians. Additionally, the study seeks to create awareness through education to bridge the knowledge gap of the limited literature available about HBV and HCV in the Nigerian population living in the US. The study aims to contribute toward the WHO's goal of eliminating HBV and HCV as a "public health burden" by 2030.² The ultimate goal of the study is to reduce the incidence (new cases) and prevalence (existing cases) of the disease. Individual knowledge deficits of risk of infection may put people at risk of contracting the disease. Hence, educating and creating awareness about HBV and HCV are paramount in curbing the prevalence and rate of this ailment, according to Ola et al.¹² and Mercy et al. (2013). In keeping with the WHO millennium number one and number three goals as stated in the "WHO 2030 Agenda for Sustainable Development," this research focused on preventing HBV transmission (WHO goal 1), and on eliminating HBV and HCV as a public health threat by 2030 (WHO goal 3).

Additionally, the next goal of the WHO is to reduce the incidence of chronic HBV and HCV from six to 10 million infections to 0.9 million infections by 2030 and to reduce the annual death rate from chronic HBV and HCV from 1.4 million diseases to less than 0.5 million infections by 2030.¹⁰

Mode of transmission of HCV in Nigeria

In Nigeria, the most common type of HCV virus genotype causing the disease is genotypes 1 and 4. In the US, the most common type is genotype 1. Genotypes 1 and 4 are transmitted via blood and mucous membranes. The genotypes are mainly location-based. Blood transfusions that were not adequately screened, inadequately sterilized equipment and vertical transmission are the main modes of infectivity. Blood and blood product screenings have improved in Nigeria, but errors still occur. Medical equipment such as contaminated scissors that were not sterilized or cleaned correctly before procedures can transmit the HCV infection. Needle reuse or poor sterilization can spread the infection. Surgical equipment can spread the virus if reused without proper sterilization. Vertical transmission during pregnancy from a mother to a neonate is one of the most popular modes of transmission globally, especially in Asia and sub-Saharan Africa, including Nigeria.

HBV and HCV prevention

Prevention at the infection's primary, secondary, and tertiary levels is essential to reduce the infection burden in the different regions of the world. Prevention of the disease at the primary level involves interventions to prevent transmission and promote early detection and treatment. Health education is essential to promote education and awareness of the disease. Treatment is provided at the secondary level of prevention to prevent progression to the tertiary level. At the secondary level, diet compliance, and weight reduction/management are necessary because excess weight can impede treatment progress. At the tertiary level, the effect of chronic hepatitis, such as cirrhosis, can be treated, or a liver can be transplanted. Other ways to achieve prevention of HBV and HCV are by creating awareness, providing knowledge through information sharing, providing disease statistics, and changing negative attitudes resulting from a lack of information and knowledge regarding the disease.

Prevention VIA knowledge

The disease's transmission modes might be unknown to individuals suffering from the disease. The individuals may have misconceptions about how the disease is transmitted. The lack of knowledge of the disease results from the fact that the modes of transmission of HBV and HCV are very varied and are based on location. While needle sharing by drug users is one of the main transmission methods in the US, needle sharing is a rare means of transmission in Nigeria. Instead, blood transfusions and products are Nigeria's most common transmission risks.

Prevention of stigmatization/Negative attitude

Sexually transmitted diseases (STDs) are stigmatized worldwide, including gonorrhea, syphilis, HIV/AIDS, HBV, and HCV.¹³ The transmission mode for HBV and HCV includes sources other than sexual contacts, such as blood transfusion, poorly sanitized medical equipment, and many others. Unfortunately, even though the transmission mode of HBV and HCV transmission is not limited to sexual activities, the stigma still applies to the disease. Stigmatization can inhibit individuals from getting the help they need in the appropriate time frame. This means some individuals seek help when the condition is advanced to liver cirrhosis or Hepatocellular Carcinoma (HCC). Some individuals may not seek proper help.¹³

Massive education to curb ignorance is essential to fight the stigmatization of HBV and HCV infections. Prevention efforts should be given to the masses to prevent the incidence of the disease. Healthcare workers should teach individuals about transmission modes, diet, and medication compliance for infected individuals. Prevention efforts should be for different levels of prevention—primary, secondary, and tertiary levels. Primary prevention levels aim to stop the disease from infecting a community's individuals, groups, or populations. Secondary prevention levels involve treating the disease with medication and other therapies relevant to treating the infection. Secondary prevention levels aim to prevent the progression of the disease to the tertiary level. The condition is managed at the tertiary prevention level to avoid further deterioration of the individual's health and functionality. Tertiary prevention-level interventions are used to care for individuals with chronic diseases. The individuals are no longer experiencing an acute phase of the disease.

Using three levels of prevention can reduce the morbidity and mortality associated with the HBV and HCV pandemic. The education of people about the disease should emphasize the mode of transmission and risks of the disease, among other factors, to reduce stigmatization. The stigmatization associated with the disease can hinder seeking treatment as individuals try to hide the diagnosis. Educating Nigerians living with viral hepatitis and others that the condition is not only transmitted via sex and needle sharing can reduce the epidemic.¹³

Prevention via awareness

Nigeria has the highest number of HBV carriers in sub-Saharan Africa, with over 20million people living with the HBV virus, and 1.1% of Nigerians living with the HCV virus (WHO, 2020). There is a need to study and create awareness of this

“silent killer.” Creating awareness of HBV and HCV will help prevent many deaths from liver cirrhosis and liver cancer deaths. According to the National Institutes of Health (NIH) (2021), 30 – 50% of deaths from liver cirrhosis and liver cancer are from HBV or HCV infections. Sub-Saharan Africa has a high number of individuals with HBV and HCV infections, yet there are limited studies regarding the disease's mode of transmission. Limited information on the disease's transmission method hampers progress in eradicating the deadly infections.¹⁴ Awareness should be created via the media such as radio, television, newspapers, and billboards, just as in the US, where HCV awareness is regularly advertised on television. In Nigeria, awareness and understanding of HBV and HCV infections, especially HBV, should also target churches, marketplaces, and rural areas.

The influence of culture on the Nigerian immigrant's knowledge of HBV and HCV

In Nigeria, traditional medicine continues to treat illnesses or diseases. Modern medicines are being used for treatment as well. Traditional medicines are primarily used in rural areas, whereas modern medicine is mainly used in urban areas. The rural areas have modern medicine through hospitals and pharmacies. Still, the indigenes have limited resources, and the government is not providing adequate assistance to individuals or communities to make health care accessible or affordable (Nigeria, n.d.). The traditional medicine dispensers use herbs and native plants to treat health problems. Traditional medicines have fewer side effects than modern medicine (Nigeria, n.d.). In addition to having the option to use traditional medicine that can sometimes be ineffective and dangerous, some Nigerians lack trust in Western drugs, especially the rural region dwellers (Nigeria, n.d.). The education and awareness creation for certain communicable diseases is the federal government's responsibility via trained physicians, nurses, and public health personnel (Nigeria, n.d.).

Studies have shown that over 300,000 Nigerians have migrated to the US.^{15,16} The immigrant Nigerians are 18- to 64-year-old individuals, including first and second-generation Nigerians.¹⁷ Nigerians living in the US are very much involved in the lives and well-being of their extended families back home. This is because Nigerians are raised to have very close family ties as part of their culture. They are very involved in helping with their financial needs, education, health promotion, arts, and culture promotion. In 2012, approximately \$6.1 billion were remitted to Nigeria.¹⁷ Nigerians send money to their loved ones, including hand-delivery to friends who travel to Nigeria. In addition to individual assistance to their extended families and friends, various community organizations are formed by Nigerian immigrants to assist their motherland further.

The influence of Nigeria's economy on Nigerian immigrant's health behavior

In 2020, the economic recession in Nigeria continued, adversely affecting Nigerians' financial conditions. Nigeria is one of the world's largest oil producers, and the country experienced an economic boom in the 1970s. Despite Nigerian wealth through oil, the government has not managed its health sector effectively. Nigeria is the most populated nation in Africa, with enormous wealth. Still, due to endemic corruption among the political class, the country is undergoing various challenges such as high

unemployment and crime. Nigeria's poor economic condition affected the people's health delivery and access to healthcare. This has resulted in poor health management, which has reduced the life expectancy of Nigerians to 51 years (Nigeria, n.d.). This situation has increased Nigerian migration to western countries such as the US and Europe to seek economic opportunities. Nigeria has mass unemployment, and those employed find it difficult to meet ends.

In 2020, most Nigerian states will continue to be unable to pay workers on time. The Nigerian population in the US has continued to grow, and it was noted that from 2009 to 2013, an estimated 376,000 Nigerians resided in the US.¹⁷ Nigerians in the US are very involved in the decision-making process in their extended families in Nigeria. A significant number of participants in this study agreed to share information about HBV and HCV with their loved ones in Nigeria. Risk factors should be discussed, and individuals should be encouraged to test for infections (HBV and HCV).

There is a need for grassroots studies and mass education to create knowledge of this disease, possibly improving prevention and treatment efforts. Nigerians have migrated to the US for years.¹⁴ Some chronic HBV carriers are unaware of the presence of the infection in their body until the disease is advanced, causing illness, loss of work hours and wages, and possibly spreading the infection to others. HBV and HCV are more easily infectious than HIV.¹⁰ Prevention efforts can reduce the incidence and prevalence of HBV and HCV amongst Nigerians living in Nigeria and Nigerian immigrant adults living in the US. Many Nigerians residing in other countries are "breadwinners" of their extended families in Nigeria; therefore, they are decision-makers for many of their families and relations living in Nigeria.¹⁷ Many Nigerian immigrants living in the US are equally involved in the decision-making of their extended families living in Nigeria; therefore, sharing this crucial life-saving HBV and HCV infection information will help address this life-threatening disease.

Pose the research question

The HBV and HCV infection has become a worldwide pandemic, causing alarming morbidity and mortality. According to WHO, about 400 million people live with the disease, and about 1.45 million people die from the resultant effect of the infection each year.¹⁰ Chronic HBV and HCV can lead to liver cirrhosis, Hepatocellular Carcinoma (HCC), and possible death.

In Nigeria, over 2 million people living with HBV, representing 12% of the population. Additionally, 2.2% of the population is living with HCV. Is the ignorance (lack of knowledge) of the disease the major contributing factor to this the high number of infections in Nigeria?

Research questions (RQs)

RQ1. Is there a difference in the perception of Western and traditional medicine use among Nigerian immigrants living in the US based on their gender, marital status, age group, ethnic group, education level, or socioeconomic status?

RQ2. Is there a difference in how Nigerian immigrants living in the US perceive HBV or HCV infection based on gender, age group, ethnic group, marital status, or socioeconomic status?

RQ3. Is there a difference in the educational awareness of HBV or HCV among Nigerian immigrants living in the US based on their gender, marital status, ethnic group, age group, socioeconomic status, or education level?

RQ4. Is there a difference in HBV or HCV infection behaviors among Nigerian immigrants living in the US based on their gender, marital status, age group, ethnic group, education level, or socioeconomic status?

Assumptions for the research

The first assumption was that participation in this research would create an awareness of HBV and HCV among Nigerian immigrants in the US. The second assumption was that participation in this study would help the individual become more aware of the disease. The third assumption was that these participants, once informed through participation in this study, can become more aware of the nature of viral hepatitis and become more motivated to get tested or vaccinated to prevent the infection. The fourth assumption was that participation in this study would allow the participants to share the information with their families and friends living in the US and Nigeria.

Limitations of the research

The participants' opinions may not represent Nigerian immigrants living in the US, making the study lack generalizability. The three major ethnic groups are Igbo, Yoruba, and Hausa. The Igbos occupy the eastern part of the country, the Yorubas occupy the western position, and the Hausas are the dominant ethnic region of the northern part of Nigeria. Most Nigerians residing in the US are the Igbos and the Yorubas. It is evident that due to the above reason, the opinions of Hausas were not well represented in this study. The number of Yorubas who participated in the study did not represent those residing in the US as well.

Nigerians are very private people; therefore, some individuals did not participate in the study because they were unwilling to share personal information regarding demographics such as age or income level. In addition to the original affirmation by the researcher that survey information would remain confidential, the researcher sent several email messages and made personal calls to reassure individual participants that their data would remain anonymous.

Characteristics of the study population

This study's sample population was primarily Nigerian immigrants living in the US. There were 132 participants in the study. The ethnic group composition of the respondents consisted of Igbos, Yorubas, and others. Igbos comprised most of this study's respondents (84%), while Yorubas (8%) made up the second-largest representation. The remaining respondents were from other Nigerian ethnic groups (8%). This study had more men (56.5%) than women (43.5%). Most of the responses came from participants who were 50 years old or older (43%), married (69%), had a master's degree education level or higher (32%), and had an income level of \$81,000 or above (55%).

Review of literature

The HBV virus and HCV virus are blood-borne viruses that attack the liver. Infection with either or both of the viruses may lead

to severe liver damage, liver scarring (cirrhosis of the liver), or Hepatocellular Carcinoma (HCC). It is estimated that over 350 million individuals worldwide are infected with HBV, and over 170 million individuals are infected with HCV.¹⁰ In Canada, an estimated 250,000 people live with HCV.¹⁸ The prevalence of viral hepatitis is high in Egypt, India, and sub-Saharan Africa, with an estimated 75 million individuals living with HBV in sub-Saharan Africa. Over 21 million people in Nigeria live with HBV, and 2.2% of the population is HCV-infected.⁴

HBV and HCV therapies are described in the literature and these therapies have been evolving for the last several decades. HBV or HCV can be acute or chronic. The acute phase can turn into a chronic disease if not treated. Hepatitis symptoms include jaundice (yellowing of the skin or eyes), fatigue, nausea and vomiting, fever, and headache.¹⁰ The acute phase lasts less than six months, while the chronic phase can last a lifetime. Viral hepatitis, including HBV and HCV, is a public health burden. The seriousness of HBV and HCV is comparable to HIV, malaria, and tuberculosis, given the amount of morbidity and mortality they cause worldwide, yet HBV and HCV get less attention. HBV and HCV cause 80% of liver cancer deaths, yet many individuals who have the disease are unaware they have the disease, making it a “silent killer,” according to the WHO (2015). The goal of the WHO is to eliminate viral hepatitis as a public health threat by 2030.¹⁰

There are five strategies for different countries that WHO wants to implement to achieve this goal. Some countries with high incidences and prevalence of viral hepatitis have started implementing some strategies, such as Egypt, Georgia, and Mongolia.¹⁹ There is a lack of adequate data on HCV prevalence in Nigeria, but HBV and HCV combined are endemic and provide an urgent reason to discuss prevention strategies, diagnosis methods, and current therapies.

A study at the University of Benin Teaching hospital in Nigeria showed the prevalence of HCV in intermediate indemnity (moderately prevalent). It was noted that 720 (12.5%) pregnant women and 206 (3.6%) pregnant women out of 5,760 pregnant women surveyed tested positive for HBV and HCV, respectively.²⁰ Furthermore, occupational exposure, such as needle sticks of healthcare workers (HCWs), and physicians, can pose a significant risk of infection during surgical procedures.²¹ A study conducted in Ibadan, Nigeria, showed that butchers are at a higher risk of exposure and transmission of the disease in the studied region.²² The different ethnic parts in areas of Nigeria use a tribal marking on individuals to identify the place where they originated. Tribal markings can result in infection transmission due to unsanitary means of making the tribal marks. Local midwives performing circumcision with inadequately sterilized equipment may be a mode of transmission of the HBV virus. Additionally, sharing household items such as toothbrushes and razors can transmit the infection.¹⁵ It is also found that participating in unprotected sex with heterosexual partners or men who have sex with men, and local tonsillectomy operations are all modes of transmitting the infection in Nigeria.²²

Prevention strategies

Universal vaccination, health education/creating awareness, needle exchange program, and mass screenings are some strategies that help prevent the transmission of viral hepatitis.

