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Seroprevalence and Associated Risk Factors of Hepatitis B Virus Infection among Students of the University of Bamenda, Northwest Region, Cameroon

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Abstract:

Background: Hepatitis B virus (HBV) infection is a major cause of liver inflammation and remains a significant global health challenge. The infection can manifest as either acute or chronic disease, leading to severe complications such as cirrhosis and hepatocellular carcinoma. HBV is transmitted through exposure to infected blood and body fluids, sexual contact, and vertical transmission from mother to child. Despite global control efforts, the disease burden remains disproportionately high in low- and middle-income countries. In Cameroon, HBV prevalence exhibits substantial geographic and demographic variability, underscoring the need for context-specific epidemiological studies and tailored public health strategies to mitigate transmission and improve disease management.

Objectives: This study aimed at determining the Seroprevalence and risk factors of viral hepatitis B infection among students at the University of Bamenda in order to intensify awareness, preventive measures and the need of proper immunization

Methods: This was a school-based cross-sectional study conducted at the University of Bamenda, located in the North West Region of Cameroon. A total of 200 students were enrolled. Data on socio-demographic characteristics and potential transmission modes were collected using self-administered questionnaires. Rapid diagnostic tests were employed to detect hepatitis B surface antigen (HBsAg) in each participant. Furthermore, Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) version 20.0 in order to determine seroprevalence and to assess associations between infection and selected risk factors.

Results: Of the 200 participants sampled, females recorded the highest prevalence of HBV infection (7.6%), while the highest infection rate by age group was observed among students aged 30 years and above (10.2%). The Faculty of Science (FS) exhibited the highest institutional prevalence (22.2%). Infection was more common among single (7.7%) and Christian (7.6%) participants. Homosexuality was the only risk factor significantly associated with HBsAg positivity. However, elevated prevalence rates were also observed among participants with a history of blood transfusion, unprotected sexual activity, sharing of fomites, longer campus stay, and limited knowledge about HBV

Conclusion: This study found the seroprevalence of HBV infection among students of the University of Bamenda to be 7.7%, suggesting that the infection is highly endemic in this population according to WHO standards. These findings highlight the urgent need for intensified awareness campaigns, routine screening, and vaccination programs among students to enhance HBV prevention and control in university and community settings.

Keywords: Seroprevalence, associated risk factors, hepatitis B, university of Bamenda

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Introduction

Background

Hepatitis B virus (HBV) infection is a global public health challenge. Of the 2 billion persons (about a third of the world's population) infected with HBV, about 360 million are known to be chronic carriers [1]. Furthermore, about one million of these infected individuals die annually mainly from hepatitis B complications, including liver cirrhosis and liver cancer. [1]

Sub-Saharan Africa has the second largest global burden of chronic carriers of hepatitis B infection after Asia [1]. Though the actual burden of HBV infection in sub-Saharan Africa is not certain owing to inaccurate medical records keeping and under-reporting of cases particularly from the rural communities, which are the homes to the majority of the people.

Estimates of hepatitis B antiginaemia sero prevalence of 6–20% have been reported_making sub-Saharan Africa a hyper-endemic region. Cameroon is also a hyper-endemic country for HBV with various rates ranging from 0.5 to 44.7% [2]

The risk of developing chronic HBV infection commonly defined as being positive for hepatitis B surface antiginaemia (HBsAg) for greater than 6 months is inversely related to the age of acquisition of the infection. Generally, the risk of chronic HBV infection is 90% following infants infected at birth while the risk is put at 30% for children infected between 1 and 5 years of age, and about 1–5% for those infected as older children and adults [2].

Chronic HBV infection has been associated with the risk of development of chronic liver disease in addition to hepatocellular carcinoma [1, 2]. Although about eight different genotypes of HBV have been reported, E genotype has been shown to be the most prevalent genotype in the sub-Saharan Africa [3].

HBV is highly infectious and is commonly spread by vertical transmission through mother to infant during birth, blood products, intravenous drug use, sexual contacts, and scarifications/tattooing, use of shared inadequately sterilized syringes and needles and institutional care and intimate care with carriers [1, 2]. The hepatitis B vaccine is the mainstay of hepatitis B prevention [1, 2]. The hepatitis B vaccine is about 95% effective in preventing its infection[1] .The World Health Organization (WHO) has recommended that all newborns receive the HBV vaccine soon after birth, preferably within the first 24 h. WHO is also working to raise awareness, promoting partnerships and mobilizing resources as well as formulating evidence-based policy and data for action and promotion of access to screening, care and treatment services to control the spread of the HBV infection [1, 2].Despite the universal HBV vaccination in Cameroon since 2004, the prevalence of HBV among Cameroonians is still in the hyper-endemic range [2].Hence, the aim of this study was to determine the prevalence and correlates of HBV infection to intensify awareness, preventive measures and the need of proper immunization among students of the University of Bamenda

Cameroon witnesses a wide disparity in the prevalence of HBV infection within the country. Noah et al [2], in a study carried out in general population in 2015 reported variable rates per region; ranging from 22.82% in the Far North, 21.53% in the North, 12.75% in the Adamawa, 14 .00% in the East and 5.22% in the South for an overall prevalence of 13.01% [2,4]. Numerous other studies reported prevalence rates among health care professionals of 4.98% in the Fako division of the south west region [2, 3] and 11.00% in Yaoundé. Since the implementation of the mother to child transmission prevention strategy against hepatitis B (PMTCT-HBV) in Cameroon, studies have been carried out in order to better control the outcome most often fatal diseases in children [2, 4]. These initiatives are of valuable importance in view of the high probability of chronic carriage in children [4]. Thus, underlining the relevance of the screening of Hepatitis B Surface Antigen (HBsAg) in pre transfusion situation. In view of the multiplicity of factors contributing to the resurgence of HBV infection in developing countries, continuous and efficient measures need to be implemented. WHO in the Global hepatitis report, 2017 target the elimination of this infection as a threat to public health by 2030 [2]. This study aims at determining the prevalence of hepatitis B infection among students of the University of Bamenda in order

Problem statement

Despite the availability of universal hepatitis B vaccination, Hepatitis B virus (HBV) infection remains highly endemic in Cameroon. Post-exposure treatment is costly and often inaccessible, posing a significant public health challenge. Youths, particularly university students, engage in activities that increase their risk of HBV infection, including unprotected sexual activity. Once infected, they can easily transmit the virus to others, contributing to the overall burden of disease. Studies have shown that sexual promiscuity is prevalent among this age group, further amplifying the risk of transmission. In light of this, the present study aimed to investigate the seroprevalence of Hepatitis B virus infection among students at the University of Bamenda.

