Republic of Yemen
Ministry of Education
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Emirates International
University
Faculty of Medicine and
health sciences

Knowledge and practice toward Hepatitis B Virus Vaccination among Clinical Medical Students, of Sana'a City Universities, Yemen, 2024.

A research submitted to the department of community medicine, faculty of medicine and health sciences, Emirates International University, in partial fulfillment for the degree of MBBH in general medicine and surgery.

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Dedication

We dedicate this research to a

Our beloved country [Yemen]:

That we have always sought to serve and our souls strive to advance scientifically and practically.

Parents:

Here we are today, reaching fulfillment your hopes for us; thanks to Allah and thanks to your prayers that accompany us as a permanent shadow.

Years of our lives:

That passed between effort, fatigue, bitterness of science and learning, cruelty of war and struggle with life.

Our University:

That embraced us in its paws and between its ribs for years.

Our Doctors:

Whom taught us and helped us achieve the Bachelor's degree.

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"Emirates International University _faculty of medicine _ community medicine".

Abstract

Introduction:

Hepatitis B virus (HBV) infection causes significant morbidity and mortality world-wide. Occupational exposure of health care workers and medical students increases their risk of acquiring HBV infection, and many authorities recommend vaccination. However, significant pre-portions of health care workers do not receive HBV immunization, and remain at increased risk to HBV infection. Hepatitis B infection among health care professionals can be prevented by strategies like vaccination, increasing awareness and following universal precautions. The present study was conducted on clinical medical students to evaluate knowledge regarding HBV and to know their vaccination status. This occasion was also used to motivate students to take HBV vaccine if not taken earlier and to educate about universal precautions.

Objective:

To assess knowledge, practice and prevalence of HB vaccination among clinical medical students at Four Universities, in Sana'a City, Yemen, 2024.

Method:

A cross section study design was conducted among 427 clinical medical students (4th, 5th, 6th) at four different Universities of Sana'a City, from 21 Oct. 2024 to 16 Nov- 2024.. Out of 427 distributed questionnaires, 427 were returned with a response rate of 100.0%. Self-administered structured questionnaire was used to collect information divided into five parts , First part including socio-demographic data . The second part included HB vaccination status .The third part included knowledge related to HB virus . The Fourth part included knowledge related to HB vaccine. The fifth part included practice related to HBV The obtained data was entered into Microsoft Excel 2013. Then entered and analyzed in IBM Statistical Package for the social sciences (SPSS) version 30.0, then data presented in tables and figures.

Result:

A total of 427 students responded to the questionnaire with a response rate of 100.0%, Among them, 65.3% were males, and 34.7% were females with a mean age of 24.69 ± 2.028 years. More than half of students 56.4% were vaccinated against hepatitis B, whereas 39.3% students had never been vaccinated and only 4.2% unknown about their vaccinated state. The main reason for not being vaccinated was lack of vaccination program 27.42%. Among the vaccinated participants, 66% were fully vaccinated (three or more doses) while 34% were partially vaccinated (one or two doses). Among the study participants, 50.8% had average knowledge about HBV, 48.7% had high knowledge about HBV vaccine, and 72% had moderate positive practice related to HBV. There was statistically significant association between the (knowledge about HB vaccine and vaccinated state) and the universities factor of participant, in which Sana’a university was more knowledge and more vaccinated than others universities.

Conclusions:

The study directed to evaluation the knowledge, vaccination states and practice to HBV, which showed good but there are other points we found out which there was relation between the knowledge about HB vaccine and the universities factor of participant that need improve by organized health education programs to increase awareness and knowledge about HBV and motivate them to take HB vaccine. These programs should be conduct especially in private collages and community centers.