The first successful universal HBV vaccination for newborns conducted in Taiwan reduced the HBV surface Antigen (HBsAg) from 11% to 1% from 1984 to 2004. HBV vaccination reduced the incidence of the infection.²³ In Taiwan and other Asian countries, perinatal transmission is endemic. Therefore, infants are vaccinated. Chronicity of the infection begins in childhood via natural transmission from mother to baby.¹⁰ In some cases, the anti-viral drugs do not completely clear the infection after treatment. However, the negative feedback loop keeps HBV infection under control.²⁴

In the US, viral hepatitis has been an epidemic affecting the public, especially intravenous drug users (IDUs) and the baby boomers (those born between 1945 and 1965). The Institute of Medicine (IOM) developed strategies to reduce the morbidity and mortality of this disease, with special emphasis on HCV. Additionally, these strategies were shared with the federal government, which assigned different strategic goals to the Health and Human Services (HHS) agency. The plans included improving community awareness and preventing transmission of the disease. These efforts to silence the epidemic are aimed at governmental and non-governmental partners collaborating to reduce and/or eradicate the epidemic. Indeed, the Centers for Disease Control and Prevention (CDC) launched a program titled “know more hepatitis.” The Veterans health administration and the federal bureau of prisons (BOP) collaborated to develop services that prevent the prevalence and incidence of the disease.²⁵

Diagnosis of HBV and HCV

The diagnosis of the HBV virus and HCV virus is a vital phase in achieving the goal of reducing the morbidity and mortality associated with the disease. Diagnosis must be accurate as different infection genotypes respond to different treatment regimens. Precaution should be taken to prevent false-negative results, which allow the virus to progress to cirrhosis, decompensation, and Hepatocellular Carcinoma (HCC) without treatment. Furthermore, a thorough history of the individual must be made to elicit information about lifestyle, sexual behaviors, and alcohol consumption (which increases the aminotransferase level in the blood resulting in a higher risk of liver damage). Risk factors of HBV and HCV infections include age, location of residence, travel to a country or area of high indemnity, family history, vaccination history, and maternal history. Risk factors must be addressed. Risk factors determine the type of test that should be selected, as many different tests are available for diagnosis. The symptoms the individual is experiencing and/or a head-to-toe physical examination, sonogram, or liver biopsy may be used for diagnostic purposes. Any infection that lasts six months or longer is chronic; the presence of HBV surface antigen (HBsAg) in the blood indicates infection.

The diagnosis of HBV or HCV must be followed by counseling as this will involve a possible lifestyle change, medication therapy, and compliance, monitoring by a healthcare provider, testing and vaccination of family and the individual against other infectious diseases, and referrals to experts and support groups. Additionally, the psychological effects of the diagnosis must be addressed to ensure compliance with medication, diet, and other treatment regimens.

HBV tests include HBV surface antigen (HBsAg), excess of which indicates infection of HBV. HBV tests are also used to

manufacture the HBV vaccine for immunity. The total antibody to HBV core protein test is another test for HBV. Also, antibody to HBV surface protein and alanine transferase (ALT) level tests are other tests for HBV infection. The HBV DNA test shows the amount of HBV in the body. As measured in preliminary tests, an increase in the level of HBV in the body indicates hepatic decompensation. The HBV DNA test determines whether the individual is eligible for treatment. It is also known as a viral load test.¹¹

HCV diagnostic tests include anti-hepatitis assays, viral core antigen tests, and Genomic RNA viral tests.²⁶ Point-of-care (POC) tests are used in several doctors' offices, hospitals, and clinics, not laboratories. POC tests are rapid, and the results are shown within 20-to-40-minute intervals. POC tests can use blood from finger sticks or oral fluids. The POC tests can also use whole blood from venipuncture, serum, or plasma. The results from POC tests can be seen visually. The criteria for POC tests are that the individual must be 15 years old or older. POC tests are used for high-risk patients. The POC test process is cost-effective and straightforward to perform. Enzyme immunoassay (EIA) tests can also detect the virus. Recombinant Immunoblot (RIBA) tests were previously used to confirm HCV in the blood. Nucleic-acid tests verify HCV presence in the blood by detecting anti-HCV antibodies.

HBV and HCV therapy and vaccination in Nigeria

The goal of therapy is to clear the DNA of the HBV virus, inhibit viral replication, and prevent the development of complications of HBV and virus infections.²⁷ Effective medication management reduces morbidity and mortality levels in HBV and HCV. The WHO (2015) noted a high need to optimize medication regimens for HBV and HCV carriers. There is a significant improvement in manufacturing medication for HBV and HCV. Tenofovir alafenamide (Vemlidy) has been approved for HBV treatment. Adults and children over the age of 12 who permanently have no detectable viruses in their blood following treatment are at lower risk for complications. Vemlidy aims to keep the viruses from multiplying in the blood. The 25 mg pill is to be taken daily by mouth with food.²⁸

The WHO (2016) called for manufacturing medicines that will be less expensive and more affordable than the current ones.

There are two basic means of treating HBV infections: using the nucleos(t)ide analogues and interferon medicines. Vaccinations are used as preventive measures for HBV infections. Currently, the HCV infection does not have a vaccination developed, unlike the HBV infection. The older nucleoside analogue (NAs) medicines in this category include Lamivudine, Adefovir, and Tenofovir. The newer drugs are Endeavor and Tenovir.²⁷ These five NAs are designated for oral use.

Interferons (IFN) are also used for HBV treatment. Types of IFN include Interferon alfa (Intron A), IFN-a-2b, and PEGylated IFN-a-2a. IFN-a-2b was first approved in 1991 to treat HBV. Work on IFN-a-2b began in 1991, and the patent was approved in 2004. It took 13 years for the evaluation of this medication. IFN-a-2b medication is an immunomodulator. The PEGylated IFN-a-2a functions to activate anti-hepatitis viral proteins. PEGylated IFN-a-2a medicine can be used as monotherapy or combined with

other medicines. The IFNs are for injection use only and are used for HBV and HCV therapy.

The IFN regimens should be followed as instructed by the provider, and medication should not be stopped abruptly to prevent a flare-up of the infection, according to Chang²⁹ and Huang.²⁷ The phases of treatment are targeted at chronic HBV infection and treatment of liver damage or failure associated with the infection. Some therapies are targeted for the acute phases of the infection.²⁷ Vaccination is strongly encouraged and essential, including post-exposure prophylaxis vaccination.⁹

Earlier medicines for HCV treatment were Telaprevir and Boceprevir, approved in 2011. These medicines are still in use today primarily for patients who cannot tolerate Sofosbuvir, Daclatasvir, Sofosbuvir/Ledipasvir (Harvoni), Sofosbuvir/Velpatasvir, and Glecaprevir/Pibrentasvir. Telaprevir and Boceprevir drugs are combined with PegIFN and Ribavirin to halt HCV viral replication. These drugs are a very potent combination therapy but may have serious adverse effects on the patients (Kandra et al., 2013). Current treatment of HCV results in fewer adverse effects on the individuals taking the medicines than the earlier drugs. Current drugs are free of interferons, direct-acting, and can be taken orally.³⁰

In Washington, DC, a combination medicine, Leipasvir and Sofosbuvir (Harvoni), was approved in 2014 for HCV treatment. Harvoni is an oral pill, a direct-acting antiviral (DAA) medicine, to be taken once per day.

HBV therapy

Prior to the beginning of HBV therapy, a rapid diagnostic test (RDT) which can be provided in a clinic, or provider's office can lead to a confirmatory test. The following are tests for HBV infection; hepatitis B surface antigen (HBsAg), antibody to HB core antigen (anti-HBs), and total antibody to HB Core antigen (total anti-HBc). These tests determine the presence of HB in the blood, (CDC,2023).

In addition to the above blood tests, a hepatitis viral panel, liver ultrasound, and liver biopsy are diagnostic tests for the infection (Mayo Clinic, September 2022). According to the National Guideline for Prevention, Care, and Treatment of Viral Hepatitis in Nigeria, the diagnosis of HBV infection is based on HBsAg positivity in the blood. If the blood test is positive, a complete viral screening of anti-HBc (IgM and Total), HBeAg, anti-HBe, anti HBs is completed. The above determines if the infection is acute or chronic. If the infection is acute, the patient should be monitored but if the infection has reached a chronic stage, evaluation for treatment should commence to determine the treatment regimen. If HBsAg is negative, test for Anti HBs for possible vaccination administration (give vaccination) if HBs is negative but if HBs is positive, discharge the patient, which means that the patient is protected with vaccination.

HBV treatment recommendations

The treatment of HBV infections has two main classes of drug therapy recommendations. They are nucleos(t)ide analogues (NAs) and Pegylated Interferon therapy. These therapies are recommended based on different factors and criteria.

Nucleos(t)ide analogues (NAs): These are recommended for all adults, adolescents, and children age 12 years and older for whom antiviral treatments have been recommended.

Adults: The drug of choice for adults is Tenofovir due to the high barrier to drug resistance. Tenofovir can be used alone or in combination with Entecavir as an alternative therapy. The other NAs lamivudine, adefovir, and Telbivudine are all not recommended due to the high level of drug resistance that has been recorded with the use.

Children: Entecavir is recommended for children ages 2 to 11 years or those who cannot tolerate Tenofovir.¹⁰ However, Tenofovir must be avoided in patients with renal disease.

Table 1 Profile of HBV Treatment Options

| Nucleoside Analogues | Resistance Barrier | Dose | Duration | Route | Indication | Cost | Remarks |
|----------------------|------------------------|-------------------------------|--|-------|-----------------|----------|----------------------------------|
| Tenofovir | Low risk of resistance | 300mg dly | Life-long, or until loss of HBsAg/HBeAg positivity | P.O | High viral load | Low | Watch out for Nephrotoxicity |
| Entecavir | Low risk of resistance | 0.5mg dly Lamivudine naïve | Life-long, or until loss of HBsAg/HBeAg positivity | P.O | High viral load | Moderate | Maybe used in place of Tenofovir |

Note: From "National Guideline for Prevention, Care and Treatment of viral hepatitis B & C in Nigeria", 2016, (<https://www.hepb.org/assets/Uploads/Nigeria-Hepatitis-Guidelines-TX-guidelines.pdf>). Copyright 2016 by the Federal Ministry of Health, Abuja, Nigeria.

Table 2 Profile of HBV Treatment Options

| Interferons | Resistance barrier | Dose | Duration | Route | Indication | Cost | Remarks |
|----------------------|--------------------|---------------|----------|-------|----------------------------|------|---|
| Pegylated Interferon | Not Applicable | 180mcg weekly | 48 weeks | S.C. | Low viral load High ALT | High | For finite duration of therapy, Higher HBsAg loss & Higher HBeAg seroconversion |

Note: From "National Guideline for Prevention, Care and Treatment of viral hepatitis B & C in Nigeria", 2016, (<https://www.hepb.org/assets/Uploads/Nigeria-Hepatitis-Guidelines-TX-guidelines.pdf>). Copyright 2016 by the Federal Ministry of Health, Abuja, Nigeria.

HBV Co-infections and therapy: The HBV infection may co-infect in some cases. Initial and subsequent screening is the source of diagnosis of co-infection.

HBV/HCV: When HBV and HCV infect the person the therapy will focus predominantly on the dominant infection. Dominance is determined by the level of viral load. The infection with a lesser viral load will be under monitoring while the infection with a higher viral load is treated.

HBV/HIV: The therapy for this co-infection is Tenofovir and Emtricitabine and a "non-nucleoside reverse transcriptase inhibitor or protease inhibitor."

HBV/HDV: The therapy of choice in the case is Pegylated Interferon, to be administered for 48 weeks.

Chemotherapy/immunosuppressive therapy: All the patients in this category are screened for HBsAg before the start of therapy. If they are positive, they are started on oral NAs one week before chemotherapy starts and continued for 6 months after therapy (National Guideline for Prevention, Care, and Treatment of Viral Hepatitis in Nigeria, 2016).

HCV therapy: HCV currently does not have an approved vaccination. HCV has 6 different genotypes. The treatment regimen is based on genotypes. About 80% of HCV infections progress to chronic liver disease and 20% , end-stage liver disease (ESLD) and 5% to liver cancer. Screening, diagnosis, and timely therapy initiation become very important.

In Nigeria, a NAFDAC-approved rapid test or enzyme immune assay (EIA) kit is used to test for the detection of HCV antibodies,

Pegylated Interferon therapy: This is another therapy option for persons living with HBV infection based on the viremia of HBV DNA < 107 IU / ml Elevated serum ALT.

It is also recommended for persons age 45 years old or younger. It should be avoided in patients with decompensated cirrhosis. In Nigeria, conventional Interferons are no longer (National Guideline for Prevention, Care and Treatment of Viral Hepatitis in Nigeria, 2016). Table 1 and Table 2 for profiles of HBV treatments.

using whole blood, serum, or plasma specimen. Treatment successes to full recovery have been recorded with current therapies.

A nucleic acid test (NAT) for HCV RNA detects the presence of the HCV and other diagnostic tests are conducted for the diagnosis and during treatment to evaluate progress.

The goal of therapy is the complete eradication of the HCV infection. The newer therapy has significantly increased the rate of Sustained Virologic Response (SVR) of HCV RNA negative, 12 to 24 weeks of SVR determines a virologic cure of HCV infection. There are co-infections and different indications for treatment such as HCV/HIV, HCV/HBV, and more.

Direct -acting antiviral drugs and interferon based therapies are indicated for HCV infection

Interferon-based drugs have serious side/adverse effects

DAA drugs are revolutionary. They have fewer side effects. Pan-genotypic DAA provides high efficacy in the cure of HCV infection by being effective in all the HCV genotypes. They are administered orally. DAA can be combined with Pegylated interferon for the effectiveness of therapy. There is a wide variety of drugs for HCV infection therapy, however, the preferred therapies are **Sofosbuvir/Daclatasvir** (treats all genotypes in 12 weeks),

Sofosbuvir/Ledipasvir (treats genotypes 1,4,5 and 6 in 12 weeks) and **Sofosbuvir + Ribavirin** (treats genotypes 2 and 3 within 12 and 24 weeks respectively (National Guideline for Prevention, Care and Treatment of Viral Hepatitis in Nigeria, 2016).

Traditional therapy for HBV and HCV in Nigeria: Traditional medications or herbal remedies are sometimes used for HBV and HCV treatment in Nigeria. The active ingredients in traditional medications used for the treatment of HBV or HCV in Nigeria can be herbs, roots, bark, or other plant-based substances. However,

it is important to note that the use of traditional medications should be approached with caution, as their safety, efficacy, and potential interactions with conventional medications may not be well-established or scientifically validated. See Table 3 for a list of preferred regimens.

Table 3 A List of Preferred Regimens

| Preferred Regimens for the Treatment of HBC | | |
|---|---|---|
| Regimen | Features | Major Contraindications |
| Sofosbuvir/Daclatasvir | Highly efficacious across all genotypes and HIV+ patients Affordable | No clinically significant contraindication |
| | Well tolerated, short duration, minimum SEs, AEs and drugs interactions | |
| Sofosbuvir/Ledipasvir (FDC) | Highly efficacious across most genotypes but not indicated for GT 2 & 3 Affordable | No clinically significant contraindication |
| | Well tolerated, short duration, minimum SEs, limited drugs interaction | |
| Sofosbuvir + Ribavirin | Acceptable cure rates across all genotypes | Pregnancy or unwillingness to use contraception |
| | More expensive and less tolerable than all-DAAAs regimens, but better than Peg-IFN | |
| | No risk of resistance | |
| | Can be used across all genotypes but with lower efficacy | |
| | Most Expensive | Pregnancy or unwillingness to use contraception |
| | Least tolerable regimen: injections, frequent SEs and AEs | Poorly controlled hypertension, cardiac failure or diabetes Abnormal Hematologic indices (see table 15), Serum Cr >1.5mg/dl |
| | No risk of resistance | Breastfeeding |

Note: From “National Guideline for Prevention, Care and Treatment of viral hepatitis B & C in Nigeria”, 2016, (<https://www.hepb.org/assets/Uploads/Nigeria-Hepatitis-Guidelines-TX-guidelines.pdf>). Copyright 2016 by the Federal Ministry of Health, Abuja, Nigeria.. HCV Treatment Costs.

Viral vaccination in Nigeria

Hepatitis C (HCV) infection does not have vaccination currently. HBV was discovered by Dr. Baruch Blumberg in 1965. The vaccination was developed in 1969, four years after the discovery of the virus. It contains purified surface antigens of the virus.¹⁰

According to Nigerian National Program on Immunization (NPI), immunization started in Nigeria in 1956 due to smallpox epidemics, and the program expanded in 1979 due to high infant morbidity and mortality. Immunization is a form of exposing the dead disease antigen to the body which makes the body feel as if the body has been attacked by the disease, thereby triggering memory cells that prevent reinfection. Immunization provides immunity to the body without the risk of life-threatening complications. Although some individuals might react to immunization on rare occasions this should also be part of the teaching prior to all vaccination administrations. The Nigerian program for immunization noted that there are different schedules for HBV immunization for infants, adolescents, and adults. The current vaccination schedule is as follows: Diphtheria, Pertussis, Tetanus, HBV, and Hib. According to WHO, pentavalent immunization protects against these five deadly diseases (CDC, 2023).