1.0. Research question

- What is the prevalence of hepatitis B virus infection among students in the University of Bamenda?
- What are the factors influencing the transmission of HBV in Students University of Bamenda?

Research objectives

General objective

The general objective of this research was to determine the prevalence of hepatitis b virus infection among the university of Bamenda students

Specific objectives

- To determine the prevalence of Hepatitis B using the HBsAg rapid diagnostic tests.
- To assess factors influencing transmission of viral Hepatitis B infection among students attending the University of Bamenda.

Scope of the study

This study was conducted among students of the University of Bamenda (UBa) to determine the prevalence of Hepatitis B virus (HBV) infection. Data collection took place over a one-week period, from 21st to 28th June, 2021, focusing on the student population as the study target.

1.6. Significance of the study

- **To the participants:** The study provided free HBV screening. Students who tested negative received counselling and were encouraged to get vaccinated, while those who tested positive were referred to the Bamenda Regional Hospital for appropriate follow-up and care.
- **To the university:** The findings serve as preliminary data that can support future research on HBV or related topics within the University of Bamenda.
- **To the Ministry of Public Health:** The study provides valuable information on the prevalence of Hepatitis B and raises awareness of the factors associated with HBV infection among university students, supporting public health planning and interventions.

Hypothesis

- H0: there is no significance positivity relation with hepatitis b infection and associated risks factors
- H1: there is a significance association of hepatitis b with associated risk factors

Literature Review

What is Hepatitis B?

Hepatitis B virus (HBV) is a deoxyribonucleic acid (DNA) virus belonging to a family Hepadnaviridae that causes acute or chronic infection which affects all age groups globally [1]. This infection can either be acute or chronic and may range from asymptomatic infection or mild disease to severe or rarely fulminant hepatitis [1, 2]. Acute hepatitis B infection is usually a self-limiting disease marked by acute inflammation and hepatocellular necrosis, with a case fatality rate of 0.5-1% [2]. Chronic hepatitis B infection encompasses a spectrum of disease and is defined as persistent HBV infection that is the presence of detectable hepatitis B surface antigen (HBsAg) in the blood or serum for longer than six months, with or without associated active viral replication and evidence of hepatocellular injury and inflammation [1,2]. Chronicity is common following acute infection in neonates and in young children under the age of 5 years, but occurs rarely when infection is acquired in adulthood [1, 3]

Epidemiology of HBV

Hepatitis B infection is the 10th leading cause of death resulting 500,000 to 1.2 million deaths per year, with 2 billion people infected worldwide and 257 million suffering from chronic HBV infection [1], of which 10% of these are in sub-Saharan Africa and East Asia. According to the World Health Organization (WHO), 350 million people are infected with hepatitis B virus (HBV) worldwide [1]. HBV is highly endemic in Cameroon and other sub Saharan Africa countries [6]. The prevalence of hepatitis B vary between continents and countries. Among Cameroonian adults, prevalence is from 8% to 12% for HBV [25].

Pathogenesis of hepatitis B

The HBV virion first attaches to a hepatocyte, penetrates the cytoplasm of hepatocytes [5] moves into the hepatocytes nucleus and convert the DNA to covalent closed circular DNA (cccDNA) – a double stranded DNA structure. The DNA is very stable and can stay in the host nucleus for many months in chronic diseases. The newly formed HBV particles are released into the bloodstream, invade other hepatocytes and repeat the replication process [6]. In adult, approximately 90% of infection are acute and only 5-10 % develop into chronic infection. There are four stages of chronic infection i.e., immune tolerance phase, immune clearance phase (immuneactive), inactive carrier phase (immune control) and reactivation phase [6] but not all chronic infected patients go through all the four stage [5]. The rate of progression from acute to chronic infection is approximately 90% of infections acquired in the perinatal period whereas 30 - 50 % for infections between the ages of 1 and 5 years and < 5 % for infections acquired in adulthood [6]. The risk of developing cirrhosis with chronic infection is 15-40 % during life time with a 2-5 % risk of hepatocellular carcinoma with cirrhosis.

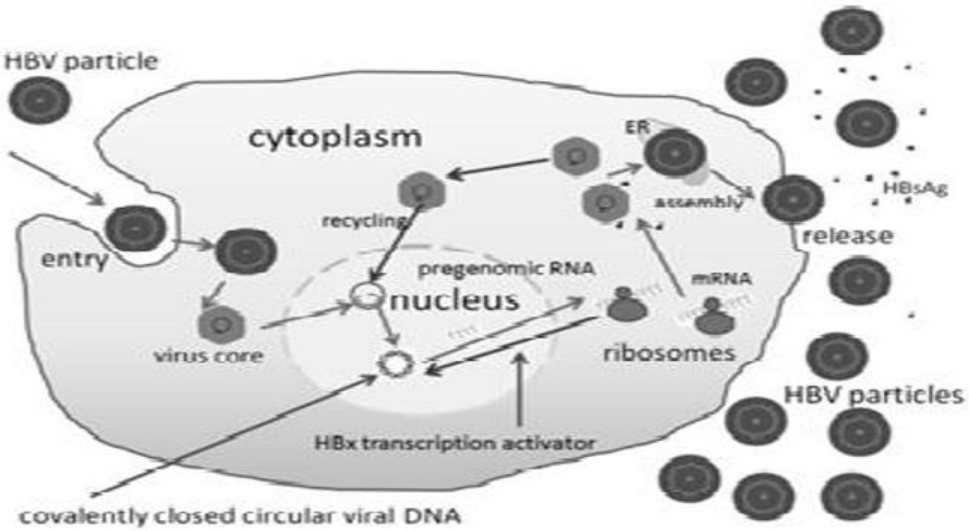

Figure 1: Life cycle of Hepatitis B virus[6]