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Abbreviation

Abbreviation	Meaning
ACOG	American College of obstetricians and gynecologists
CBC	Complete blood count
CDC	Center for disease control and prevention
CLD	Chronic liver disease
CRP	C-reactive protein
DNA	Deoxyribonucleic acid
ESR	Erythrocyte sedimentation rate
FDA	Food and drug administration
FHCP	Future healthcare professional
HBcAg	Hepatitis B core antigen
HBsAg	Hepatitis B surface antigen
HBV	Hepatitis B virus
HCC	Hepatocellular carcinoma
HCV	Hepatitis C virus
HCWs	Healthcare workers
HIV	Human immunodeficiency virus
HLA	Human leukocyte antigen
ICP	Infection control and prevention
INR	International normalized ratio
IQR	Interquartile range
KAP	Knowledge , attitude and practice
LMICs	Low and middle income countries
MLS	Medical laboratory sciences
PCR	Polymerase chain reaction
PT	Prothrombin Time
RNA	Ribonucleic acid
SD	Standard deviation
SIDs	Sudden infant deaths
SPSS	Statistical Package for the social sciences
SPU	Syrian Private University
U.S	United State
WHO	World health organization
YMSs	Yemeni medical students

Chapter 1
Introduction

Background:

Hepatitis B represents a significant infectious disease affecting humanity. It is the leading cause of chronic hepatitis, liver cirrhosis, and hepatocellular carcinoma on a global scale. This condition is characterized by inflammation of the liver, which can be attributed to the Hepatitis B virus (HBV).[1]

World health organization (WHO) : Data from 187 countries shows that viral hepatitis is a major public health challenge of this decade. An estimated 1.3 million people died from chronic viral hepatitis B and C in 2022, i.e., 3500 deaths per day. An estimated 254 million people are living with hepatitis B and 50 million people are living with hepatitis C worldwide, and 6000 people are newly infected with viral hepatitis each day. Many people remain undiagnosed in many countries, and even when hepatitis is diagnosed, the number of people receiving treatment remains incredibly low, High-impact interventions are available, such as an effective cure for hepatitis C and vaccines for hepatitis B, but access to these interventions must be urgently expanded to save lives and prevent a future generation of new infections, cancers and deaths.[2]

Healthcare workers (HCWs) are at high risk of HBV infection in healthcare settings. Also Students of health sciences are at risk of HBV infection during their clinical and practical sessions of study. Therefore, satisfactory awareness about HBV is very important to protect them against the infection[2].

HBV is transmitted via bodily fluids, including blood, vaginal secretions, and semen. The modes of transmission encompass sexual activity, accidental needle sticks, the use of contaminated needles, organ transplants, and blood transfusions.[3] Additionally, pregnant women who are infected may pass the virus to their infants during childbirth.[4]

The Hepatitis B vaccine is recognized as the first vaccine developed to combat cancer, demonstrating an exceptional safety and efficacy profile. It is 95% effective in preventing both children and adults from developing chronic infections. In 1991, the WHO recommended that all children receive this vaccine, and to date, 116 countries have incorporated it into their routine immunization schedules.[5] The mass vaccination initiatives launched in the late 1980s and mid-1990s across many East and South-East Asian nations have led to a significant reduction in the rate of HBV carriers, as well as a decrease in the incidence of hepatic decompensating and hepatocellular carcinoma.[1 , 4]

Healthcare professionals, particularly doctors and medical students, frequently interact with patients and are at risk of contracting infectious diseases. Their roles often include performing blood transfusions, administering injections, and conducting surgical procedures. It is essential for them to recognize the potential risks associated with these treatment methods and to implement suitable precautions when engaging with patients.[1 , 5]

The worldwide prevalence of hepatitis B and hepatitis C represents a significant public health challenge. Chronic infections with hepatitis B and C rank among the foremost preventable causes of mortality globally. It is estimated that infections caused by HBV and HCV result in nearly one million fatalities annually.[6] According to the (WHO), approximately two billion individuals globally have been infected with HBV, with around 350 million people suffering from chronic HBV infection. Furthermore, approximately 600,000 individuals succumb to liver disease or hepatocellular carcinoma related to HBV each year.[7]

The endemicity of infection in Yemen is regarded as high, with the prevalence of positive HBsAg ranging from 8% to 20%. Additionally, it is estimated that up to 50% of the population of HBsAg in Yemen falls between 12.7% and 18.5%. In contrast, the prevalence of has serological evidence of prior HBV infection.[8] Other studies indicate that the prevalence antibodies to HCV among healthy volunteers is recorded at 1.7%. [9] Numerous epidemiological conducted across various cities in Yemen reveal prevalence rates of HBsAg and HCV antibodies of 10.5% and 2.3% in Sana'a, 4.75% and 0.6% in Aden, 5.6% and 0.8% in Hajah, and 26.3% and 5.1% in Soqotra respectively. [10,11]