Infant and childhood vaccination: Vaccination that starts during infancy requires a total of four doses of HBV vaccination. The first dose is given within 24 hours of birth (the dose is 10µg /

0.5 ml), at six weeks, ten weeks, and fourteen weeks. It must be completed within the first year of birth. The dose after the first dose is 0.5ml. All the doses are given intramuscularly via the anthro-lateral thigh (NPI, 2022). The first HBV vaccination dose is monovalent, and the remaining three doses are pentavalent, including vaccination against four other deadly infections: Diphtheria, Pertussis, Tetanus, Hib, and HBV.

Horizontal infection of HBV prevention: The pregnant HBV mother is given the HBV vaccine, HBV immune globulin (HBIG), and oral nucleos(t)ide analogues in the 3rd trimester (28th weeks) of pregnancy until delivery day. The presence of HBV surface Antigen (HBsAg) positivity is the primary determinant of infectivity of HBV infection. Infected pregnant women who are HBV e-Antigen (HBeAg) positive or HBeAg negative with viremia equal or higher than ($\geq 200,000$ IU/ml) should be treated with nucleos(t)ide analogues (NAs), (NPI, 2020). The recommended NAs for administration to pregnant HBV-positive women are Tenofovir and lamivudine (Entecavir safety during pregnancy is unknown) (NPI, 2020). The newborns of HBV infected mothers are given HBIG and 1st dose of HBV vaccination within 24 hours of birth. The doses are given to different sites intramuscularly.

Adult and older children (1-11 years) HBV vaccination: All previously unvaccinated children and adults are given 3 doses of monovalent HBV vaccination for immunity against the infection.

The schedule is 0,1, 6 months intervals. If the individual's HBsAg is negative, vaccination is recommended. If HBV titer is ≥ 10 mIU/mL vaccination administration is not recommended as this indicates immunity to the infection. Children ages 1 to 11 years is recommended to receive vaccination doses of (dose – 10 μ g /0.5ml, IM) at 0,1, 6 months.

Adults who have never received the HBV vaccine is recommended for (dose – 20 μ g /1ml, IM), three doses at 0,1 and 6 months respectively. According to CDC (2023), adults who have never received the HBV vaccine, whether they are at risk of the infection or not need to receive the vaccination to prevent the disease. The vaccination will be given 2, 3, or 4 times.

In Nigeria, both governmental and non-governmental organizations (NGOs) embark on HBV vaccination. HBV vaccination starts at birth per the NPI schedule. Immunization is highly encouraged in Nigeria but it is not compulsory. Governmental and non-governmental organizations, community outreach workers administer vaccination (NPI, 2022).

Effects of HBV and HCV

An individual is diagnosed with HBV when the HBV surface antigen (HBsAg) is positive in the blood. Positive HBV in an individual increases the risk of liver failure, liver cirrhosis, hepatic decomposition, and Hepatocellular Carcinoma (HCC). These risks to the liver can ultimately lead to death if liver transplantation is not performed. HCV virus is an endemic disease of the liver, and there are an estimated 170 million people worldwide living with the disease. The resultant effect of the disease is liver failure, cirrhosis of the liver, and Hepatocellular Carcinoma (HCC). The end-stage liver disease accounts for one in forty deaths worldwide.³²

Modes of transmission

HBV and HCV infection can be acute or chronic. In either stage, the infection can be transmitted to other individuals or animals (e.g., chimpanzees). The infection can affect people of different regions and ethnic groups. It is non-discriminatory. The mode of transmission is similar but may defer slightly based on area, lifestyle, awareness efforts of health care personnel, and treatment availability. The older people become, the higher the risk of the infection. The baby boomers in the US are the largest age group with the disease. The carriers are asymptomatic, so the disease begins to manifest as they age, indicating its advancement. The advancement of the disease means liver damage. Although the risks of the disease increase with age, the sexual activities of youth have also made this group a high-risk group (Ola et al., 2008).

HCV mode of transmission in the US

Injection Drug Use (IDU) is a transmission mode of HCV in the US and other parts of the world. Injection drug use by people injecting drugs is a faster mode of transmission. A blood transfusion that is not adequately screened is also a mode of transmission in the US and worldwide.

The amount of the infection determines its ability to be transmitted. For example, one-time sexual contact with an infected individual may not share the infection. Still, repeated sexual contact, which predisposes the individual to large amounts of the disease, may transmit the disease.² NPI,⁵

In the US, IDU is the most common mode of transmission of HCV.²⁵ Since 1997, there has been a significant decline in the incidence and prevalence of the disease, possibly due to needle exchange programs in the US. In the US, the mortality rate for HCV is eight times higher than that of HBV. The age range affected is primarily from 45 to 65 years old, i.e., the baby boomers.³³

Some factors prevent the progress of HBV and HCV prevention and treatment, which promote the incidence and prevalence of the disease.

At the conference in Glasgow, the WHO (2016) mapped out strategic plans to fight the disease that is a significant public health burden. One of the plans focused on information giving to increase awareness (WHO, 2016). The attitude towards the infection of HBV and HCV, which includes stigmatization, is one factor that affects the diagnosis and treatment of the disease. There is a need for teaching interventions, which is the focus of this study. The goal is to change the attitudes toward viral hepatitis.³⁴ A study has found that the risk of infection depends on the knowledge of the infected person; therefore, health education must improve knowledge of the disease and reduce the risk of infection.³⁵

HBV mode of transmission in Nigeria

HCV virus is a single-stranded RNA virus. HCV is coated with protein and lives in a lipid envelope. It is highly infectious based on the viral load, even more than HIV, and very persistent 60. The mode of transmission and risk Ejiiofactors of the HCV virus is multifaceted. The method of transmission can vary depending on the location. In western countries such as the US, intravenous drug users (IDUs) constitute the highest risk for acquiring HCV. IDU needle-sharing behaviors can be a significant mode of HCV transmission. In sub-Saharan Africa, IDU needle-sharing behaviors are not a standard mode of transmission for HCV; instead, the transfusion of blood and blood product is the most common mode of transmission in Nigeria.⁶

Sub-Saharan Africa's transmission through blood and blood products has decreased due to screening efforts such as better screening equipment. Blood transfusion poses a high risk of infection, especially for regions that have not implemented routine HCV donor screening. Nigeria implements a safe blood program led by the Safe Blood for Africa Foundation (SBFA). SBFA was initiated originally to fight the HIV and AIDS spread in Africa (Obienu et al., 2011).

HCV is less likely to be transmitted by a single small dose exposure (unlike HBV). HCV is most likely transmitted via repeated blood exposure and large amounts of percutaneous blood exposure, such as blood transfusion, transplantation, or intravenous drug use or abuse.¹⁵

The varied number of genotypes and strands of the infection in the US makes it difficult to determine particular modes of transmission of this disease. Therefore, there is an urgent need for government and non-governmental organizations to create awareness of the disease and pinpoint the different modes of transmission. In Nigeria, the other mode of transmission is blood transfusions that are not adequately screened.

The following are modes of transmitting the HCV infection. Sexual activities such as having multiple sex partners can put an

individual at risk of acquiring HCV. Also, using medical/surgical equipment that is not well sterilized and reusing needles used on infected individuals to inject other individuals may transmit the HCV infection. It is also found that vertical transmission of HCV infection from HCV-infected mom to baby during childbirth may transmit HCV infection. Sometimes family members who live together or friends who live near each other may share household items such as razors, toothbrushes, and knives. Sharing personal items may be a mode of transmitting the HCV infection. Other ways of transmitting the infection include not covering wounds properly, opening and draining tonsillitis by local healers, and inducing abortion.³⁵

Risk factors for HCV infections include multiple sexual partners, prostitutes, and anal sexual activities. According to a study conducted in Nigeria, butchers risk transmitting the infection due to their profession and lifestyle (Nigeria, n.d.). Blood donation/transfusion, health care workers (including physicians, nurses, dental workers, and nurse's aides), needle sticks, sickle cell patients who receive blood frequently, and individuals receiving hemodialysis are possible modes of transmitting the infection in

Nigeria, according to studies. Possible modes of transmitting the infection make it essential to create awareness of modes of transmission for HBV and HCV to prevent the high prevalence of the infections.

The cost of hepatitis infection therapy

The importance of preventing viral hepatitis incidence and prevalence worldwide cannot be overstated. Once an individual is diagnosed with the infection, the following action will be a treatment regimen. Medication treatment is vital, but the cost of viral hepatitis medicine is exorbitant, making it unaffordable for many, especially in developing countries. The WHO called for reducing HCV costs.¹⁰ It is estimated that it will cost \$3.96 billion to treat HCV-infected intravenous drug users (IDUs) in Canada between 2006 and 2026.³⁷ Barber et al. collected data on the prices for the following current medications for HCV treatment: Sofosbuvir, Daclatasvir, Sofosbuvir/Ledipasvir, Sofosbuvir/Velpatasvir, and Glecaprevir/Pibrentasvir. Table 4 for a summary of Barber et al. findings on the costs of treating HCV.

Table 4 HCV Treatment Costs

| | Median originator prices per standard course | Estimated cost-based generic prices for a 12-week course |
|--------------------------|--|--|
| Sofosbuvir | \$40,502 | \$28 |
| Daclatasvir | \$26,928 | \$4 |
| Ledipasvir | | \$31 |
| Velpatasvir | | \$58 |
| Sofosbuvir/Ledipasvir | \$46,812 | \$58 |
| Sofosbuvir/Velpatasvir | \$34,381 | \$85 |
| Glecaprevir/Pibrentasvir | \$30,710 | API cost data were insufficient to calculate an estimate for G/P |
| Sofosbuvir/daclatasvir | | \$31 |

Note: From "National Guideline for Prevention, Care and Treatment of viral HBV & C in Nigeria", 2016, (<https://www.hepb.org/assets/Uploads/Nigeria-Hepatitis-Guidelines-TX-guidelines.pdf>). Copyright 2016 by the Federal Ministry of Health, Abuja, Nigeria.

The cost of HBV and HCV therapy in the US

The medication management of individuals living with HBV or HCV is crucial. Medication management is the most important means of reducing morbidity and mortality associated with the disease. However, the cost of treatment for viral HCV continues to be very high. There is an improvement in new medicines for the treatment of HCV, but the price is also very high. It costs an estimated \$84,000 for a 12-week course of treatment (Henry, 2018).

The cost of HBV and HCV therapy in Nigeria

The cost of HBV and HCV therapy is costly but still available to the public, especially in government hospitals and clinics. Lack of information creates poor access to treatment. Some carriers who embark on traditional treatment may be misdiagnosed and therefore not receive appropriate therapy, especially in rural areas. Barber et al. listed cost of treatment for 50 countries but did

not provide costs for Nigeria, however, costs for the 50 countries provide an approximation of cost of treatment in Nigeria.

The epidemiology of HBV and HCV in Nigeria

The morbidity and mortality that HBV infection causes worldwide are alarming. The morbidity and mortality of HBV infections are considered a major worldwide epidemic.⁹ The infection can be symptomatic or asymptomatic. HBV infection does not make the individual symptomatic; most infected people recover without any residual effect of the disease. An estimated 5% to 10% of the infected individuals become chronically infected with the disease (Liang, 2009). Some chronic carriers of the disease manifest mild liver disease while others further progress to cirrhosis and Hepatocellular Carcinoma (HCC).⁸ The type of HBV infection determines if infection occurs or not or the level of infection. The shape of HBV is spherical, and the smaller DNA, 20nm by 22nm, is not infectious, while the more significant 42 nm DNA virus is infectious.

Symptoms of HBV infection

The symptoms can be mild complaints of not feeling well, tiredness, severe symptoms of liver failure, and/or jaundice.⁸ HBV symptoms mainly manifest in an individual depending on the disease's phase. The incubation phase which takes six weeks to one year before the initial symptom of illness shows (Nigeria, 2022), pre-icteric prodromal (brief, 1-7 days, fatigue, fever, body aches, nausea, anorexia, high ALT, HBsAg, HBV DNA), then, jaundice and dark urine, Icteric (lasts 1 – 2 weeks, decrease viral level) and convalescence (up to 4 weeks, symptoms, HBsAg, HB DNA clears). It also depends on whether it is acute or chronic. In the acute phase, 1% get liver failure from fulminant hepatitis with symptoms of fever, abdominal pain, and encephalopathy symptoms – disorientation, confusion, and coma. In the fulminant stage, HBV surface Antigen and HBV DNA levels fall, while in chronic hepatitis, the levels rise. Also, some of the symptoms associated with HBV are fatigue, nausea, increased jaundice, dark urine, fever, anorexia, body aches, and abdominal pain.⁸

Signs and symptoms of HCV

The signs and symptoms of HCV include fatigue, malaise, itchy skin, yellowish eye discoloration, and bleeding skin. The symptoms of the infection may vary based on the level of the infection. Viral hepatitis may manifest the following symptoms, an elevated ALT, liver inflammation, and fibrosis. Chronic viral hepatitis may show symptoms such as palmar erythema, splenomegaly, gynecomastia, and fector hepaticus. Additionally, advanced cirrhosis may also show symptoms of ascites, peripheral edema, encephalopathy, and GI bleeding. Platelet levels decrease in the last stage, and AST, bilirubin, prothrombin time, and albumin are abnormal.

Mode of transmission

Health education will address the mode of transmission for this disease. This will eliminate some misconceptions and affirm the actual modes from which the disease can be transmitted. In the US, the predominant modes of transmission are sexual transmission and needle sharing by drug addicts. Other modes of transmission include perinatal and inadequately cleaned surgical tools and other equipment. In Nigeria, as well as other countries in sub-Saharan Africa, horizontal transmission, blood transfusion, and non-hygiene-conscious removal of tonsillitis by local individuals who are not trained ranked higher than needle sharing by drug addicts.³⁶ Indeed, universal precaution and health teaching will also cover the importance of hand hygiene, either by hand washing or hand sanitizer, which has been found to reduce infection transmission.

The co-morbidity of HBV and HCV

The morbidity and mortality of HBV and HCV are also magnified by the co-morbidity of the infection with other diseases. There are different co-morbidities of HBV and HCV infection.

1. Co-morbidity with HIV/AIDS
2. Co-morbidity with other hepatitis (HBV and HCV, HCV and HAV).

3. Co-morbidity with mental health such as depression
4. Co-morbidity with substance abuse
5. Co-morbidity with diabetes mellitus

Co-morbidities of HBV and HCV and HIV/AIDS infections

HBV and HCV infection can affect different body organs such as the liver, possibly causing liver failure, cirrhosis of the liver, and Hepatocellular Carcinoma (HCC), a type of liver cancer. It can also affect the pancreas. HBV and HCV infection have also affected some individuals living with HIV/AIDS. A study in Nigeria found that the co-infection of HBV and HIV is suggested to be a result of parental and sexual routes of transmission.⁴⁰ It was also found that among the HIV/AIDS-infected individuals in Nigeria (a country with 3.6% of the population living with HIV/AIDS and the second-highest number of HIV/AIDS mortality after South Africa), 7.9% of the 443 patients studied have HIV, and HCV co-infection and 2.3% of the same group of patients have HIV and HCV co-infection respectively. Some patients are infected with all three infections-HIV, HBV, and HCV, 0.7% of the group. The patients with co-infection of all three were found to have the lowest CD4 count (97 cells/ul), while the others with co-infection of either HBV or HCV and HIV have a low CD4 count of 205 cells/ul.⁴ Additionally, a co-morbidity of HIV/AIDS with HBV and HCV among pregnant women has been found.⁴¹

Psychiatric

There is comorbidity between HCV and psychiatric Mental Health Co-morbidity with Viral Hepatitis: diseases such as depression. It is suggested that HCV carriers be screened for mental health symptoms before starting antiviral drugs to determine the best treatment option to avoid drug interaction and improve quality of life.

Co-morbidity with substance abuse

HBV and HCV can affect the same individual in the substance abuse population at the same time. This is the case, especially with HCV patients whose predominant mode of transmission is intravenous drug use, especially in the US and other Western countries. This is due to drug users and abusers sharing needles and transferring the infection via the needles. The use of injection drugs, as in the case of persons who inject drugs (PWIDs), has a strong relationship with HCV infection. Other modes of transmission mentioned earlier may be controversial or questionable, especially in developing countries.^{42,43}

HBV and HCV co-morbidity with diabetes mellitus

There has been an association between HCV genotype 3 and Diabetes Mellitus type 2.⁴⁰ Diabetes mellitus is also associated with cirrhosis (Muhammad, 2013). There is an association between HCV and chronic kidney disease (CKD) patients (Chen et al., 2013).