Transmission and risk factors of hbv

Transmission of Hbv

HBV has been found in virtually all body secretions and excretions. However, only blood, body fluids containing visible blood, semen and vaginal secretions represent a risk of transmission [1,7]. HBV is transmitted by percutaneous and mucosal exposure to infective blood or body fluids. Major modes of HBV transmission include sexual or close household contact with an infected person, perinatal mother to infant transmission, injecting drug use and nosocomial exposure [8]. Percutaneous exposures that have resulted in HBV transmission include transfusion of unscreened blood or blood products, sharing unsterilized injection needles for IV drug use, haemodialysis, acupuncture, tattooing and injuries from contaminated sharp instruments sustained by hospital personnel. HBV is stable on environmental surfaces for at least 7 days and is 100 times more infectious than HIV [9].

Here are some routes of the HBV infection

Perinatal transmission

It is the major route of HBV transmission in the world. It usually happens at the time of birth from HBsAg positive mother to their new born infants (vertical transmission). There is no risk that HBV can be transmitted though breast feeding the risk of perinatal transmission depends on the HBeAg sero status of the mother. The risk of HBV infection approximately ranges from 70-90% for HBeAg positive mothers and 5-20% for HBeAg negative mothers. [1,7-9]

Sexual transmission

HBsAg has been found in seminal fluid and vaginal secretions, although concentrations in these fluids are lower than in blood. The risk of transmission of HBV following sexual exposure depends on the type of exposure, the viral load of the source, and the presence of sexually transmitted infections. The prevalence of HBV in heterosexuals is increased in those with multiple sexual partners, and those who have markers for HIV or syphilis. An infection rate of 18-44.2% is seen in regular heterosexual partners of HBV infected patients in addition, female commercial sex workers with a history of having anal intercourse had an increased risk of HBV infection. The risk of developing HBV infection is particularly high among men who have sex with men [1, 9]. For men who have sex with men, the prevalence of HBV infection is increased in those who have a history of an ulcerative sexually transmitted infection, chlamydia, gonorrhoea, commercial sex work, or multiple partners there is also a significant risk associated with unprotected incentive anal intercourse

Horizontal transmission

The spread of HBV infection from child to child usually happens in household settings but also occurs in day care centres and schools, contact of skin sores, small breaks in the skin or mucous membranes with blood or skin sore secretions [7]

Sharing of contaminated objects

The virus may spread from inanimate objects such as shared towels or toothbrushes is possible because the virus can survive for up to 7 days outside the body and can be found in high tires even in the absence of visible blood [2,7]. The most important percutaneous transmission route is sharing of syringes and needles by people who inject drugs, razor blades, and additional practices such as acupuncture, tattooing, and body piercings have been associated with the transmission of HBV. There are case reports documenting the transmission of HBV among butchers. These are attributed to small hand cuts, and sharing knives, which can carry the virus on the handle. It is also thought that HBV can be transmitted via small cuts acquired in barber shops

The injection of illicit drugs using shared needles is a common mode of HBV transmission in developed countries.

Blood transfusion

HBV can easily be transmitted in countries where the blood supply is not properly screened for HBsAg. Blood donors are routinely screened for HBsAg therefore, incidence of transfusion related HBV has significantly reduced. [1, 7, 9]

Nosocomial transmission

This normally occurs from patient to patient, patient to health worker and vice versa. HBV is considered the most commonly transmitted blood-borne virus in health care settings. This is normally acquired through unsafe injection practices, reuse of syringes or needles, reuse of contaminated medical equipment and dental procedures.

Risk factors of hepatitis b virus

The transmission of HBV among the youth population is characterise by the following

- **Multiple sexual partners and unprotected sexual intercourse**. The act of having multiple sexual partners accompanied with having unprotected sexual intercourse has been associated to the transmission of the HBV. [10]
- **Sharing of items.** The HBV has the tendency of surviving outside the human body for up to 7days and sharing of items such as needles, blades, toothbrushes etc. are associated with the HBV transmission [8].
- **Lack of awareness about infection and transmission modes.** Most youths go around enjoying life with little or no knowledge on this virus, thus Knowledge on hepatitis B through regular sensitization of various transmission modes will ease the adoption of preventive and protective by youths [7,11]
- **Tattooing, scarification and other forms of skin piercings.** The practice of tattooing and scarification which often could be lead to frustration and boredom in prisons is a high risk to getting infected because these activities are often times being carried out by people without skills, who use local tools such as blades, sharps or needles and inadequate equipment which are commonly shared among youths [1-4,11].
- **Homosexuality.** The risk of being infected with the HBV is potentially high among men who have sex with men (MSM). In MSM the prevalence of HBV infection is increased in those who have a history of an ulcerative sexually transmitted infection, chlamydia or gonorrhoea. [3,11]
- **HIV infection.** It has been reported that most people who are infected with the HIV virus have higher chances of being infected with the HBV due to weakened

immune systems and possible common routes of infection [3].

- **Intravenous drug users (IDUs).** Also, known as PWID (people who inject drugs), is one of the commonest and highly observed risk factor among youths. The injecting drug users (IDUs) have a strong relationship with the transmission of viral hepatitis, being populations at risk by sharing materials used for drug consumption. IDUs have been reported to having confections such as HCV and HIV [1, 11]

Clinical Manifestations

The course of hepatitis B may be extremely variable. Hepatitis B infection has different clinical manifestations depending at the Patient's age at the time of infection and immune status, and the stage at which the disease is recognised. During the incubation period (6 to 12 weeks), patients may feel unwell with possible nausea, vomiting, diarrhoea, anorexia and headaches. Patients may then become jaundiced although low grade fever and loss of appetite may improve. Sometimes HBV infection may neither produce jaundice nor obvious symptoms [12].

The asymptomatic cases can be identified by detecting biochemical or virus specific serological alterations in the blood. They may become silent carriers of the virus and constitute a reservoir for further transmission to others.