In 2016, (WHO) released its inaugural global health sector strategy addressing viral hepatitis. This strategy aims to achieve a 90% reduction in the incidence of chronic viral hepatitis and a 65% decrease in mortality by the year 2030. [12] While a vaccine for (HBV) exists that effectively prevents infection, global vaccination coverage remains inconsistent. Notably, around 24% of healthcare workers worldwide have not received the vaccine. The WHO report indicates that vaccination rates among healthcare workers in low and middle-income countries (LMICs) range from 18% to 39%, in stark contrast to the 67% to 79% coverage observed in high-income countries.[13,14]

In the pre-vaccination era transmission of hepatitis B virus (HBV) in medical settings was a severe public health problem. A high rate of infections of health care workers (HCW) with HBV was observed and 5–10% of the infected subjects usually became chronic HBV carriers. HBV transmission was especially frequent in cases of direct contacts with blood,

such as surgery, hemodialysis units, or oncology wards. In contrast to hepatitis C, transmission of HBV from patient to HCW can be prevented by vaccination. Therefore, the number of HBV infections of HCW dropped significantly during the last 20 years. This sustained decline in the incidence of hepatitis B among persons with occupational exposure can be attributed to hepatitis B vaccination of HCW, graduates of medical school, and emergency medical technicians. Introduction of a series of measures to prevent exposure to HBV in addition contributed to the reduction of the rate of HBV infections. Because more than 95% of vaccines develop protective antibodies, the risk of vaccinated HCW to acquire HBV during their professional activities is minimal. However, not all HCW are vaccinated or are responders to vaccine and, therefore, are at risk to acquire HBV infection. In Germany each year about 60 HCW who acquired hepatitis B by exposure at work are registered by the health care insurance.(15)

In a seroprevalence study of viral hepatitis markers in the main hospital in Yemen, health-care workers were tested for HBsAg: the rate of infection was 9.9% [16]. In another study among hospital health-care workers in Saudi Arabia, 13% of the study sample showed previous infection with hepatitis B virus [17]. In a separate study conducted among high risk groups in Palestine, the rate of infection among health-care workers was 9.6% [18].

HCWs are reported to have the highest occupational risk for HBV infection [18]. There are 35million HCWs worldwide, and percutaneous injuries have been
estimated to result in approximately 66,000 hepatitis B viral infections per year [18]. Data from the United States in the 1990s showed that unvaccinated HCWs had serologic evidence of past or current HBV infection three to five times greater than the general population [19].

In Ethiopia there is study show 95.3% of the medical students were not fully vaccinated against Hepatitis B, which makes them vulnerable to the disease and 48.4% of the students were not aware about the availability of post exposure prophylaxis for HB.(20)

Study Justification:

The (HBV) represents a major global health issue, particularly impacting developing nations such as Yemen. As future healthcare professionals, the vaccination status of medical students against HBV is vital for curbing the transmission of this virus. This study seeks to evaluate the level of awareness and the prevalence of HBV vaccination among medical students in Yemen, with the goal of guiding targeted interventions and enhancing vaccination coverage. Additionally there are many points that this research could justify them at the end including:

1- High Prevalence of HBV in Yemen: Yemen experiences a considerable prevalence of Hepatitis B Virus (HBV), which presents a substantial public health concern. Medical students face an elevated risk of occupational exposure to blood and bodily fluids, rendering them a particularly susceptible group.

2- Knowledge Gap: There is a limited understanding of HBV vaccine awareness and coverage among Yemeni medical students. This research was fill this knowledge gap and provide valuable data for targeted interventions.

3- Importance of Healthcare Worker Vaccination: Vaccinating healthcare workers, including medical students, is essential in preventing HBV transmission to patients and colleagues. This research will contribute to improving the overall vaccination rate among medical students in Yemen.

4- Policy Implications: The findings of this research can be used to advocate for policies that support HBV vaccination among medical students and healthcare workers in Yemen.

Study Objectives:

General Objective:

To assess knowledge, practice and prevalence of HB vaccination among clinical medical students (4th, 5th, 6th) at Four Universities, in Sana'a City, Yemen, 2024.