Methodology

Research methodology refers to the process utilized in collecting data to find out the level of HBV and HCV awareness, knowledge, and attitude of Nigerian immigrants in the US. The methodology will address the data collection, the population, the sample, the research design, the procedure, and the method of data analysis used in conducting the study.

Population and sample

The target population for this research was adult Nigerian-born immigrants in the US, 18 years and over, living in the US. Using the people in the communities ensured that people of various socioeconomic statuses were represented regardless of their religion, gender, socioeconomic status, and immigration status. A random selection of men and women was surveyed.

The inclusion criteria were that the participant must be born in Nigeria, 18 years and above, and live in the US during the research. Along with the gender and age group of the participants, ethnic group, marital status, education level, and socioeconomic status were also examined. A sample size of 200 participants was targeted. The survey monkey link was sent to 200 emails from the above population. There were 132 (66%) who responded and participated in the survey.

Research design

This study was conducted using a quantitative method of data collection.

Descriptive statistics such as contingency tables were used for data analysis in this study. It analyzed the perceptions, educational awareness, and behaviors among Nigerian immigrants in the US toward HBV and HCV infection. This type of design used percentages and averages (parameters) to describe and synthesize data in quantitative research.

Fisher's exact test was employed to determine if significant differences existed between two proportions or if an association existed between two categorical variables.⁴⁴ Also, Fisher's exact test is usually more accurate than the chi-square test when the expected numbers are small.

Scale and nominal measurements were used in this study to assign numbers to different categories such as ethnicity (Igbos, Hausa, Yorubas, or other), gender, marital status, and professional affiliation.⁴⁵ A variety of research was reviewed.⁴⁴

The statistical package for social science

ces (SPSS) was used to analyze the study. SPSS is a widely used program for statistical analysis in social sciences, particularly in education and research.⁴⁶

Procedures

Taylor et al.⁴⁷ used the Cambodian Health Project survey instrument and the researcher modified the survey instrument for this study. The researcher obtained permission from the authors to use the survey instrument. The survey was then modified to survey Nigerian immigrants living in the US and their perceptions, educational awareness, and behaviors about HBV and HCV. There were 51 items on the survey that consisted of demographic characteristics (13 items) and Nigerian immigrants living in the US perceptions, educational awareness, and behaviors regarding HBV and HCV (38 items). The participants for the research were randomly selected. Inclusion criteria were adult males and females who migrated from Nigeria (not any other African country) and could utilize computers or cell phones to complete the research survey. The web-based survey contained a consent form that allowed participants to either agree to take the survey or opt-out. The survey took approximately 15 minutes for participants to complete. The participants were informed of their anonymity in participating in the survey.

The demographic variables (6 items) from the survey used in the analysis were: gender, age group, ethnic group, marital status, education level, and socioeconomic status. Thirty-two items from the survey used in the analysis examined participants' perceptions, educational awareness, and behaviors about HBV and HCV. Namely, one question item (Q6) from the survey looked at the perceptions of the use of western and traditional medicine among Nigerians, and the responses consisted of western medicine (1), traditional medicine (2), and both types of medicine (3) categories. Twenty-four question items (Q18_1 thru Q18_15, Q19 thru Q23, Q38) from the survey looked at the perceptions of HBV or HCV infection among Nigerians, and the responses consisted of yes (1), no (2), and not sure/don't know (3) categories. Three question items (Q12, Q24, Q30) from the survey looked at the educational awareness of HBV or HCV among Nigerians, and the responses consisted of yes (1), no (2), and not sure/don't know (3) categories. Four question items (Q13, Q15, Q16, Q28) from the survey looked at the HBV or HCV infection behaviors among Nigerians, and the responses consisted of yes (1), no (2), and not sure/don't know (3) categories. The question items that reflect the participants' perceptions, educational awareness, and behaviors are detailed in Table 5.

Table 5 Question items used in the study's analysis

| | Question Items | Question |
|---|----------------|--|
| Perception of use of western and traditional medicine | Q6 | In general, what do you think is the best way to treat health problems (Traditional, Western, Both types)? |
| | Q18_1 | Do you think HBV can be spread by eating food prepared by an infected person? |
| | Q18_2 | Do you think sharing spoons/forks with an infected person can spread HBV? |
| | Q18_3 | Do you think sharing toothbrushes with an affected person can spread HBV? |
| | Q18_4 | Do you think sharing razors with an affected person will spread HBV? |
| | Q18_5 | Do you think an infected person can spread HBV by coughing? |
| | Q18_6 | Do you think an infected person can spread it through hand shaking? |
| | Q18_7 | Do you think HBV can be spread during sexual intercourse with an infected person? |
| | Q18_8 | Do you think HBV can be spread from an infected mother to baby? |
| | Q18_9 | Do you think sharing needles with an Infected person can spread HBV? |
| | Q18_10 | Do you think tribal marking is a risk of getting HBV? |
| Perceptions of HBV or HCV infection | Q18_11 | Do you think getting a tattoo is a risk of getting hepatitis? |
| | Q18_12 | Do you think local ear piercing is a risk of getting HBV? |
| | Q18_13 | Do you think native doctor or herbalists performing tonsillectomy is a risk of getting HBV? |
| | Q18_14 | Do you have more than one sexual partner? |
| | Q18_15 | Are you comfortable with your partner? |
| | Q19 | Do you think an infected person who looks and feels healthy can spread HBV and/or HCV? |
| | Q20 | Do you think other people sometimes avoid people with HBV and/or HCV? |
| | Q21 | Do you think HBV and/or HCV can cause liver cancer? |
| | Q22 | Do you think people can be infected with HBV for life? |
| | Q23 | Do you think there is any treatment for HBV? |
| | Q38 | Do you think that weight loss or gain has any effect on HBV and/or HCV? |
| Educational awareness of HBV or HCV | Q12 | Have you heard of HBV and/or HCV? |
| | Q24 | Has a doctor ever told you that you should be tested for hepatitis? |
| | Q30 | Have you ever read information on HBV and/or HCV? |
| | Q13 | Have you ever had a blood test specifically for HBV and/or HCV? |
| HBV or HCV infection behaviors | Q15 | Have you ever had shots (vaccinations) to prevent you from getting HBV? |
| | Q16 | Did you complete the HBV shots (3 times)? |
| | Q28 | Have you ever asked a doctor to test you for HBV and/or HCV? |

Variables

The independent research variables were demographic: gender, age group, ethnic group, marital status, education level, and socioeconomic status. The dependent variables were the perceptions, educational awareness, and behaviors regarding HBV and HCV among Nigerian immigrants in the US. Namely, the perceptions of the use of western and traditional medicine, perceptions of HBV or HCV infection, educational awareness, and HBV or HCV infection behaviors stemming from the 32 question items of the survey instrument. Figure 1 presents the relationship between this study's independent and dependent variables.

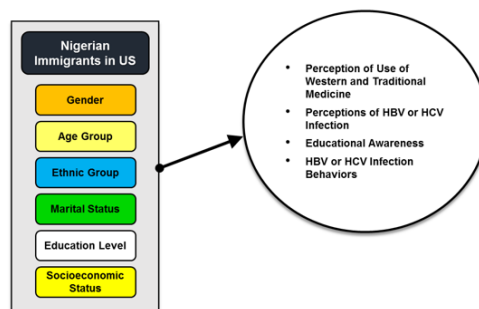


Figure 1 Relationship between the independent and dependent variables in this study.

Methods of data analysis

This is a **quantitative** study of the effect of HBV and HCV infection health education/awareness on Nigerian immigrants living in the US.

A method of **random sampling** was used to determine the participants of the research. Using the random sampling method ensured that all Nigerian immigrants that reside in the US had an equal opportunity to be selected for the survey.²¹

Simple random sampling was used to choose the survey participants.

The sampling further stratified the immigrants according to the different ethnic groups of Nigeria in the region: Igbos, Hausa, and Yorubas, males, females, and professions²¹ The tribe of origin for the individual participants was indicated in the questionnaire.

Data collected for the study were analyzed using the SPSS statistical package. Descriptive statistics were used to analyze the four research questions. The inferential statistic was the Fishers Exact test employed to test each of the hypotheses at an alpha level of .05. Fisher's exact test is used to determine if significant differences exist in the perceptions, educational awareness, and behaviors regarding HBV and HCV among Nigerian I-immigrants living in the US based on their gender, age group, ethnic group, marital status, education level, and socioeconomic

status. Fisher's exact test was used instead of Chi-square since this study's expected numbers were small.

Hypotheses

The hypotheses are

H₀₁: There is no difference in the perception of the use of western and traditional medicine among Nigerian immigrants living in the US based on their gender, marital status, age group, ethnic group, education level, or socioeconomic status.

H₀₂: There is no difference in the perceptions of HBV or HCV infection among Nigerian immigrants living in the US based on their gender, age group, ethnic group, marital status, or socioeconomic status.

H₀₃: There is no difference in the educational awareness of HBV or HCV among Nigerian immigrants living in the US based on their gender, marital status, ethnic group, age group, socioeconomic status, or education level.

H₀₄: There is no difference in HBV or HCV infection behaviors among Nigerian immigrants living in the US based on their gender, marital status, age group, ethnic group, education level, or socioeconomic status.

See Table 6 for a summary of this study's hypotheses.

Table 6 Data Analysis Schema Data

| Research question | Hypothesis | Independent variable | Dependent variable | Statistical procedure |
|-------------------|-----------------|---|--|-----------------------|
| 1 | H ₀₁ | Selected demographic variables: a. Gender b. Age Group c. Ethnic Group d. Marital Status e. Education Level f. Socioeconomic Status | Perceptions of Use of Western and Traditional Medicine | Fisher Exact Test |
| 2 | H ₀₂ | Demographic Variables: a. Gender b. Age Group c. Ethnic Group d. Marital Status e. Education Level f. Socioeconomic Status | Perceptions of HBV or HCV Infection | Fisher Exact Test |
| 3 | H ₀₃ | a. Demographic Variables: b. Gender c. Age Group d. Ethnic Group e. Marital Status f. Education Level g. Socioeconomic Status | Educational Awareness | Fisher Exact Test |
| 4 | H ₀₄ | Demographic Variables: g. Gender h. Age Group i. Ethnic Group j. Marital Status k. Education Level l. Socioeconomic Status | HBV or HCV Infection Behaviors | Fisher Exact Test |

Research

This chapter analyzes the perceptions of medicinal use in the US vs. Nigeria, the perception of HBV and HCV infections, educational awareness, and behaviors regarding HBV and HCV among Nigerian immigrants living in the US.

Data collection

The data collection for this research started in September 2016 via a Survey Monkey questionnaire and ended in March 2017. The target population for this study was 200 adult (18 years and older) Nigerian immigrants living in the US. Gender, marital status, ethnic group, age group, marital status, education level, and socioeconomic status of participants were reviewed. Participants were solicited via email, text messaging, phone calls, and face-to-face to participate in this study. The participants had the option to opt out of the survey at any time. The confidentiality of their information was reiterated several times to encourage participation. The survey took approximately 15 to 30 minutes for participants to complete.

Once the survey was closed, there were a total of 132 (66%)

participants who responded to the survey. Each of the participant's responses was collected and codified. The data collected were then opened in Microsoft Excel, where any identifiable information was removed to protect the identity of participants. Next, the data was saved and opened in SPSS for analysis. An alpha level of .05 was used to test the hypotheses. Initially, the researcher considered using chi-square to analyze the data collected; however, because the expected numbers were small, the Fisher exact test was deemed more appropriate to analyze the data for precision and accuracy.

Respondent's demographic characteristics

There were 132 participants who participated in this study. The ethnic group composition of the respondents consisted of Igbos, Yorubas, and Others. Igbos made up the majority of the respondents (84%) in this study, while Yorubas (8%) made up the second largest representation. There were more men (56.5%) than women (43.5%) in this study. Most of the responses came from participants who were 50 and older (43%), married (69%), with a master's degree (32%), and with an income level of \$81,000 and above (55%). Table 7 presents the findings of the demographics.

Table 7 Demographic Characteristics of the Respondents

| | Frequency | Percent |
|-------------------------|-----------|---------|
| Gender | | |
| Male | 61 | 56.5% |
| Female | 47 | 43.5% |
| Total | 108 | 100.0% |
| Ethnic Group | | |
| Igbos | 81 | 84.4% |
| Yorubas | 8 | 8.3% |
| Other | 7 | 7.3% |
| Total | 96 | 100.0% |
| Marital Status | | |
| Single | 29 | 27.9% |
| Married | 72 | 69.2% |
| Separated | 2 | 1.9% |
| Other | 1 | 1.0% |
| Total | 104 | 100.0% |
| Age Group | | |
| 18 to 24 | 10 | 9.3% |
| 25 to 30 | 9 | 8.3% |
| 31 to 37 | 10 | 9.3% |
| 38 to 43 | 15 | 13.9% |
| 44 to 49 | 20 | 18.5% |
| 50 and older | 44 | 40.7% |
| Total | 108 | 100.0% |
| Education Level | | |
| High School | 4 | 3.7% |
| Associate | 11 | 10.2% |
| Bachelors | 30 | 27.8% |
| Masters | 35 | 32.4% |
| Nurse Practitioner (NP) | 1 | 0.9% |
| Medical Doctor (MD) | 3 | 2.8% |
| Doctorate | 21 | 19.4% |
| Other | 3 | 2.8% |
| Total | 108 | 100.0% |

Table 7 Continued...

| | Frequency | Percent |
|----------------------|-----------|---------|
| Socioeconomic Status | | |
| Less than \$25,000 | 9 | 8.3% |
| \$25,000 - 30,000 | 6 | 5.6% |
| \$31,000 - 40,000 | 6 | 5.6% |
| \$41,000 - 50,000 | 10 | 9.3% |
| \$51,000 - 60,000 | 4 | 3.7% |
| \$61,000 - 70,000 | 8 | 7.4% |
| \$71,000 - 80,000 | 6 | 5.6% |
| \$81,000 and above | 59 | 54.6% |
| Total | 108 | 100.0% |

Perception of use of western and traditional medicine

RQ1: Is there a difference in the perception of the use of western and traditional medicine among Nigerian immigrants living in the US based on their gender, marital status, age group, ethnic group, education level, or socioeconomic status?

H_{01} : There are no differences in the perception of the use of western and traditional medicine among Nigerian immigrants living in the US based on their gender, marital status, age group, ethnic group, education level, or socioeconomic status.

Research question one sought to determine whether differences existed in the perceptions of the use of western and traditional medicine among Nigerians living in the US based on their gender, marital status, age group, ethnic group, education level, and socioeconomic status. The question item (Q6) from the survey that looked at the perceptions of the use of western and traditional medicine among Nigerians was used in this analysis, and responses consisted of western medicine (1), traditional medicine (2), and both types of medicine (3), categories. Fisher exact tests were performed to compare the perceptions of the use of western and traditional medicine among Nigerians and the demographic variables mentioned separately.

A statistically significant interaction was found among the ethnic groups of Nigerians and their perceptions of Western and traditional medicine use (Fisher exact test, $p=.035$). Examination of the within-ethnic group column found that respondents from the Igbos (67%) and the Yorubas (67%) considered western medicine as the best way to treat health problems than respondents from the other ethnic groups (25%). It was also found that respondents from the other ethnic groups (75%) considered both types of medicine as the best way to treat health problems than the Igbos (33%) and the Yorubas (17%). Respondents from the Yorubas (17%) were the only ethnic group considering traditional medicine the best way to treat health problems. Thus, the null hypothesis was rejected for the ethnic group.

Conversely, there was no statistically significant interaction found between gender (Fisher exact test, $p=.487$), marital status (Fisher exact test, $p=.379$), age group (Fisher exact test, $p=.927$), an education level (Fisher exact test, $p=.392$), or socioeconomic status (Fisher exact test, $p=.186$) in the perception of the use of western and traditional medicine among Nigerians living in the US. The null hypothesis was retained for gender, marital status, age group, education level, and socioeconomic status. The significant results of the Fisher exact test for ethnic groups are illustrated in Table 8.

Table 8 Fisher Exact Test Results for Ethnic Group and What Respondents thought was the Best Way to Treat Health Problems (Q6)

| Types of medicine | Ethnic group | | |
|-------------------|--------------|-----------|-----------|
| | Igbos | Yorubas | Other |
| Western | 46 (66.7%) | 4 (66.7%) | 1 (25.0%) |
| Traditional | 0 (0.0%) | 1 (16.7%) | 0 (0.0%) |
| Both types | 23 (33.3%) | 1 (16.7%) | 3 (75.0%) |

Note: Fisher exact test, $p = .035$. Column percentages in parentheses.