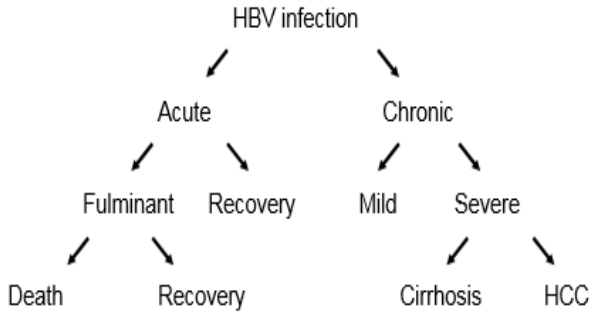

Figure 2: Spectrum of liver disease after HBV infection

Natural history

The clinical course of HBV infection is variable and includes acute (self-limiting) infection, fulminant hepatic failure, inactive carrier state, and chronic hepatitis with chances of progression to cirrhosis and HCC.

Acute Hepatitis B

The acute form of hepatitis B usually resolves spontaneously after a 4 to 8weeks illness. Most patients recover without significant consequences and without recurrence. The incubation period varies between 45 and 120 days, with an average of 60 to 90 days [1]. The variation is related to the amount of virus in the inoculum, the mode of transmission and host factors [13]. The hallmark of acute viral hepatitis B is the striking elevation in serum transaminase (amino transaminase) activity. The increase in amino transferase, especially ALT during acute hepatitis B varies from a mild/moderate increase of 3 to 10 folds to a striking increase of >10 folds [12]. Onset of clinical disease is insidious and is characterised by tiredness, anorexia, vague abdominal discomfort, nausea, vomiting, fever (may be mild or absent) and sometimes arthralgia's and rash. Icteric phase of acute infection begins usually within 10 days of initial symptoms with dark urine, followed by pale stool, yellowish discoloration of mucous membrane, conjunctiva, sclera and skin.

Chronic Hepatitis B

Chronic HBV infection is defined as the persistent of HBsAg for 6 months or longer and is characterised by continuous wild inflammatory activity in the liver with high risk of cirrhosis and hepatocellular carcinoma [10, 13]. the risk of developing chronic hepatitis B infection depends on the age at which infection is acquired. Chronic infection occurs in 90% of those infected parentally but is less frequent in those infected as children [10]. Chronic infection clinically is divided into three phases:

- At the inactive (Non-replicative) phase, markers of viral replication (viral proteins & antibody) are either absent or below detection level and inflammation of the liver is minimal.
- The immune tolerance phase is characterized by low rate of viral replication, presence of HBsAg and HBcAg in serum, high level of HBV- DNA, with normal enzyme level and less pathological changes in liver biopsy.
- The immune active phase, ALT levels up with detectable levels of HBsAg & HBV-DNA and necro-inflammatory conditions with or without cirrhosis and fibrosis occurs. There is loss of HBeAg and appearance of anti-HBe [36]

This is a rare condition that develops from massive necrosis of the liver substance in about 1% of HBV cases [1, 12-13]. There is a rapid fall in ALT and AST which may be erroneously interpreted as a resolving hepatic infection.

Hepatocellular carcinoma

The risk of HCC varies depending on the severity of the underlying liver disease and current and past hepatic inflammatory activity. Those with high HBV DNA concentrations and ongoing hepatic inflammatory activity (evidenced by elevated ALT values) are at increased risk for HCC, and surveillance should be considered. Genotype C infection and the presence of BCP and pre-S1 mutations are also associated with an increased risk of HCC [10, 12]

Coinfection

- HBV–HDV: Hepatitis D virus (HDV) is a defective virus with a circular RNA genome and a single structured protein, the hepatitis delta antigen. The virus requires HBV surface antigen to serve as an envelope for its delta antigen. This helper function of HBV is required for HDV assembly and propagation. Up to 5% of the world's population is infected with HBV, and probably 5% of those chronically infected with HBV have HDV infection. Up to 5% of the world's population is infected with HBV, and probably 5% of those chronically infected with HBV have HDV infection.
- HBV–HCV Coinfection**:** Infection with both Hepatitis B virus (HBV) and Hepatitis C virus (HCV) can occur, as the two viruses share similar risk factors and transmission routes. Coinfection is most prevalent in

regions where both viruses are highly endemic and among individuals exposed through injection drug use. Unlike HBV, HCV is less efficiently transmitted via sexual contact or from mother to child. Consequently, HBV–HCV coinfections and in some cases triple infections with HBV, HCV, and HIV, or even quadruple infections including Hepatitis D virus (HDV) may be observed in high-risk populations

- HBV–HIV Coinfection: Globally, an estimated 36 million individuals are living with HIV. Chronic coinfection with Hepatitis B virus (HBV) can occur due to the shared modes of transmission, including parenteral exposure, sexual contact, and vertical transmission from mother to child. Such coinfections pose significant clinical challenges, as they can accelerate liver disease progression and complicate management strategies [13].

Diagnosis of HBV infection

The following markers are use in the laboratory for the diagnoses of HBV infections; [1, 14].

- HBsAg: use as general marker for infection
- HBsAb: to monitor recovery or immunity to HBV infections
- Anti HBc IgM: marker of acute infection
- Anti HBc IgG: marker of past or chronic infection
- HBeAg: indicates effectiveness of active viral replication
- Anti HBe: virus no longer replicating. However, the patient can still be positive for HBsAg
- HBV DNA: indicates active replication of virus, more accurate than HBeAg, use mainly for monitory response to therapy

The diagnosis of acute hepatitis B is based on the detection of HBsAg and anti-HBc (immunoglobulin M). During the initial phase of infection, markers of HBV replication, HBeAg and HBV DNA are also present. Recovery is accompanied by the disappearance of detectable HBV DNA, HBeAg sero conversion to anti-Huber, and subsequent clearance of HBsAg with sero conversion to anti-HBs and appearance of anti-HBc (IgG).