Perceptions of HBV or HCV infection

RQ2: Is there a difference in how Nigerian immigrants living in the US gender, age group, ethnic group, marital status, or socioeconomic status affect their perceptions of HBV or HCV infection?

H_{02} : There are no differences in the perception of the use of western and traditional medicine among Nigerian immigrants living in the US based on their gender, marital status, age group, ethnic group, education level, or socioeconomic status. Research question two sought to determine whether differences existed in the perceptions of HBV or HCV infection among Nigerians living in the US based on their gender, marital status, age group, ethnic group, education level, and socioeconomic status. The question

items (Q18_1 thru Q18_15, Q19 thru Q23, Q38) from the survey that looked at the perceptions of HBV or HCV infection among Nigerians were used in this analysis, and responses consisted of yes (1), no (2), and not sure/don't know (3) categories. Fisher exact tests were performed to compare the perceptions of HBV or HCV infection among Nigerians and the demographic variables mentioned separately.

A statistically significant interaction was found between Nigerian men and women on their perceptions of HBV or HCV infection regarding question items Q18_7 (Fisher exact test, $p=.019$) and Q18_8 (Fisher exact test, $p=.039$). Examination of the gender column found that the women (83%) thought HBV could be spread during sexual intercourse compared to 61% of men. It was also found that men (20%) thought HBV could be spread during

sexual intercourse compared to 4% of women. Twenty percent of men were unsure or did not know whether they thought HBV could be applied during sexual intercourse compared to 13% of women. The significant results of the Fisher exact test for gender as to Q18_7 are presented in Table 9.

Examination of the within gender column found for Q18_8 that women (81%) thought HBV could be spread from an infected mother to baby compared to 68% of men. It was also found that men (11%) did not think HBV could be spread from an infected mother to baby, while there were no responses from the women.

Table 9 Fisher Exact Test Results for Gender and Whether Respondents think HBV Can Be Spread through Sexual Intercourse (Q18_7)s

| Responses | Gender | |
|----------------|------------|-----------|
| | Men | Women |
| Yes | 37 (60.7%) | 2 (83.3%) |
| No | 43 (19.7%) | 42 (4.2%) |
| Not sure/Don't | 1 (19.7%) | 4 (12.5%) |

Note: Fisher exact test, $p = .019$. Column percentages are in parentheses.

Table 10 Exact Test Results for Gender and Whether Respondents think HBV Can Be Spread from an Infected Mother to baby (Q18_8)

| Responses | Gender | |
|----------------|------------|------------|
| | Men | Women |
| Yes | 42 (67.7%) | 38 (80.9%) |
| No | 7 (12.5%) | 0 (0.0%) |
| Not sure/Don't | 13 (21.0%) | 9(19.1%) |

Note: Fisher exact test, $p = .039$. Column percentages are in parentheses.

A statistically significant interaction was found among the age group of Nigerians on their perceptions of HBV or HCV infection regarding question items Q18_3 (Fisher exact test, $p=.010$), Q18_10 (Fisher exact test, $p=.037$), Q18_11 (Fisher exact test, $p=.001$), Q18_12 (Fisher exact test, $p=.024$), Q18_13 (Fisher exact test, $p=.012$), and Q21 (Fisher exact test, $p=.038$). Examination of the within age group column for Q18_3 found that respondents between 44 and 49 (75%) thought that sharing toothbrushes with an affected person can spread HBV compared to 74% of respondents 50 and older, 67% of respondents between 38 and 43, 50% of respondents between 31 and 37, 44% of respondents between 25 and 30, and 30% of respondents between 18 and 24. It was also found that respondents between 38 and 43 (33%) did not think sharing toothbrushes with an affected person could spread HBV compared to respondents from the other age groups. Forty percent of respondents between 18 and 24 were unsure or did not know whether sharing toothbrushes with an affected person can spread HBV compared to respondents from the other age groups. Thus, the null hypothesis was rejected for the age group regarding Q18_3. The significant results of the Fisher exact test for the age group as to Q18_3 are presented in Table 11.

Examination of the within age group column for Q18_10 found that respondents between 44 and 49 (85%) thought that tribal marking is a risk of HBV compared to respondents from the other age groups. It was also found that respondents between 25 and 30 (38%) did not think that tribal marking is a risk of contracting HBV compared to respondents from the other age groups. Fifty percent of respondents between 18 and 24 were unsure or did not know whether tribal marking is a risk of contracting HBV compared to respondents from the other age groups. Thus, the null hypothesis was rejected for the age group regarding Q18_10.

Twenty-one percent of men were unsure or did not know whether HBV can be spread from an infected mother to baby compared to 19% of women. Thus, the null hypothesis was rejected for gender regarding Q24 and Q30.

Conversely, no significant interaction was found in the perceptions of HBV or HCV infection among Nigerian men and women regarding question items Q18_1 thru Q18_6, Q18_9 thru Q18_15, Q19 thru Q23, Q38 Q18_15, Q19 thru Q23, Q38. The significant results of the Fisher exact test for gender as to Q18_8 are presented in Table 10.

The significant results of the Fisher exact test for the age group as to Q18_10 are presented in Table 12.

Examination of the within-age group column for Q18_11 found that respondents between 38 and 43 (93%) thought that getting a tattoo is a risk of contracting HBV compared to respondents from the other age groups. It was also found that respondents between 25 and 30 (44%) did not think that getting a tattoo is a risk of contracting HBV compared to respondents from the other age groups. Thirty percent of respondents between 18 and 24 were unsure or did not know whether getting a tattoo is a risk of contracting HBV compared to respondents from the other age groups. Thus, the null hypothesis was rejected for the age group regarding Q18_11. The significant results of the Fisher exact test for the age group as to Q18_11 are presented in Table 13.

Examination of the within-age group column for Q18_12 found that respondents between 31 and 37 (90%) thought that Local ear piercing is a risk of getting HBV compared to respondents from the other age groups. It was also found that respondents between 25 and 30 (44%) did not think that getting a tattoo is a risk of contracting HBV compared to respondents from the other age groups. Twenty-eight percent of respondents between 50 and older were unsure or did not know whether getting a tattoo is a risk of contracting HBV compared to respondents from the other age groups. Thus, the null hypothesis was rejected for the age group regarding Q18_12. The significant results of the Fisher exact test for the age group as to Q18_12 are presented in Table 14.

Examination of the within age group column for Q18_13 found that respondents between 44 and 49 (95%) thought that native doctor or herbalists performing tonsillectomy is a risk of getting HBV compared to respondents from the other age groups. It was

also found that respondents between 25 and 30 (22%) did not think that native doctor or herbalists performing tonsillectomy is a risk of getting HBV compared to respondents from the other age groups. Fifty percent of respondents between 18 and 24 were unsure or did not know whether native doctors or herbalists

performing tonsillectomy is a risk of getting HBV compared to respondents from the other age groups. Thus, the null hypothesis was rejected for the age group regarding Q18_13. The significant results of the Fisher exact test for the age group as to Q18_13 are presented in Table 15.

Table 11 Fisher Exact Test Results for Age Group and Whether Respondents Think Sharing Toothbrushes with an Affected Person can Spread HBV (Q18_3)

| Responses | Age group | | | | | |
|----------------|-----------|-----------|---------|------------|----------|------------|
| | 18-24 | 25-30 | 31-37 | 38-43 | 44-49 | 50-above |
| Yes | 3 (30%) | 4 (44.4%) | 5 (50%) | 10 (66.7%) | 15 (75%) | 34 (73.9%) |
| No | 3 (30%) | 2 (22.2%) | 3 (30%) | 5 (33.3%) | 1 (5%) | 3 (6.5%) |
| Not sure/Don't | 4 (40%) | 3 (33.3%) | 2 (20%) | 0 (0%) | 4 (20%) | 9 (19.6%) |

Note: Fisher exact test, $p = .010$. Column percentages in parentheses.

Table 12 Fisher Exact Test Results for Age Group and Whether Respondents Think Tribal Marking is a Risk of Getting HBV (Q18_10)

| Responses | Age group | | | | | |
|----------------|-----------|-----------|---------|------------|----------|------------|
| | 18-24 | 25-30 | 31-37 | 38-43 | 44-49 | 50-above |
| Yes | 5 (50%) | 4 (50%) | 8 (80%) | 11 (73.3%) | 17 (85%) | 31 (67.4%) |
| No | 3 (30%) | 3 (37.5%) | 2 (20%) | 3 (20%) | 0 (0%) | 7 (15.2%) |
| Not sure/Don't | 5 (50%) | 1 (12.5%) | 0 (0%) | 1 (6.7%) | 3 (15%) | 8 (17.4%) |

Note: Fisher exact test, $p = .037$. Column percentages are in parentheses.

Table 13 Fisher Exact Test Results for Age Group and Whether Respondents Think Tattoo is a Risk of Getting HBV (Q18_11)

| Responses | Age group | | | | | |
|----------------|-----------|-----------|-----------|------------|----------|------------|
| | 18-24 | 25-30 | 31-37 | 38-43 | 44-49 | 50-above |
| Yes | 7 (50%) | 5 (55.6%) | 7 (77.8%) | 14 (93.3%) | 18 (90%) | 32 (69.6%) |
| No | 0 (0%) | 4 (44.4%) | 2 (22.2%) | 1 (6.7%) | 0 (0%) | 1 (2.2%) |
| Not sure/Don't | 3 (50%) | 0 (0%) | 0 (0%) | 0 (0%) | 2 (10%) | 13 (28.3%) |

Note: Fisher exact test, $p = .001$. Column percentages are in parentheses.

Table 14 Fisher Exact Test Results for Age Group and Whether Respondents Think Local Ear Piercing is a Risk of Getting HBV Fisher Exact Test Results for Age Group and Whether Respondents Think Local Ear Piercing is a Risk of Getting HBV (Q18_12)

| Responses | Age group | | | | | |
|----------------|-----------|-----------|---------|------------|----------|------------|
| | 18-24 | 25-30 | 31-37 | 38-43 | 44-49 | 50-above |
| Yes | 6 (60%) | 5 (55.6%) | 9 (90%) | 10 (10.5%) | 17 (85%) | 30 (65.2%) |
| No | 2 (20%) | 4 (44.4%) | 1 (10%) | 3 (20%) | 0 (60%) | 3 (6.5%) |
| Not sure/Don't | 2 (20%) | 0 (0%) | 0 (0%) | 2 (13.3%) | 3 (15%) | 13 (28.3%) |

Note: Fisher exact test, $p = .024$. Column percentages are in parentheses.

Table 15 Fisher Exact Test Results for Age Group and Whether Respondents Think Native Doctors or Herbalists Performing Tonsillectomy is a Risk of Getting HBV (Q18_13)

| Responses | Age group | | | | | |
|----------------|-----------|-----------|-----------|-----------|----------|------------|
| | 18-24 | 25-30 | 31-37 | 38-43 | 44-49 | 50-above |
| Yes | 5 (50%) | 3 (33.3%) | 6 (60%) | 12 (80%) | 19 (95%) | 31 (67.4%) |
| No | 0 (0%) | 2 (22.2%) | 2 (22.2%) | 2 (22.2%) | 0 (0%) | 5 (10.9%) |
| Not sure/Don't | 5 (50%) | 4 (44.4%) | 2 (20%) | 1 (6.7%) | 1 (5%) | 10 (21.7%) |

Note: Fisher exact test, $p = .012$. Column percentages are in parentheses.

Examination of the within-age group column for Q18_21 found that respondents between 38 and 43 (100%) thought HBV and HCV can cause liver cancer compared to respondents from the other age groups. It was also found that respondents between 25 and 30 (11%) did not think that HBV and HCV can cause liver cancer compared to respondents from the other age groups. Forty percent of respondents between 18 and 24 were unsure or did not know whether HBV and HCV can cause liver cancer compared to

respondents from the other age groups. Thus, the null hypothesis was rejected for the age group regarding Q21.

Conversely, there was no significant interaction found on the perceptions of HBV or HCV infection among Nigerians age group as to question items Q18_1 (Fisher exact test, $p=.910$), Q18_2 (Fisher exact test, $p=.525$), Q18_4 (Fisher exact test, $p=.151$), Q18_5 (Fisher exact test, $p=.423$), Q18_6 (Fisher exact

test, $p=.308$), Q18_7 (Fisher exact test, $p=.245$), Q18_8 (Fisher exact test, $p=.297$), Q18_9 (Fisher exact test, $p=.110$), Q18_14 (Fisher exact test, $p=.157$), Q18_15 (Fisher exact test, $p=.144$), Q18_19 (Fisher exact test, $p=.432$), Q18_20 (Fisher exact test, $p=.397$), Q22 (Fisher exact test, $p=.687$), Q23 (Fisher exact test, $p=.501$), Q38 (Fisher exact test, $p=.970$). The significant results of the Fisher exact test for the age group as to Q21 are presented in Table 16.

A statistically significant interaction was found among the ethnic groups of Nigerians on their perceptions of HBV or HCV infection regarding question items Q18_15 (Fisher exact test, $p=.000$). Examination of the ethnic group column for Q18_15 found that respondents from the Igbos (95%) said they were comfortable with their partner compared to 75% of respondents from the Yorubas and 43% from the other ethnic groups. It was also found that respondents from the Yorubas (13%) said that they were not comfortable with their partner compared to 1% of respondents from the Igbos. Fifty percent of respondents from the other were unsure or did not know whether they were comfortable with their partner compared to respondents from the Yorubas (13%) and Igbos (4%). Thus, the null hypothesis was rejected for the ethnic group regarding Q18_15.

Conversely, there was no significant interaction found on the perceptions of HBV or HCV infection among Nigerian ethnic groups as to question items Q18_1 (Fisher exact test, $p=.706$), Q18_2 (Fisher exact test, $p=.202$), Q18_3 (Fisher exact test, $p=.082$), Q18_4 (Fisher exact test, $p=.158$), Q18_5 (Fisher exact test, $p=.096$), Q18_6 (Fisher exact test, $p=.565$), Q18_7 (Fisher exact test, $p=.578$), Q18_8 (Fisher exact test, $p=.832$), Q18_9 (Fisher exact test, $p=.856$), Q18_10 (Fisher exact test, $p=.795$), Q18_11 (Fisher exact test, $p=.960$), Q18_12 (Fisher exact test, $p=.710$), Q18_13 (Fisher exact test, $p=.674$), Q18_14 (Fisher exact test, $p=.427$), Q19 (Fisher exact test, $p=.354$), Q20 (Fisher exact test, $p=.161$), Q21 (Fisher exact test, $p=.142$), Q22 (Fisher exact test, $p=.122$), Q23 (Fisher exact test, $p=.917$), Q38 (Fisher exact test, $p=.546$). The significant results of the Fisher exact test for the ethnic group as to Q18_15 are presented in Table 17.

A statistically significant interaction was found between the marital status of Nigerians on their perceptions of HBV or HCV infection regarding question items Q18_3 (Fisher exact test, $p=.008$), Q18_5 (Fisher exact test, $p=.043$), Q18_15 (Fisher exact test, $p=.046$). Examination of the marital status column for Q18_3 found that respondents whose marital status was other (100%) thought that sharing toothbrushes with an affected person can spread HBV compared to 77% of respondents who are married, separated (50%), and single (41%). It was also found that single respondents (23%) did not think sharing toothbrushes with an

affected person could spread HBV compared to 1% of married respondents. Fifty percent of separated respondents were unsure or did not know whether sharing toothbrushes with an affected person can spread HBV compared to single (36%) and married (14%) respondents. Thus, the null hypothesis was rejected for marital status regarding Q18_3. The significant results of the Fisher exact test for marital status as to Q18_3 are presented in Table 18.

Examination of the within marital status column for Q18_5 found that respondents whose marital status was separated (50%) thought that an infected person could spread HBV by coughing compared to 25% of married and single respondents (23%). It was also found that married respondents (65%) did not think an infected person could spread HBV by coughing compared to 50% of single and separated (47%) respondents. A hundred percent of respondents whose marital status is other were unsure or did not know whether an infected person can spread HBV by coughing compared to single (30%) and married (10%) respondents. Thus, the null hypothesis was rejected for marital status regarding Q18_5. The significant results of the Fisher exact test for marital status as to Q18_15 are presented in Table 19.