Chronic HBV infection Diagnosis of chronic HBV infection is defined as the persistence of HBsAg for more than 6 months. Additional tests for markers of HBV replication namely; HBeAg and serial measurements of serum HBV DNA in addition to ALT. This will in part determine whether the patient should be considered for HBV therapy

The most widely used HBsAg screening tests are ELISAs as they are the most appropriate for screening large numbers of specimens on a daily basis, as is the case in blood transfusion services in industrialized countries. However, many blood transfusion services in resource limited countries only process limited numbers of specimens. Hence, individual tests would be more appropriate. Several simple, instrument and electricity-free screening tests have been developed including agglutination, immuno filtration (flow through) and immunochromatographic (lateral flow) membrane tests. A positive result is indicated by the appearance of a coloured dot or line, or shows an agglutination pattern. While most of these tests can be performed in less than 10 minutes, other simple tests are less rapid and their performance requires 30 minutes to 2 hours. The results are read visually. In general, these simple/rapid (S/R) tests are most suitable for use in laboratories that have limited facilities and/or process low numbers of specimens daily. The 3 standard blood test for hepatitis B can determine if a patient is currently infected with hepatitis B, has recovered, is a carrier or is susceptible to hepatitis B virus infection. Summarily, diagnostic tests to determine HBV infection and monitor disease progression measure three viral components found in serum samples; HBV DNA, HBsAg (s-antigen), HBeAg (e-antigen) as well as non-viral components such as antibodies to the respective antigens, including HBcAb, and host serum transaminase (ALT) levels [15]. Of these markers, HBsAg, HBsAb and HBcAb are usually the primary markers screened to establish a diagnosis and core antibodies may be subtyped to distinguish between acute (IgM class) and chronic (IgG class). Secondary markers most frequently used are HBeAg and HBeAb; However, ALT levels and molecular tests (quantitative PCR of HBV DNA/Viral load) may also be used. These markers vary in titre and may all but disappear, depending on the stage (acute vs. chronic) and the phase of persistent infection. [10, 14]

Treatment

There is no specific treatment for acute hepatitis B. Therefore, care is aimed at maintaining comfort and adequate nutritional balance, including replacement of fluids lost from vomiting and diarrhoea most important is the avoidance of unnecessary medications. Acetaminophen/Paracetamol and medication against vomiting should not be given.

Chronic hepatitis B infection can be treated with medicines, including oral antiviral agents. Treatment can slow the progression of cirrhosis [16], reduce incidence of liver cancer and improve long term survival. Only a proportion (estimates vary from 10% to 40% depending on setting and eligibility criteria) of people with chronic hepatitis B infection will require treatment.

WHO recommends the use of oral treatments - tenofovir or entecavir [1] as the most potent drugs to suppress hepatitis B virus. They rarely lead to drug resistance compared with other drugs, are simple to take (1 pill a day), and have few side effects, so require only limited monitoring. Entecavir is off-patent [17]. In 2017, all low- and middle-income countries could legally procure generic entecavir, but the costs and availability varied widely. Tenofovir is no longer protected by a patent anywhere in the world. In most people, however, the treatment does not cure hepatitis B infection, but only suppresses the replication of the virus. Therefore, most people who start hepatitis B treatment must continue it for life [13]. There is still limited access to diagnosis and treatment of hepatitis B in many resource-constrained settings. In 2016, of the more than 250 million people living with HBV infection, 10.5% (27 million) were aware of their infection. Of those diagnosed, the global treatment coverage is 16.7% (4.5 million). Many people are diagnosed only when they already have advanced liver disease. Among the long-term complications of HBV infections, cirrhosis and hepatocellular carcinoma cause a large disease burden [16.17]. Liver cancer progresses rapidly, and since treatment options are limited, the outcome is generally poor. In low-income settings, most people with liver cancer die within months of diagnosis. In high-income countries, surgery and chemotherapy can prolong life for up to a few years. Liver transplantation is sometimes used in people with cirrhosis in high income countries, with varying success. [16]

Prevention and control

Immunisation with the hepatitis B vaccine is the most effective way of preventing HBV infection [1,10]. A program for universal vaccination of all new-borns is a key step toward effective control of HBV infection throughout the world. HBV vaccination has been shown to be highly cost-effective. Vaccination prevents infection with HBV and thus reduces the incidence of chronic hepatitis, cirrhosis, and HCC in the vaccinated population, as well as reducing transmission by limiting the number of susceptible individual. The hepatitis B vaccine is the mainstay of hepatitis B prevention and has been available since 1982. The vaccine was originally prepared from plasma obtained from patients who had chronic HBV infection. However, these are currently more often made using recombinant DNA technology, though plasma derived vaccine continue to be used; the two types of vaccines are equally effective and safe [18].

A combination of control strategies such as

- Proper screening of blood before transfusion.
- Use of new syringes, not sharing of needles and sharps especially for IDU and people who practice tattooing.
- safe medical practices especial during surgery
- Promotion of awareness through mass media and social media.
- Testing in Schools colleges or other educational institutions.
- National testing campaigns. Routine testing in antenatal clinics [1,10,18]

Management of HBsAg positive individuals.

- Detailed patient history and physical examination.
- Family history of liver disease and HCC should be investigated.
- Biochemical tests: Serum alaninetransferase (ALT), Aspartates (AST), alkaline phosphatase (ALP), gamma-glutamyl transferase (GGT), total and direct bilirubin and albumin levels should be performed to identify the presence and severity of liver disease. Serum alpha fetoprotein (AFP) level should be recommended for diagnosis and surveillance of HCC. [19]
- Haematological tests: Complete blood count (CBC), international normalized ratio (INR)
- Serum anti-HBc Immunoglobulin M (IgM), anti-HBc IgG, hepatitis B e antigen (HBeAg), antibody against HBeAg (Anti-HBe) antibodies should be recommended to distinguish acute or chronic HBV infection. Quantitative serum HBV DNA level should be recommended to determine the HBV replication status.
- Testing for antibodies against hepatitis delta virus (HDV), HCV and HIV should be performed to rule out any co-infection with other hepato tropic viruses.
- Testing for antibodies against hepatitis A virus (HAV) should be recommended to determine the immunity against HAV.
- Upper abdominal sonography should be performed to assess liver abnormality and spleen size and the presence of portal hypertension [19].