Examination of the marital status column for Q18_15 found that respondents whose marital status was other (100%) said that they were comfortable with their partner compared to 96% of respondents who were married, single (83%), and separated (50%). It was also found that single respondents (3%) did not think they were comfortable with their partner compared to respondents from various marital statuses. Fifty percent of separated respondents were unsure or did not know whether they were comfortable with their partner compared to single (14%) and married (4%) respondents. Thus, the null hypothesis was rejected for marital status regarding Q18_15.

Conversely, there was no significant interaction found on the perceptions of HBV or HCV infection among Nigerian marital status as to question items Q18_1 (Fisher exact test, $p=.380$), Q18_2 (Fisher exact test, $p=.235$), Q18_4 (Fisher exact test, $p=.105$), Q18_6 (Fisher exact test, $p=.792$), Q18_7 (Fisher exact test, $p=.834$), Q18_8 (Fisher exact test, $p=.414$), Q18_9 (Fisher exact test, $p=.403$), Q18_10 (Fisher exact test, $p=.400$), Q18_11 (Fisher exact test, $p=.206$), Q18_12 (Fisher exact test, $p=.278$), Q18_13 (Fisher exact test, $p=.191$), Q18_14 (Fisher exact test, $p=.189$), Q19 (Fisher exact test, $p=.703$), Q20 (Fisher exact test, $p=.706$), Q21 (Fisher exact test, $p=.115$), Q22 (Fisher exact test, $p=.186$), Q23 (Fisher exact test, $p=.561$), Q38 (Fisher exact test, $p=.785$). The significant results of the Fisher exact test for marital status as to Q18_15 are presented in Table 20.

Table 16 Fisher Exact Test Results for Age Group and Whether Respondents think HBV Can Cause Liver Cancer (Q21)

| Responses | Age group | | | | | |
|----------------|-----------|-----------|---------|-----------|----------|------------|
| | 18-24 | 25-30 | 31-37 | 38-43 | 44-49 | 50-above |
| Yes | 6 (60%) | 6 (66.7%) | 7 (70%) | 15 (100%) | 14 (70%) | 39 (84.8%) |
| No | 0 (0%) | 1 (11.1%) | 0 (0%) | 0 (0%) | 2 (10%) | 0 (0%) |
| Not sure/Don't | 4 (40%) | 2 (22.2%) | 3 (30%) | 0 (0%) | 4 (20%) | 7 (15.2%) |

Note: Fisher exact test, $p = .039$. Column percentages are in parentheses.

Table 17 Fisher Exact Test Results for Ethnic Group and Whether Respondents are Comfortable with Their Partner (Q18_15)

| Responses | Ethnic group | | |
|----------------|--------------|-----------|-----------|
| | Igbos | Yorubas | Other |
| Yes | 76 (95%) | 6 (75%) | 3 (42.9%) |
| No | 1 (1.3%) | 1 (12.5%) | 0 (0.0%) |
| Not sure/Don't | 3 (3.8%) | 1 (12.5%) | 4 (57.1%) |

Note: Fisher exact test, $p = .000$. Column percentages are in parentheses.

Table 18 Fisher Exact Test Results for Marital Status and Whether Respondents Think Sharing Toothbrushes with an Affected Person can Spread HBV (Q18_3)

| Responses | Marital status | | | |
|----------------|----------------|------------|-----------|----------|
| | Single | Married | Separated | Other |
| Yes | 13 (41.9%) | 54 (77.1%) | 1 (50%) | 1 (100%) |
| No | 7 (22.6%) | 6 (8.6%) | 0 (0%) | 0 (0%) |
| Not sure/Don't | 11 (35.5%) | 10 (14.3%) | 1 (50%) | 0 (0%) |

Note: Fisher exact test, $p = .008$. Column percentages are in parentheses.

Table 19 Fisher Exact Test Results for Marital Status and Whether Respondents think an Infected Person Can Spread HBV by Coughing (Q18_5)

| Responses | Marital status | | | |
|----------------|----------------|-----------|-----------|-----------|
| | Single | Married | Separated | Other |
| Yes | 76 (95%) | 6 (75%) | 3 (42.9%) | 3 (42.9%) |
| No | 1 (1.3%) | 1 (12.5%) | 0 (0.0%) | 0 (0.0%) |
| Not sure/Don't | 3 (3.8%) | 1 (12.5%) | 4 (57.1%) | 4 (57.1%) |

Note: Fisher exact test, $p = .043$. Column percentages are in parentheses.

Table 20 Fisher Exact Test Results for Marital Status and Whether Respondents are Comfortable with Their Partner (Q18_15)

| Responses | Marital status | | | |
|----------------|----------------|-----------|-----------|-----------|
| | Single | Married | Separated | Other |
| Yes | 76 (95%) | 6 (75%) | 3 (42.9%) | 3 (42.9%) |
| No | 1 (1.3%) | 1 (12.5%) | 0 (0.0%) | 0 (0.0%) |
| Not sure/Don't | 3 (3.8%) | 1 (12.5%) | 4 (57.1%) | 4 (57.1%) |

Note: Fisher exact test, $p = .46$. Column percentages in parentheses.

A statistically significant interaction was found between the socioeconomic status of Nigerians on their perceptions of HBV or HCV infection regarding question item Q18_5 (Fisher exact test, $p=.021$). Examination of the socioeconomic status column found that respondents with income between \$51,000 and \$60,000 (75%) thought an infected person could spread HBV by coughing compared to respondents from another socioeconomic status. It was also found that respondents with income between \$61,000 and \$70,000 (75%) thought that an infected person could spread HBV by coughing compared to respondents from other socioeconomic statuses. Forty percent of respondents with income between \$31,000 and \$40,000 (40%) and between \$41,000 and \$50,000 (40%) thought that an infected person could spread HBV by coughing compared to respondents from another socioeconomic status. Thus, the null hypothesis was rejected for socioeconomic status regarding Q18_5.

Conversely, there was no significant interaction found on the perceptions of HBV or HCV infection among Nigerians socioeconomic status as to question items Q18_1 (Fisher exact test, $p=.088$), Q18_2 (Fisher exact test, $p=.186$), Q18_3 (Fisher exact test, $p=.779$), Q18_4 (Fisher exact test, $p=.205$), Q18_6 (Fisher exact test, $p=.309$), Q18_7 (Fisher exact test, $p=.141$), Q18_8 (Fisher exact test, $p=.427$), Q18_9 (Fisher exact test, $p=.586$), Q18_10 (Fisher exact test, $p=.262$), Q18_11 (Fisher exact

test, $p=.339$), Q18_12 (Fisher exact test, $p=.632$), Q18_13 (Fisher exact test, $p=.137$), Q18_14 (Fisher exact test, $p=.501$), Q18_15 (Fisher exact test, $p=.064$), Q18_19 (Fisher exact test, $p=.143$), Q18_20 (Fisher exact test, $p=.534$), Q18_21 (Fisher exact test, $p=.136$), Q22 (Fisher exact test, $p=.373$), Q23 (Fisher exact test, $p=.934$), Q38 (Fisher exact test, $p=.500$). The significant results of the Fisher exact test for socioeconomic status as to Q18_5 are presented in Table 21.

Educational awareness

RQ3: Is there a difference in the educational awareness of HBV or HCV among Nigerian immigrants living in the US based on their gender, marital status, ethnic group, age group, socioeconomic status, or education level?

Research question three sought to determine whether differences existed in the educational awareness of HBV or HCV among Nigerians living in the US based on their gender, marital status, age group, ethnic group, education level, and socioeconomic status. Three question items (Q12, Q24, Q30) from the survey that looked at the educational awareness of HBV or HCV among Nigerians were used in this analysis, and responses consisted of yes (1), no (2), and not sure/don't know (3) categories. Fisher exact tests were performed to compare the educational awareness

of HBV or HCV among Nigerians and the demographic variables mentioned separately.

A statistically significant interaction was found in the educational awareness of HBV or HCV between Nigerian men and women regarding Q24 (Fisher exact test, $p=.000$) and Q30 (Fisher exact test, $p=.035$). Examination of the gender column found that the men (29%) said they were told about getting tested for HBV by a doctor compared to 4% of women. It was also found that women (88%) said that they were not told about getting tested for HBV by a doctor compared to 70% of men. Eight percent of women were unsure or did not know whether they were told about getting tested by a doctor for HCV compared to 2% of men. Thus, the null hypothesis was rejected for socioeconomic status regarding Q24. The significant results of the Fisher exact test for gender as to Q24 are presented in Table 22.

Examination of the within gender column found for Q30 that the women (71%) read the information on HBV or HBV compared to 69% of men. It was also found that men (29%) did not read the information on HBV or HBV compared to 17% of women. Thirteen percent of women were unsure or did not know whether they read the information on HBV or HBV compared to 2% of women. Thus, the null hypothesis was rejected for gender regarding Q30.

Conversely, no significant interaction was found in education awareness of HBV or HCV among Nigerian men and women regarding question item Q12 (Fisher exact test, $p=.323$). In addition, no statistically significant interactions were found between the ethnic group, marital status, age group, education level, or socioeconomic status on the perception of the use of western and traditional medicine among Nigerians living in the US. The null hypothesis was retained for gender, marital status, age group, education level, and socioeconomic status regarding question items Q12, Q24, and Q30. The significant results of the Fisher exact test for gender as to Q30 are presented in Table 23.

HBV or HCV infection behaviors

RQ4: Is there a difference in HBV or HCV infection behaviors among Nigerian immigrants living in the US based on their gender, marital status, age group, ethnic group, education level, or socioeconomic status?

Research question four sought to determine whether differences existed in the HBV or HCV infection behaviors among Nigerians living in the US based on their gender, marital status, age group, ethnic group, education level, and socioeconomic status. The question items (Q13, Q15, Q16, Q28) from the survey that looked

at the HBV or HCV infection behaviors among Nigerians was used in this analysis, and responses consisted of yes (1), no (2), and not sure/don't know (3) categories. Fisher exact tests were performed to compare Nigerians' HBV or HCV infection behaviors, and the demographic variables mentioned separately.

A statistically significant interaction was found in Nigerian men and women's HBV or HCV infection behaviors regarding items Q16 (Fisher exact test, $p=.030$). Examination of the gender column found that the men (80%) said that they completed the HBV shots (3 times) compared to 73% of women. It was also found that women (19%) said that they did not complete the HBV shots (3 times) compared to 2% of men. Eighteen percent of men were unsure or did not know whether they met the HBV shots (3 times) compared to 8% of women. Thus, the null hypothesis was rejected for gender regarding Q16. Conversely, there were no significant interactions found on the HBV or HCV infection behaviors among Nigerian men and women regarding question items Q13 (Fisher exact test, $p=.592$), Q15 (Fisher exact test, $p=.147$), and Q28 (Fisher exact test, $p=.545$). Thus, the null hypotheses were retained for gender regarding question items Q13, Q15, and Q28. The significant results of the Fisher exact test for gender as to Q16 are presented in Table 24.

A statistically significant interaction was found between the education level of Nigerians on their HBV or HCV infection behaviors regarding item Q28 (Fisher exact test, $p=.011$). Examination of the within education level column found that a respondent who held a nurse practitioner degree (100%) asked a doctor to test for HBV or HCV compared to 67% of those with a medical degree, 33% with a master's degree, 18% with an associate degree, 10% with a bachelor's degree, and 5% with a doctorate. It was also found that respondents who held other degrees (100%) said that they did not complete the HBV shots (3 times) compared to those with different education levels. Twenty-five percent of respondents were unsure or did not know whether they met the HBV shots (3 times) compared to those with different education levels. Thus, the null hypothesis was rejected for education level regarding Q28.

Conversely, no statistically significant interactions of ethnic group, marital status, age group, or socioeconomic status on the HBV or HCV infection behaviors among Nigerians living in the US were found. The null hypothesis was retained for marital status, age group, and socioeconomic status regarding question items Q13, Q15, Q16, and Q28. The significant results of the Fisher exact test for education level as to Q16 are presented in Table 25.

Table 21 Fisher Exact Test Results for Socioeconomic Status and Whether Respondents think an Infected Person Can Spread HBV by Coughing (Q18_5)

| Responses | Socioeconomic status | | | | | | | |
|---------------------------------|----------------------|---------------------|---------------------|----------------------|---------------------|---------------------|----------------------|------------|
| | Less \$25,000 | \$25,000 -30,000 | \$31,000 -40,000 | \$41,000 - 50,000 | \$51,000 -60,000 | \$61,000 -70,000 | \$71,000 - 80,000 | \$81,000+ |
| Yes | 2 (25%) | 3 (50%) | 0 (0%) | 2 (20%) | 3 (75%) | 1 (12.5%) | 3 (50%) | 12 (19.7%) |
| No | 4 (50%) | 1 (16.7%) | 3 (60%) | 4 (40%) | 1 (25%) | 6 (75%) | 3 (50%) | 43 (70.5%) |
| Not sure/ Don't Know | 2 (25%) | 2 (33.3%) | 2 (40%) | 4 (40%) | 0 (0%) | 1 (12.5%) | 0 (0%) | 6 (9.8%) |

Note: Fisher exact test, $p = .021$. Column percentages are in parentheses.

Table 22 Fisher Exact Test Results for Gender and Whether Respondents were told by a Doctor to be Tested (Q24)

| Responses | Gender | |
|----------------|------------|------------|
| | Men | Women |
| Yes | 18 (29.0%) | 2 (4.2%) |
| No | 43 (69.0%) | 42 (87.5%) |
| Not sure/Don't | 1 (1.6%) | 4 (8.3%) |

Note: Fisher exact test, $p = .000$. Column percentages are in parentheses.

Table 23 Fisher Exact Test Results for Gender and Whether Respondents Read Information on HBV or HCV (Q30)

| Responses | Gender | |
|----------------|------------|------------|
| | Men | Women |
| Yes | 43 (69.4%) | 34 (70.8%) |
| No | 18 (29.0%) | 8 (23.6%) |
| Not sure/Don't | 1 (1.6%) | 6 (12.5%) |

Note: Fisher exact test, $p = .035$. Column percentages are in parentheses.

Table 24 Fisher Exact Test Results For Gender And Whether Respondents Completed The HBV Shot (3 Times) (Q16)

| Responses | Gender | |
|----------------|------------|------------|
| | Men | Women |
| Yes | 36 (80.0%) | 27 (73.0%) |
| No | 1 (2.2%) | 7 (18.9%) |
| Not sure/Don't | 81 (17.8%) | 3 (8.1%) |

Note: Fisher exact test, $p = .030$. Column percentages are in parentheses.

Table 25 Fisher Exact Test Results For Education Level And Whether Respondents Ever Asked A Doctor To Test For HBV or HCV

| Responses | Education level | | | | | | |
|----------------|-----------------|-----------|------------|------------|-------------------------|---------------------|------------|
| | High school | Associate | Bachelors | Masters | Nurse practitioner (NP) | Medical doctor (MD) | Doctorate |
| Yes | 0 (0%) | 2 (18.2%) | 3 (9.7%) | 12 (33.3%) | 1 (100%) | 2 (66.7%) | 1 (4.8%) |
| No | 3 (75%) | 9 (81.8%) | 27 (87.1%) | 24 (66.7%) | 0 (0%) | 1 (33.3%) | 19 (90.5%) |
| Not sure/Don't | 1 (33.3%) | 0 (0%) | 1 (3.2%) | 0 (0%) | 0 (0%) | 0 (0%) | 1 (4.8%) |

Note: Fisher exact test, $p = .011$. Column percentages are in parentheses.

Discussion and analysis of results

Nigeria is the country with the highest HBV carriers in sub-Saharan Africa. The disease is endemic in Nigeria, with an alarming over 21 million people living with HBV (Lesi et al., 2007). Additionally, 2.2% of Nigerians are living with HCV. There is a need to study and create awareness of this “silent killer.” Creating awareness of this infection will help prevent many deaths from liver cirrhosis and liver cancer. According to WHO, 80% are from HBV or HCV infection, as noted by WHO. Sub-Saharan Africa is endemic to viral hepatitis, yet there are limited studies regarding the disease’s mode of transmission. Little knowledge of the mode of transmission hampers progress in eradicating this deadly infection (WHO, 2016).

This study, therefore, aims at investigating the level of knowledge, perception, and attitude of Nigerian immigrants (living in the US) toward the disease and to create awareness through this survey.

Prevention of HBV and HCV is the purpose of this study. To achieve this goal, prevention is targeted via creating awareness, providing knowledge through information sharing, giving the statistics of the disease, and aiming at changing negative attitudes (due to lack of information and knowledge regarding the disease).

There is a lack of knowledge of modes of transmission and misconceptions about the disease. This is because the modes of transmission of HBV and HCV are very varied based on location. While needle sharing by drug users is one of the main methods of transmission in the US, it is hardly a means of transmission in Nigeria. Instead, transfusion of blood and blood products is Nigeria’s most common risk of transmission.

Sexually transmitted diseases (STDs) are stigmatized worldwide.¹³ This is because having sex outside of marriage or with multiple partners is immoral. The people who indulge in that actively try to hide their actions or their relationships.

STDs include gonorrhea, syphilis, HIV/AIDS, HBV, and HCV. The mode of transmission for HBV and HCV has other sources such as blood transfusion, using unsanitized and poorly sanitized medical equipment, and many others. Unfortunately, even though the transmission mode of HBV and HCV transmission is not limited to sexual activities, the stigma still applies to the disease. Stigmatization can inhibit individuals from getting the help they need in the appropriate time frame. This means that some individuals seek help when the disease is advanced to cirrhosis of the liver or Hepatocellular Carcinoma (HCC). Some individuals may not seek appropriate help at all. To fight the stigmatization of HBV and HCV infections, massive education must be employed to curb that level of ignorance. These prevention efforts should be for different levels of prevention---primary, secondary, and tertiary levels.

The primary level of prevention is aimed at stopping the disease from infecting the individual, group, or population in a community. Secondary prevention is treating the disease, medication, and other therapies relevant to treating the infection. Secondary prevention aims to prevent the disease's progression to the tertiary level. At the tertiary prevention level, the disease is managed to avoid promoting the health or functionality of the individual. These are interventions used to care for individuals with chronic diseases. The individuals are no longer experiencing the acute phase of the disease. The diagnosis is also established. Using all these levels of prevention can reduce the HBV and HCV epidemic. The education of the people about the disease should emphasize the mode of transmission and risks of the disease (among other factors) to reduce stigmatization.

The stigmatization associated with the disease can hinder seeking treatment as individuals try to hide their diagnosis. Educating Nigerians living with viral hepatitis and others that the disease is not only transmitted via sex and needle sharing can reduce the epidemic.

The target population for this research is adult Nigerian-born immigrants to the US, 18 years and over, living in the US. Using the people in the communities will ensure that people of various socioeconomic statuses will be represented regardless of their religion, gender, socioeconomic status, and immigration status. A random selection of men and women was surveyed. The inclusion criteria are that the participant must be born in Nigeria, 18 years and above, and live in the US during the research. A sample size

of 200 participants is targeted. The survey monkey link is sent to 200 emails from the above population.

This quantitative study aimed to investigate the perceptions, educational awareness, and behaviors regarding HBV and HCV among Nigerian immigrants in the US. Quantity survey data were collected from Nigerian immigrants who resided in the US and were born in Nigeria. There were a total number of two hundred participants selected for this study. The participants were male and female Nigerian immigrants 18 years of age and over who are employed. The survey questionnaires contained several questions concerning knowledge and attitude toward the disease: one hundred thirty-two males (66%) and females participated in this study.

Additionally, participants were informed that their identities and personal information would not be disclosed. The participants have the option to agree or disagree to participate. The participants that agreed to partake in the survey completed the survey electronically. A total of 132 participants completed the survey, and I downloaded the survey data and conducted the analysis-employing Fisher exact test.

The demographic variables (6 items) from the survey used in the analysis were: gender, age group, ethnic group, marital status, education level, and socioeconomic status. Thirty-two items from the survey used in the analysis examined participants' perceptions, educational awareness, and behaviors about HBV and HCV. Namely, one question item (Q6) from the survey looked at the perceptions of the use of western and traditional medicine among Nigerians, and the responses consisted of western medicine (1), traditional medicine (2), and both types of medicine (3) categories. Twenty-four question items (Q18_1 thru Q18_15, Q19 thru Q23, Q38) from the survey looked at the perceptions of HBV or HCV infection among Nigerians, and the responses consisted of yes (1), no (2), and not sure/don't know (3) categories. Three question items (Q12, Q24, Q30) from the survey looked at the educational awareness of HBV or HCV among Nigerians, and the responses consisted of yes (1), no (2), and not sure/don't know (3) categories. Four question items (Q13, Q15, Q16, Q28) from the survey looked at the HBV or HCV infection behaviors among Nigerians, and the responses consisted of yes (1), no (2), and not sure/don't know (3) categories. The question items that reflect the participants' perceptions, educational awareness, and behaviors are detailed in Table 26.

Table 26 Question Items Used in the Study's Analysis

| | Question Items | Question | |
|---|--------------------------------|--|--|
| Perception of use of western and traditional medicine | Q6 | In general, what do you think is the best way to treat health problems (Traditional, Western, Both types)? | |
| | Q18_1 | Do you think HBV can be spread by eating food prepared by an infected person? | |
| | Q18_2 | Do you think sharing spoons/forks with an infected person can spread HBV. | |
| | Q18_3 | Do you think sharing toothbrushes with an affected person can spread HBV? | |
| | Q18_4 | Do you think sharing razors with an affected person will spread HBV? | |
| | Q18_5 | Do you think an infected person can spread HBV by coughing? | |
| | Q18_6 | Do you think an infected person can spread it through hand shaking? | |
| | Q18_7 | Do you think HBV can be spread during sexual intercourse with an infected person? | |
| | Q18_8 | Do you think HBV can be spread from an infected mother to baby? | |
| | Q18_9 | Do you think sharing needles with an Infected person can spread HBV? | |
| Perceptions of HBV or HCV infection | Q18_10 | Do you think tribal marking is a risk of getting HBV? | |
| | Q18_11 | Do you think getting a tattoo is a risk of getting Hepatitis? | |
| | Q18_12 | Do you think local ear piercing is a risk of getting HBV? | |
| | Q18_13 | Do you think native doctor or herbalists performing tonsillectomy is a risk of getting HBV | |
| | Q18_14 | Do you have more than one sexual partner? | |
| | Q18_15 | Are you comfortable with your partner? | |
| | Q19 | Do you think an infected person who looks and feels healthy can spread HBV, C? | |
| | Q20 | Do you think other people sometimes avoid people with HBV, C? | |
| | Q21 | Do you think HBV, C can cause liver cancer? | |
| | Q22 | Do you think people can be infected with HBV for life? | |
| Educational awareness of HBV or HCV | Q23 | Do you think there is any treatment for HBV? | |
| | Q38 | Do you think that weight loss or gain has any effect on HBV, C? | |
| | Q12 | Have you heard of HBV, C? | |
| | Q24 | Has a doctor ever told you that you should be tested for hepatitis? | |
| | Q30 | Have you ever read information on HBV, C? | |
| | Q13 | Have you ever had a blood test specifically for HBV, C? | |
| | Q15 | Have you ever had shots (vaccinations) to prevent you from getting HBV? | |
| | HBV or HCV infection behaviors | Q16 | Did you complete the HBV shots (3 times)? |
| | | Q28 | Have you ever asked a doctor to test you for HBV, C? |

Demographic characteristics

An analysis of the demographic data indicated that Nigerian men accounted for 56.5% of the respondents, while 43.5% were Nigerian women. In terms of ethnic group, Igbos made up the majority of the respondents (84%) in this study. Forty-three percent of the respondents were 50 and older (43%), married (69%), with a master's degree (32%), and with income levels between \$81,000 and above (55%).

Perception of use of western and traditional medicine

Research question one sought to determine whether differences existed in the perceptions of using western and traditional medicine among Nigerians living in the US based on their gender, marital status, age group, ethnic group, education level, and socioeconomic status. Fisher's exact test indicated a statistically

significant interaction among the ethnic groups of Nigerians and their perceptions of the use of western and traditional medicine. Sixty-seven percent of the respondents from the Igbos and the Yorubas considered western medicine the best way to treat health problems than respondents from the other ethnic groups. It was also found that respondents from the other ethnic groups (75%) considered both types of medicine the best way to treat health problems than the Igbos and Yorubas. Seventeen percent of the respondents from the Yorubas were the only ethnic group that considered traditional medicine the best way to treat health problems. Research indicated that traditional medicine has some positive effects on health promotion; however, it was noted that groups such as the educated class recognize and prefer modern medicine.⁴⁸ Conversely, no statistically significant interaction was found among the other demographic variables on the perception of Western and traditional medicine use among Nigerians in the US.

Perceptions of HBV or HCV infection

Research question two sought to determine whether differences existed in the perceptions of HBV or HCV infection among Nigerians living in the US based on their gender, marital status, age group, ethnic group, education level, and socioeconomic status. Fisher's exact test indicated a statistically significant interaction among Nigerians living in the US on their perceptions of HBV or HCV infection regarding question items Q18_7 and Q18_8. The gender column for Q18_7 found that the women (83%) thought HBV could be spread during sexual intercourse compared to 61% of men. It was also found that men (20%) thought HBV could be applied during sexual intercourse compared to 4% of women. Twenty percent of men were unsure or did not know whether they thought HBV could be spread during sexual intercourse compared to 13% of women. Researchers have noted that sexual intercourse is a means of transmitting viral hepatitis. This is especially true of unprotected sex (39, 40).

In addition, the gender column found for Q18_8 that women (81%) thought HBV could be spread from an infected mother to a baby compared to 68% of men. It was also found that men (11%) did not think HBV could be spread from an infected mother to baby, while there were no responses from the women. Twenty-one percent of men were unsure or did not know whether HBV can be spread from an infected mother to baby compared to 19% of women. Thus, the null hypothesis was rejected for gender regarding Q24 and Q30. Studies have found that vertical transmission is a means of transmitting viral hepatitis globally, especially in Asia and Africa. This is a transmission from the infected mother to the baby.¹¹ HBsAg was found in the placenta of the studied pregnant women, tissues obtained during a caesarian section. This confirms the reality of vertical transmission of the infection (Ugebor et al., 2011). This mode of transmission has improved due to the testing of pregnant women and the subsequent treatment. This improvement is true for the western world and urban areas of Nigeria; it may not apply to some rural pregnant women who may not have access to a hospital due to the inability to pay the cost of testing and delivery. They would rather use cost-effective local midwives for antenatal and delivery.

Examination of the within age group column for Q18_3 found that respondents between 44 and 49 (75%) thought that sharing toothbrushes with an affected person can spread HBV compared to 74% of respondents 50 and older, 67% of respondents between 38 and 43, 50% of respondents between 31 and 37, 44% of respondents between 25 and 30, and 30% of respondents between 18 and 24. It was also found that respondents between 38 and 43 (33%) did not think sharing toothbrushes with an affected person could spread HBV compared to respondents from the other age groups. Forty percent of respondents between 18 and 24 were unsure or did not know whether sharing toothbrushes with an affected person can spread HBV compared to respondents from the other age groups. A study by Ejiofor et al. (2010) conducted in Nigeria has supported this finding in that they claim that sharing of household items of an infected individual, such as toothbrushes, and razors, can transmit HCV.

Examination of the marital status column for Q18_5 found that half of the respondents whose marital status was separated thought an infected person could spread HBV by coughing compared to 25% of married and single respondents (23%). It was also found that married respondents (65%) did not think an infected person

could spread HBV by coughing compared to 50% of single and separated (47%) respondents. A hundred percent of respondents whose marital status is other were unsure or did not know whether an infected person can spread HBV by coughing compared to single (30%) and married (10%) respondents. Research has shown that airborne infections can be transmitted through coughing by the infected person; viral hepatitis is not transmitted through coughing or sneezing.⁴⁹ Viral hepatitis is transmitted via an infected person's percutaneous or mucus membrane fluids and semen.¹⁵

Examination of the within-age group column for Q18_10 found that respondents between 44 and 49 (85%) thought tribal marking was a risk of contracting HBV compared to respondents from the other age groups. It was also found that respondents between 25 and 30 (38%) did not think the tribal marking is a risk of contracting HBV compared to respondents from the other age groups. Fifty percent of respondents between 18 and 24 were unsure or did not know whether tribal marking is a risk of contracting HBV compared to respondents from the other age groups. In Nigeria, as well as in some sub-Saharan countries, tribal marking is popular. Local practitioners usually perform this practice using unsanitized equipment to make the marks. This practice risks transmitting HBV.¹⁵

Examination of the within-age group column for Q18_11 found that respondents between 38 and 43 (93%) thought that getting a tattoo is a risk of contracting HBV compared to respondents from the other age groups. It was also found that respondents between 25 and 30 (44%) did not think obtaining a tattoo is a risk of contracting HBV compared to respondents from the other age groups. Thirty percent of respondents between 18 and 24 were unsure or did not know whether obtaining a tattoo is a risk of contracting HBV compared to respondents from the other age groups. Studies have found that if licensed individuals provide tattoos, the risk of transmitting hepatitis is shallow (58). This means that the practitioners will follow the stipulated guideline for making tattoos. The opposite is the case with local unlicensed individuals who provide tattoos, especially in rural regions of Nigeria.¹⁵

Examination of the within-age group column for Q18_12 found that respondents between 31 and 37 (90%) thought that local ear piercing is a risk of contracting HBV compared to respondents from the other age groups. It was also found that respondents between 25 and 30 (44%) did not think obtaining a tattoo is a risk of contracting HBV compared to respondents from the other age groups. Twenty-eight percent of respondents between 50 and older were unsure or did not know whether getting a tattoo is a risk of contracting HBV compared to respondents from the other age groups. Local ear piercing and using unsanitized equipment post increased the risk of transmitting HBV.¹⁵ Ear piercing, when performed by licensed individuals, ear-piercing most likely uses all the precautions to prevent the transmission of communicable diseases, especially in western countries and urban areas of Nigeria.

Examination of the within-age group column for Q18_13 found that respondents between 44 and 49 (95%) thought that native doctors or herbalists performing tonsillectomy risk getting HBV compared to respondents from the other age groups. It was also found that respondents between 25 and 30 (22%) did not think that native doctor or herbalists performing tonsillectomy is a risk of

getting HBV compared to respondents from the other age groups. Fifty percent of respondents between 18 and 24 were unsure or did not know whether native doctors or herbalists performing tonsillectomy is a risk of getting HBV compared to respondents from the other age groups. According to a study by studies, local herbalists perform tonsillectomy (for sore throats) in Nigeria with equipment that may not be sanitized, putting the individuals at risk of transmitting HBV the other clients.¹⁵ The clients usually seek local healers because the cost of hospitalization might be higher, or they simply believe that the herbalist or local healers might be more effective for such illnesses.

Educational awareness

Research question three sought to determine whether differences existed in the educational awareness of HBV or HCV among Nigerians living in the US based on their gender, marital status, age group, ethnic group, education level, and socioeconomic status. Fisher indicated a statistically significant interaction in the educational awareness of HBV or HCV among Nigerian men and women regarding Q24 and Q30. Examination of the gender column found that men (29%) respondents said they were told about getting tested for HBV by a doctor compared to 4% of women. It was also found that women (88%) respondents said that they were not told about getting tested for HBV by a doctor compared to 70% of men. Eight percent of women were unsure or did not know whether they were told about getting tested by a doctor, compared to 2% of men. In this question, more men responded and stated that they had been asked to get tested for viral hepatitis than women. This may be related to the fact that more men have the chance to consume alcohol even for social reasons. Alcohol consumption triggers the symptoms of HBV or C in chronic carriers. Hence, both attack the liver³⁹ Men have higher chances of becoming incarcerated or working in correctional facilities than women as there are high chances of contracting HCV in those facilities either as inmates or workers (Department of Health and Human Services, n.d.). Polygamy (practiced in Nigeria) is closely related to sexual promiscuity as one of the reasons for marrying more than one wife is sexual satisfaction.³⁹ Sexual promiscuity poses a high risk for HBV or C infection. It is evident that for the reasons mentioned above, the likelihood of being perceived as at a higher risk of contracting the disease is why the physician or NP will suggest HBV or HCV testing for more men than women.

HBV or HCV infection behaviors

Research question four sought to determine whether differences existed in the HBV or HCV infection behaviors among Nigerians living in the US based on their gender, marital status, age group, ethnic group, education level, and socioeconomic status. Fisher's exact tests indicated statistically significant interaction found on the HBV or HCV infection behaviors among Nigerian men and women regarding items Q16. Examination of the gender column found that the men (80%) said that they completed the HBV shots (3 times) compared to 73% of women. It was also found that women (19%) said that they did not complete the HBV shots (3 times) compared to 2% of men. Eighteen percent of men were unsure or did not know whether they met the HBV shots (3 times) compared to 8% of women. Conversely, no significant interactions were found on the HBV or HCV infection behaviors among Nigerian men and women regarding question items Q13, Q15, and Q28.