Materials and Methods

The Study Site

This study was conducted on the University of Bamenda campus, located in Bambili, Tubah Subdivision, North West Region of Cameroon. The university is led by a Vice-Chancellor and comprises six schools and six faculties, each headed by directors and deans, respectively. Departments within the faculties are overseen by Heads of Departments, while student affairs are managed by the Student Union President. The university has an estimated total student population of 18,000.

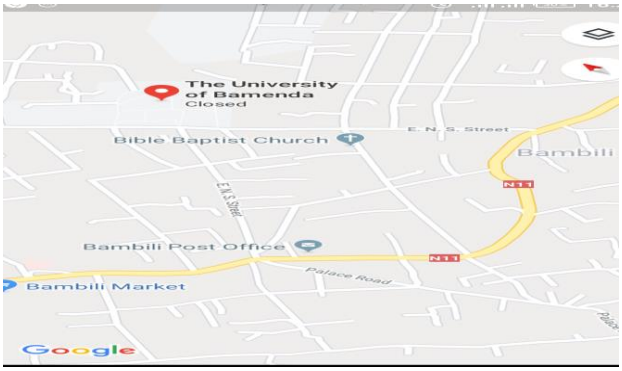

Figure 3: map of study site (university of Bamenda) [20]

Study Period

The study was conducted from 21st to 28th June 2021

Study Design

This was a school-based cross-sectional study conducted among students attending the University of Bamenda.

Study Population

All students attending and taking classes in the University of Bamenda.

Criteria

Inclusion criterion

All students attending the University of Bamenda from the month of April to June of 2021 and those who gave consent to take part in the study were sampled

Exclusion criteria

- Students who had received the HBV vaccine
- Those students who refused to sign the consent form.

Sample Size and Sampling Technique

The sample size was calculated from the Fishers formula,

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

Where,

n = required sample size

z = confidence level at 95% (standard value of 1.96)

p = estimated prevalence of the infection under investigation (In Cameroon, the prevalence of Hepatitis B virus (HBV) infection under investigation is estimated to be [1]

- q= (1−p)
- d = margin of error at 5 % (standard value of 0.05)
- If
- z=1.96
- p= 11.2% (0.112)
- d=0.05
- Then, $n = \frac{(1.96)^2 \times 0.112(1-0.112)}{(0.05)(0.05)} = 153\ participants$

The calculated minimum sample size for this study was 153 participants; however, a total of 200 students were recruited and included in the study to increase statistical power and ensure representative coverage of the population

Data Collection

A self-administered questionnaire was provided to each participant, to collect data on socio demographic characteristics and risk factors which took 7 to 10 minutes to complete it. Prior to the beginning of this study, the questionnaire was tested on 20 students of another university [CATUC] to ensure questions were appropriate and to reformulate as needed.

Collection of specimen and Laboratory procedure

Principle of HBsAg one step test strip

The HBsAg one step hepatitis B Surface Antigen Test strip (Serum/plasma) is a qualitative lateral flow immunoassay for the detection of HBsAg in serum or plasma. The membrane is pre-coated with anti-HBsAg antibodies on the test region of the strip. During testing, the serum or plasma specimen reacts with the particles coated with anti-HBsAg antibody. The mixture migrates upward on the membrane chromatographically by capillary action to react with anti-HBsAg antibodies on the membrane and generate a coloured line. The presence of this coloured line in the test region indicates a positive result, while its absence indicates negative results.

Venous blood collection

A blood collection tube was labelled with the subject's code, sex, age, date and time of sample collection. After choosing a suitable vein on either arm of the participant, a tourniquet was tied on the upper arm to provide pressure for adequate blood flow. The person was asked to make fist to support the pressure The selected point to be punctured was swabbed with a cotton wool soaked in 70% alcohol, in order to decontaminate it. Using a sterile syringe, about 4mls of blood was drawn for analysis. The subject was asked to open the hand, the tourniquet untied and dry cotton placed on the area before the syringe was withdrawn. The participant was asked to apply pressure on the dry cotton wool attached to the punctured site until the blood stop flowing. The sample was then dispensed into a 5ml blood collection tube containing an EDTA as an anticoagulant. All waste was disposed of appropriately.

Test procedure

The one step hepatitis B surface antigen test strip (serum/plasma) is a rapid chromatographic immunoassay for the qualitative detection of hepatitis B surface antigen, a marker of Hepatitis B infection in serum/plasma specimens. The test strip to room temperature before the test was carried out. The test strips were removed from the pouch and labelled appropriately with participant's code, sex and age as in serum specimen. The test strip was immersed vertically in the serum for 10-15 seconds making sure that the maximum line (MA X) in the test strip was not exceeded when immersing the strip. The test strip was then removed after the appropriate time and placed on a non-absorbent flat surface. The results were read after 15 minutes.

Data management

The data collected was coded and stored in printed sheets. The data was also stored in a laptop, flash drives and in a smart phone. Storing the data in multiple devices was aimed at minimising the chances of losing the data.

Data analysis

The data was analysed using the Statistical Package for Social Sciences (SPSS) version 20.0.

Results

Distribution of study population according to socio demographic characteristics

During the study period, 200students were consecutively sampled and tested for HBsAg. Female students were highly represented 117(58.55%) than Male students 83(41. 5%). The most represented age group was; those between 20 to 30 years 101(50.2%), 45(22.45%) were married and 155(77.1%) were single students. participants were higher in Christians 170(84.6%) and in Muslim 30 (14.4%). The most represented establishment was FHS 36(17.0%) and least represented was HTTC 10(5.0%) as shown in the table1 below.

Factor	Category	N° tested	%
Sex	Male	83	41.5
	Female	117	58.5
Age (years)	< 20	50	24.4
	20-30	101	50.2
	> 30	49	24.4
	HTTC	10	5.0
	HTTTC	14	7.0

Schools /faculties	FS	18	9.0
	FHS	36	17.0
	FA	19	10.5
	HICM	14	9.5
	HITL	15	7.0
	FLPS	12	7.5
	FED	21	6.0
	FEMS	13	1O.4
	COLTECH	16	6.5
	NAHPI	12	8.0
Marital Status	Married	45	22.4
	Single	155	77.1
Religion	Christians	170	84.6
	Muslims	30	14.4

Table 1: Socio Demographic Data of Study Participants

Prevalence of Hepatitis B with respect to the socio and demographic factors

Hepatitis B infection was higher in female (7.7%) than in male (7.2%) participants . students with age above 30 years (10.2 %) were the most infected age group while below 20 years (6.0%) was the least infected. According to establishments the infection was predorminant in FS (22.2%) and the least was in HTTC(0.0%). Students who were single (7.7%) were highly infected than those who were married(6.7%.) Participants who were christains (7.6%) had a high prevalence than the muslim(6.6 %).

4.2. Prevalence of Hepatitis B With Respect To Socio Demographic Factors:

Factor	**Category**	**N° tested**	**HBV status**		**OR at 95%CI or χ^2**	**Level of significance**	
			Positive	**Negative**			
Sex	Male	83	6	77	7.2	OR: 1.07 (0.37-3.13)	**P=0.56**
	Female	117	9	1O8	7.7		
Age (years)	< 20	50	3	47	6.0	0.72	0.564
	20-30	101	7	94	6.9		
	> 30	49	5	44	10.2	11.16	0.430
establishments	ENS	10	0	10	0.0		
	ENSET	14	1	13	7.1		
	FS	18	4	14	22.2		
	FHS	36	2	34	1O.5		
	FA	19	2	17	10.5		
	HICM	14	0	14	0.0		
	HITL	15	2	13	13.3		
	FLPS	12	1	11	8.3		
	FED	21	2	19	9.5		
	FEMS	13	1	12	7.7		
	COLTECH	16	0	16	0.0		
	NAHPI	12	0	12	0.0		

marital	Married	45	3	42	6.7	1.18(0.32-4.36)	0.058
	Single	155	12	143	7.7		
Religion	Christians	170	13	157	7.6	0.10	0.102
	Muslims	30	2	28	6.6		

Prevalence of Hepatitis B with respect to risk factors

The results were analysed according to the possible risk factors that might be associated with HBsAg**.** Prevalence was higher in students without knowledge about HBsAg (10.2%) than those with knowledge about the infection (3.7%). Prevalence was higher in students with a history of blood transfusion (10.9%) than those with no history of blood transfusion (6.2%). According to duration on campus, students who have being studying for 7years and above were the most infected (20.0%) and students who have been on campus for one or two years (5.3%) were the least infected . prevalence was higher in Students with no history of taking drugs by injection (8.3%) than those with history of taking drugs by injection (6.6%), students without tattoo showed a high prevalence of (8.3%) while those with tattoos had a prevalence of (5.8%), student with a history of operation presented with a prevalence of (5.5%), while those with no operation history had (8.5%), students involve in protected sex showed (2.2%) while students with unprotected sex hade a high (9.0%), students with no multiple sex (4.0) while those with multiple sex partners (8.7%), students who said they are homosexual (0.0%) while those who said they are not homosexuals (7.7%), and those who share sharp utilisable objects (7.6%) while those who don't share sharp objects (7.1%) as represented in the table 3 below.

Table 3: **Risks Factors Associated with Hepatitis B of Study Participants**

Factor	**Category**	**N° tested**	**%**	**HBV frequency**		**% prevalence**	**OR (range at 95% CI)**	**p-value**
				negative	positive			
Knowledge of HBV	NO	118	59	106	12	10.2	0.32 (0.09-1.23)	0.09
	YES	82	41	79	3	3.7		
Transfuse	NO	145	72.5	136	9	6.2	0.54(0.18-1.59)	0.26
	YES	55	27.5	49	6	10.9		
Duration in UBa	1-2	113	56.5	107	6	5.3	5.13	0.27
	3-4	41	20.5	37	4	9.7		
	5-6	31	15.5	29	2	6.5		
	7+	15	7.5	12	3	20.0		
Injection	Yes	91	45.5	85	6	6.6	0.28(0.09-0.86)	0.36
	No	109	54.5	100	9	8.3		
tattoo	Yes	69	34.5	65	4	5.8	1.49(0.46-4.87)	0.94
	No	131	65.5	120	11	8.4		
operated	Yes	55	29	52	3	5.5	0.76	0.13
	No	142	71	130	12	8.5		
Unprotected sex	NO	45	22.5	44	1	2.2	4.37(0.56-34.17)	0.29
	YES	155	77.5	141	14	9.0		
Multiple sex partners	yes	50	25	47	2	4.0	2.23(0.49-10.25)	0.57
	no	150	75	137	13	8.7		
homosexual	Yes	4	2	4	0	0.0	1.08(1.04-1.13)	0.02
	No	196	98	181	15	7.7		
Share cloths razors, earring	NO	56	28	52	4	7.1	1.08(0.38-3.53)	0.91
	YES	144	72	133	11	7.6		

Regression analysis on socio demographic factors and risk factors

The regression analysis on effect of socio demographic factors of HBV infection, p values less than 0.05, the margin of error at 5%, are considered significant. Sex (p value0.50 >0, 05), Age (p value, 0.56>0.05); marital status (p value, 0.06 > 0.05); marital status (p value, 0.06 > 0.05) religion (p value 0.10 > 0.05). Here, the P values are greater than 0.05. Therefore, sex, age, marital status, and religion at 95% C.I shows no significant relationship with the positivity of HBV infection.

Knowledge (p value0.09 >0, 05), history of blood transfusion (p value, 0.26>0.05); duration in university (p value, 0.27 > 0.05); received drugs by injection (p value, 0.36 > 0.05) having tattoo (p value 0.94 > 0.05), history of operation (p value 0.13 >0, 05), involve in unprotected sex (p value, 0.29>0.05); having multiple sex partners (p value, 0.59 > 0.05); sharing of sharps (p value 0.91 > 0.05). This risks factors had a p value greater than 0.05 which implies they had no significant association with HBV infection

Homosexuality (p value, 0.02<0.05) this therefore implies this factor had an association with HBV infection.