Several researchers have found that women seek healthcare more than men. However, in the question about HBV and HCV health behavior, more men completed their hepatitis vaccination (80%) than women (73%). Men also waited longer before consultation than women.

Summary and conclusions

According to WHO and many researchers, the case of HBV and HCV (viral hepatitis) a significant public health burden around the globe.¹⁰ The prevalence of HBV and HCV infections is estimated at over 350 to 400 million and 170 million, respectively, worldwide. It was noted that many western countries had improved their HBV vaccination programs, while some developing countries have not improved.¹⁰ In the case of Nigeria, where the infection is endemic. Several reasons noted in this research are responsible for the prevalent condition, as pointed out in this research, are responsible for the infection is prevalent, such as misconceptions about the disease, stigmatization, and lack of knowledge.⁴

This study utilized quantitative research methods that investigated the level of knowledge, perception, and attitude of Nigerian immigrants in the US towards HBV and HCV. This population was chosen for this study due to migration from a country of high indemnity of infection. Also, the expectation is that due to their family ties with loved ones living in Nigeria, it is assumed that they will share information regarding HBV and HCV and encourage those living in Nigeria to get tested for both infections and vaccinated against the HBV virus. This study found a significant difference in the participants' perception of western medicine versus local herbal medicine in treating diseases. Many participants believe that herbal medicines are better or may be adequate to treat infections.

It must be noted that statistically significant interactions were found in the perceptions of using western and traditional medicine and HBV and HCV infection among Nigerian ethnic groups. Additionally, statistically significant interactions were found between Nigerian men and women on the perceptions of HBV or HCV disorder, educational awareness, and HBV or HCV infection behaviors. There were statistically significant interactions found in the perceptions of HBV or HCV infection within Nigerian immigrants' age group, marital status, and socioeconomic status. Statistically meaningful interactions were found in the education level of Nigerians on their HBV or HCV infection behaviors.

Cultural practices still compromise and put individuals at risk of contracting the infection, such as performing vasectomies locally with unsanitized or poorly sanitized equipment. It is also found that there was a significant difference in the belief of tribal marking, which is usually performed locally with unsanitized or poorly sanitized equipment. This practice can be a mode of transmitting viral hepatitis. Sharing household items in Nigeria, such as cups, toothbrushes, and shaving razors, is still in practice. This can be a mode of transmitting this infection to others from carriers who may not have symptoms.

Similarly, Nigeria's poor economic situation and corruption have made it challenging to eradicate the infection. Mismanagement of agricultural and oil resources puts the country in financial difficulty. The cost of hepatitis drugs is prohibitive, making it difficult for citizens to have free access to health care. The political situation in the country equally affects healthcare decisions. Given the varied nature of Nigeria's ethnic regions, different

religious beliefs, corruption, and financial mismanagement affect health care in general.

This is limited literature on HBV and HCV among Nigerian immigrants in the US; therefore, this study and other similar studies will help create awareness and knowledge about this deadly disease. This research contacted the US embassy clinic in Lagos, Nigeria, to inquire about medical tests/vaccination for immigrants traveling to the US and was informed that HBV and HCV are not among the communicable diseases required to be tested before travel. However, it noted that travelers are encouraged to be vaccinated against HBV. There is a lack of facilities for HBV and HCV research in Nigeria, and inherent electrical outages and hot climate conditions may affect the specimen for research. The research encountered difficulties during data collection as Nigerians are very private and unwilling to give personal demographic information despite assurances that participants' identities and information will remain unanimous. As a result, several email communications, phone calls, and text messages were sent as a follow-up to reiterate the confidentiality of their personal information. These efforts finally yielded some responses that produced the data used in this study.

This study found that many Nigerians lack knowledge of HBV and HCV infection even though it is endemic in their home country. Many immigrant Nigerians have some misconceptions about the disease regardless of educational level. The mode of HBV and HCV transmission remains a significant knowledge deficit area that must be addressed.

This study revealed that some of the participants have some knowledge about HBV and HCV. However, additional education and awareness are still required to correct some misconceptions about HBV and HCV. The participants in this survey may not represent thousands of Nigerian immigrants who reside in the United. Hopefully, knowledge gained from this survey and the study result has added to the literature on HBV and HCV.⁴¹⁻⁶¹

Recommendation for prevention of HBV and HCV

- Government and private organizations should promote educational awareness programs on HBV and HCV prevention. They should organize health fairs to promote HBV and HCV education to the communities and announce the dangers of HBV/HCV at marketplaces, churches, schools, and strategic public places, the dangers of HBV/HCV.
- Advocate for behavior change of Nigerian men having multiple sex partners, girlfriends, and polygamous practices.
- Promote abstinence for unmarried individuals and safe sex.
- Screen pregnant women, test babies, and treat them as early as possible.
- Healthcare providers should encourage their patients to get tested.
- Use social media and billboards to create awareness of the disease.
- Household items such as razors and toothbrushes should not be shared.
- Only licensed professionals should do tattoos and bodily piercings.
- Nigerians who reside in the US should contact their family members and encourage them to get tested, vaccinate against HBV, and start treatment immediately if positive.
- Nigerian community leaders should create awareness among members, especially during their community meetings, about the dangers of Hepatitis.
- Nigerian government should enforce eradicating the use of local healers for vasectomies/tonsillectomies procedures.
- Continue needle exchange programs for PWID.
- Immigrant Nigerian young adults ages 25 to 30 need more education on the mode of transmission, as their lack of knowledge is high.

Future research

This study employed a quantitative research method; I recommend that a mixed method be explored. This study focused on adult men and women of Nigerian immigrants residing in the US; future studies should examine the level of knowledge, attitude, and behavior of those who live in Nigeria toward HBV and HCV. Further studies may investigate young children regarding their understanding of HBV and HCV. Finally, research may be conducted to examine the knowledge level of Nigerian Primary Care Physicians (PCP) on HBV and HCV.

References

- Wiktor SZ, Hutin Y J. The global burden of viral hepatitis: Better estimates to guide hepatitis elimination efforts. *The Lancet*. 2016;388(10049):1030–1031.
- World Health Organization (WHO). Draft global health sector strategy on viral hepatitis, 2016–2021. Geneva: World Health Organization; 2015.
- World Health Organization (WHO). (n.d.). EPHO5: Disease prevention, including early detection of illness. Geneva: World Health Organization; 2020.
- Tremeau-Bravard A, Ogbukagu C, Ticao C J, et al. Seroprevalence of hepatitis B and C infection among the HIV – positive population in Abuja, Nigeria. *African Health Sciences*. 2012;12(3):312–317.
- Tirrell M. Pricing wars heat up over hepatitis C drugs. 2015.
- Ejiofor OS, Emechebe GO, Igwe WC, et al. Hepatitis C virus in Nigerians. *Nigerian Medical Journal*. 2010;51(4):173–176.
- Taylor B. Treatment of hepatitis C has more than doubled since 2013. Yet 99% of people are still being denied the life-saving cure. 2016.
- Liang TJ. Hepatitis B: The virus and disease. liver diseases branch. American Association for the Study of Liver Disease (AASLD). *Hepatology*. 2009;49(S5):S13–S21.
- Aspinall EJ, Hawkin J, Frasier A, et al. Hepatitis B prevention, diagnosis, treatment, and care: A review. *Occup Med (Lond)*. 2011;61(8):531–540.
- World Health Organization (WHO). World Hepatitis Summit harnesses global momentum to eliminate viral hepatitis. 2015.
- Krajden M, McNabb G, Petric M. The laboratory diagnosis of hepatitis B virus. *Can J Infect Dis Med Microbiol*. 2005;16(2):65–72.
- Ola SO, Otegbayo JA, Yakubu A, et al. Pitfalls in diagnosis of hepatitis B virus infection among adults Nigerians. *Nigerian Journal of Clinical Practice*. 2009;12(4):350–354.

13. Morris L, Lippman PS, Bernstein SA, et al. Sexually transmitted infection related stigma and shame among African American male youth: Implications for testing practices, partner notification, and treatment. *AIDS Patient Care STDS*. 2014;28(9):499–506.
14. Layden JE, Phillips R, Opare–Sem O, et al. Hepatitis C in sub–Sahara Africa: urgent need for attention. *Open Forum Infect Dis*. 2014;1(2):ofu065.
15. Obienu O, Nwokediuko S, Malu A, et al. Risk factors for hepatitis C virus transmission are obscure in Nigeria patients. *Gastroenterol Res Pract*. 2011;2011:939673.
16. Kenin J, Fuller J. 1 in 10 Black people in the U.S. are migrants. Here's what's driving that shift. USA: National Public Radio (NPR); 2022.
17. Migration Policy Institute (MPI). RAD Diaspora Profile: The Nigerian Diaspora in the USA. 2015;2–7.
18. Shoukry N, Feld J, Grebely J. Hepatitis C: A canadian perspective. *Can Liver J*. 2018 ;1(2):1–3.
19. Colpitts C, Verrier E, Baumert T. Targeting Viral Entry for Treatment of hepatitis B and C Virus Infections *ACS Infectious Diseases*. 2015;1(9):420–427.
20. Ugbebor O, Aigbirior M, Osazuwa F, et al. The prevalence of hepatitis B and C viral infections among pregnant women. *N Am J Med Sci*. 2011 May;3(5):238–241.
21. Karoney M J, Siika AM. Hepatitis C virus in africa: a review. *Pan–African Medical Journal*. 2013;14(44).
22. Ola SO, Otegbayo JA, Yakubu A, et al. Nigeria butchers and Hepatitis B infection. *Trop Gastroenterol*. 2008;29(1):32–34.
23. Tung–Hung S, Pei–Jer C. Emerging hepatitis B virus infection in vaccinated populations: a rising concern? *Emerg Microbes Infect*. 2012;1(9):e27.
24. Reherrmann B, Ferrari C, Pasquinelli C, et al. The hepatitis B virus persists for decades after patients' recovery from acute viral hepatitis despite active maintenance of a cytotoxic t–lymphocytes response. *Nat Med*. 1996;2(10):1104–118.
25. Ward JW, Valdiserri RO, Koh HK. Hepatitis C virus prevention, care, and treatment: From policy to practice. *Clin Infect Dis*. 2012;55 Suppl 1:S58–S63.
26. Li HC, Lo SY. Hepatitis C virus: Virology, diagnosis, and treatment. *World J Hepatol*. 2015;7(10):1377–1389.
27. Huang C, Lin HH, Wan J, et al. Research and development of hepatitis B drugs: an analysis based on technology flows measured by patent citations. *PLoS One*. 2016;11(10):e0164328.
28. NIH. National Institute of Allergy and Infectious Diseases NIH–Led Study to Assess Community–Based Hepatitis C Treatment in Washington, DC The laboratory diagnosis of hepatitis B virus. 2015.
29. Chang L. Hepatitis flares in chronic hepatitis B: pathogenesis, natural course, and management. *J Hepatol*. 2014;61(6):1407–1417.
30. Barber M, Gotham D, Khwairakpam G, et al. Price of a hepatitis C cure: Cost of production and current prices for direct–acting antivirals in 50 countries. *J Virus Erad*. 2020;6(3):100001.
31. <https://www.ncbi.nlm.nih.gov/books/NBK447117/>
32. Perz J, Armstrong G, Farrington L, Hutin Y, et al. The contributions of hepatitis B and C virus infections to cirrhosis and primary liver cancer worldwide. *J Hepatol*. 2006;45(4):529–538.
33. Spach D. HCV Epidemiology in the US. 2021.
34. Chen EY, North CS, Fatunde O, et al. Knowledge and attitudes about HCV virus (HCV) infection and its treatment in HCV mono–infected and HCV/HIV co–infected adults. *J Viral Hepat*. 2013;20(10):708–714.
35. Williams I, Bell BP, Kuhnert W, et al. Incidence and transmission patterns of acute hepatitis. *Arch Internal Medicine*. 2011;171(3), 242–248.
36. <https://www.everyculture.com/Ma–Ni/Nigeria.html#ixzz4d9buUPTZ>
37. Werb D, Wood E, Kerr T, et al. Treatment costs of hepatitis C infection among injection drug users in Canada, 2006 –2026. *International Journal Drug Policy*. 2011;22(1):70–76.
38. Henry B. Drug pricing & challenges to hepatitis c treatment access. *J Health Biomed Law*. 2018;14:265–283.
39. Park J, Oh C, Sub J. Factors associated with alcohol consumption in hepatitis B carriers: A nationwide study in the Republic of Korea. *PLoS One*. 2014.
40. Lesi OA, Kehinde MO, Ogunh DN, et al. Hepatitis B and C virus infection in Nigeria patients with HIV/AIDS. *Niger Postgrad Med J*. 2007;14(2):129–133.
41. Ezechi OC, Kalejaiye OO, Gab–Okafor CV, et al. Sero–prevalence and factors associated with Hepatitis B and C co–infection in pregnant Nigerian women living with HIV infection. *Pan Afr Med J*. 2014;17:197.
42. Wiessing L, Ferri M, Grady B, et al. Hepatitis C virus infection epidemiology among people who inject drugs in Europe: A systematic review of data for scaling up treatment and prevention. *PLoS One*. 2014; 9(7):1–19.
43. Mboti CI, Andy IE, Eni OI, et al. Prevalence, sociodemographic characteristics and risk factors for hepatitis C infection among pregnant women in Calabar municipality, Nigeria. *Hepat Mon*. 2010;10(2):116–120.
44. Fisher RA. The logic of inductive inference (with discussion). *Journal of Royal Statistical Society*. 1935;98(1):39–82.
45. Polit D, Beck C. Nursing research: Generating and assessing evidence for nursing practice. 9th edn. Philadelphia, PA: Wolters Kluwer/Lippincott Williams & Wilkins; 2012.
46. <https://uwindsor.teamdynamix.com/TDClient/1975/Portal/Requests/ServiceDet?ID=13591>
47. Taylor VM, Talbot J, Do HH, et al. Hepatitis B knowledge and practices among Cambodian Americans. *Asian Pac J Cancer Prev*. 2011;12(4):957–961.
48. Abdullahi AA. Trends and challenges of traditional medicine in Africa. *Afr J Tradit Complement Altern Med*. 2011;8(5 Suppl):115–123.
49. Memarzadeh F. Literature Review: Room Ventilation and Airborne Disease Transmission. The American Society for Healthcare Engineering (ASHE) of the American Hospital Association, 2013.
50. Chen Y, Chiou W, Hung S, et al. Hepatitis C virus itself is a causal risk factor for chronic kidney disease beyond traditional risk factors: A 6–year nationwide cohort study across Taiwan. *BMC Nephrol*. 2013;14:187.
51. Kanda T, Yokosuka O, Omata M. Treatment of hepatitis C virus infection in the future. *Clin Mol Hepatol*. 2021;27(2):246–256.
52. Koumbi L. Current and future antiviral drug therapies of hepatitis B chronic infection. *World J Hepatol*. 2015;7(8):1030–1040.

53. Memon M, Arain Z, Zaki M, et al. Prevalence of type 2 diabetes mellitus in hepatitis C virus–infected population: a southeast asian study. *J Diabetes Res*. 2013;2013:539361.
54. Musa B, Borodo S, Samaila A, et al. Prevalence of hepatitis B virus infection in Nigeria, 2000–2013: A systemic review and meta-analysis. *Niger J Clin Pract*. 2015;18(2):163–172.
55. Okonkwo UC, Ngim OE, Osim H, et al. Knowledge of Hepatitis B virus infection among traders. *Niger J Clin Pract*. 2017;20(4):415–420.
56. Owuamanam B. Family type and attitude to sexual promiscuity of adolescent students in Ekiti State, Nigeria. *European Scientific Journal*. 2013;9(17):1857–1881.
57. Surial B, Wyser D, Béguelin C, et al. Prevalence of liver cirrhosis in individuals with hepatitis B virus infection in sub-Saharan Africa: Systematic review and meta-analysis. *Liver Int*. 2021;41(4):710–719.
58. <https://www.cdc.gov/hepatitis/hcv/pdfs/hepcincarcerationfact-sheet-bw.pdf>
59. Tohme RA, Holmberg SD. Transmission of hepatitis C virus infection through tattooing and piercing: a critical review. *Clin Infect Dis*. 2012;54(8):1167–178.
60. World Health Organization (WHO). World Hepatitis Day in Nigeria, an estimated 20 million people are infected. Geneva: World Health Organization; 2020.
61. Yu M, Jiang Q, Gu X, et al. Correlation between vertical transmission of Hepatitis B virus and the expression of HBsAg in ovarian follicles and placenta. *PLoS One*. 2013;8(1):e54246.

Appendix

Appendix A

Appendix B

Appendix C