Table 4: Regression Analysis on Effect of Socio Demographic Factors and Risk Factors

Factors	OR (range at 95% CI)	P-Value (>0.05%)
sex	1.07(0.37-3.13)	0.09
age	0.72	0.56
establishment	1.16	0.43
Marital status	1.18(0.32-4.36)	0.06
religion	0.10	0.10
knowledge	0.32(0.09-0.86)	0.09
History of blood transfusion	0.54(0.46-4.87)	0.26
Duration on campus	5.13	0.27
History of having receiving drugs by injection	0.28(0.09-0.86)	0.36
tattoo	1.49(0.46-4.87)	0.94
History of operation	0.76(0.56-34.17)	0.13
Unprotected sex	4.37	0.29
Multiple sex partners	2.23(O.49-10.25)	0.57
homosexuality	1.08(1.04-10.25)	0.02
Sharing of cloths, earrings, razors	1.08(0.38-3.53)	0.91

Discussion, Conclusion and Recommendation

Discussion

The seroprevanlence of 7.5 hepatitis b surface antigen reported in this study is regareded as high hepatitis b infection per the WHO classification of asssessing severity of HBV infection in endemic countries: low (<2%), moderate (2-6%) and high (>6%) [1,25]. This seroprevalence rate is lower than 9.2% earlier reported among students in a tertiary institute in north werstern nigeria (Isa I et al, 2015), 11.5% month students of nasarawa state university (pennap et al, 2011)

Incontrast, Mboto and Edet (2012) repoerted a lower seroprevalence of 4.1%among uyo university students and 5.08% reported by Tadongfack et a l(2020) in a study of sero prevalence

and associated risk Factors in a rural area in Dschang with university students having the highest prevalence.The reason for variation may be related to the fact that infection tend to vary from one locality to another or from one country to the other depending on the level of associated risk factors. The rate of infection was higher in female students than in male.this finding agrees with that of mustapha and jibrin (2004). Hower ever this results contrasts the report of pennap et al (2011). This difference could be as result of paucity from male participants. Students with age above 30 years were the most infected age group showing that viruses is significally associated with increasing age. this result is similar to the findings of okonko et al (2012) who found out higher prevalenc in those above 30 years. It is also very possible that other than HIV , many people may not be aware of other STIs infection and so continue to have unprotected sex with fellow HIV negative partners who might be chronic HBVcarriers. It has been noted that more than half of the population become HBV infected during their life time and above 8% of the inhabitants become chronic carriers .(Pennap et ,2011)

FS was the most infected establishment, could be because FS is one of the establishments in the university that offers courses that take about 7years to be graduated, she it is a fact that longer duration on campus is a risk factor to hepatitis B infection. Also, this could be as a result of lack of awareness of the virual infection. In relation to marital status, higher prevalence was recorded among single students.this resuilt is similar to that of Ejele et al (2004).this may be explain by the fact that promiscuity and unprotected sexaual behaviors among unmarried might be higher among the married therefore increasing the risk of acquiring the viruses due to their due to their inabilility to stick to only one partner.

Greater prevalence was observe among christains than in muslims. Prevalence was high among students who were not Knowledgeable about hepatistis than in those who were knowlegde .this could be as result .

Higher prevalence was observed in students with history of blood trasnfusion than in students with no history of blood transfusion .this study is in line with that reported by Isa e t al (2015) and Dionne o et al in a study conducted among blood donors in four large hospitals of cameroon baptist convention health services. This could be the due to the transfusion of improperly screened blood because not all health facilities in cameroon have the means and facilities for effective screening for hbv including the markers.thus underlinning the proper screening hbv in pretransfusion. There was no significant association with duration of students on campus. Howerver ,there was a higher prevalence in students who have been studying in the university for 7 years and above. Therefore , being on campus for a longer period exposes you to the risks of being infected with HBV. Prevalence with respect of drugs by injection was higher in students with no history than in students with history of recieving drugs by injection. This could be that those with no history got the infection via another mode.this study is in line with that reported by Ekuma O.O et al (2014). Prevalence with respect to tattoo was higher in students witho taatoo than with students with taattoo. This could be because ,they was a means of safe practices or the infection was gotten from another route. Those with history of surgery had a lower prevalence than those with no history of operation.this could be due to proper use os sterilised sugery equipments. There was no significant asociation of unprotected sex with HBV positivity. This reult is similar to the finding of Otori et al (2013)which reported high prevalence of HBV infection in students involve in unprotected sex or poorly use of condoms which increases the risks of hbv infection.

Prevalence was higher in students with no multiple sex partners than in those with multiple sex patners. This result is similar to the findings of Mboto and Edet (2012), pennap et al (2011) and contrary to that of a Adekanle et al (2010). the lower prevalence with multiple sex partner could be that studennts might have been carefull and usually take necesaary precautions those infected could have gotten the infection from another routes.

Homosexuality had a significance association with hbv positivity

Students who accepted of sharing sharps, cloths, earrings had a higher prevalence as compared to those who don't share. This finding agrees with isal et (2015). However, there was no statistical significant association between this potential risk factors and infection. Sharing of cloths,earrings is a predorminant life style of students in the university area hence increasing the chance of acquiring hepatitis b virus infection.

Conclusion

This study found the seroprevalence of hepattitis b virus infection among students of the university of Bamenda to be 7.7% which implies the infection is highly endemic among bthe students based on WHO recommendation . this calls for awareness, screening and vaccination of the students for a better control of the the infection with hepatitis b virus in our communities.

Recommendations

- **To The Ministry Of Public Health:** sensitization and aware campaigns should be intensified in all universities and subsidization of cost of tests and vaccines as wells
- **To Ministry of Higher Education:** hepatitis B screening should be included in the medicals of students, follow by vaccinations. Also, basic health concepts should be taught in all schools and faculties of the university especially STIs by so doing, this target population will be knowledgeable enough to educate their peers, family members and this will be a great remedy.

Limitations

- The major limitations in this study was partially due to the corona virus crisis that scared students away from the school medical centre.
- self-reported information is a limitation because one cannot totally rely on the information provided by the participants

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