Specific Objectives:

- To determine the prevalence of HBV vaccination among medical clinical students.
- To assess the awareness of medical students regarding HBV vaccination.
- To determine the barriers that affecting vaccination among medical students.
- To measure the association between socio- demographic factors and variations and awareness scores.

Chapter 2
Literature Review

2.1 Viral Hepatitis B

2.1.1 Pathology of hepatitis B

Hepatitis B is an infection of the liver caused by the hepatitis B virus. The infection can be

- **acute (short and severe).** when severe, acute hepatitis can lead to liver failure, which can lead to death.
- **chronic (long term)** which puts people at high risk of death from cirrhosis and liver cancer (hepatocellular canceroma). It can spread through contact with infected body fluids like blood, saliva, vaginal fluids and semen. It can also be passed from a mother to her baby.[2]

The virus is not directly cytotoxic to cells; rather, it is an immune response to viral antigens displayed on infected hepatocytes that initiates liver injury. This explains why there may be very high levels of viral replication but little hepatocellular damage during the 'immune-tolerant' phase.[21]

The risk of progression to chronic liver disease depends on the source and timing of infection In children due to vertical transmission from mother to child in the perinatal period is the most common cause of infection worldwide and carries the highest risk of ongoing chronic infection. In this setting, adaptive immune responses to HBV may be absent initially, with apparent immunological tolerance.[21]

Also note, hepatitis B virus has been linked to membranous glomerulonephritis [22]. Given HBV and its ability to affect multiple organ systems including the liver and kidney,.

Hepatitis B virus

Hepatitis B virus is a double-stranded DNA virus that is a member of the Hepadnaviridae family. It is a highly contagious virus.

The hepatitis B virus consists of a core containing DNA and a DNA polymerase enzyme needed for virus replication. The core of the virus is surrounded by surface protein.The virus, also called a Dane particle, and an excess of its surface protein (known as hepatitis B surface antigen, HBsAg) circulate in the blood. So the viral antigens are:

1- **Hepatitis B surface antigen (HBsAg)** is a protein that makes up part of the viral envelope.
2- **Hepatitis B core antigen (HBcAg)** is a protein that makes up the capsid or core part of the virus (found in the liver but not in blood).
3- **Hepatitis B e antigen (HBeAg)** is part of the HBcAg that can be found in the blood and indicates infectivity.[21]

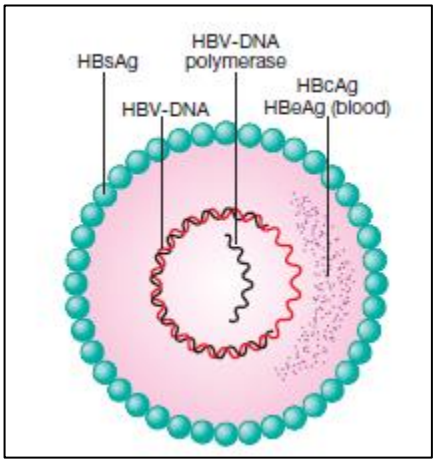

Figure 1 Schematic diagram of the HBV[21]

2.1.2 Transmission

In highly endemic areas, hepatitis B is most commonly spread from mother to child at birth (perinatal transmission) or through horizontal transmission (exposure to infected blood), especially from an infected child to an uninfected child during the first 5 years of life. The development of chronic infection is common in infants infected from their mothers or before the age of 5 years.[2]

Hepatitis B is also spread by needle stick injury, tattooing, piercing and exposure to infected blood and body fluids, such as saliva and menstrual, vaginal and seminal fluids. Transmission of the virus may also occur through the reuse of contaminated needles and syringes or sharp objects either in health care settings, in the community or among persons who inject drugs. Sexual transmission is more prevalent in unvaccinated persons with multiple sexual partners.[2]

Hepatitis B infection acquired in adulthood leads to chronic hepatitis in less than 5% of cases, whereas infection in infancy and early childhood leads to chronic hepatitis in about 95% of cases. This is the basis for strengthening and prioritizing infant and childhood vaccination.[2]

The hepatitis B virus can survive outside the body for at least 7 days. During this time, the virus can still cause infection if it enters the body of a person who is not protected by the

vaccine. The incubation period of the hepatitis B virus ranges from 30 to 180 days. The virus may be detected within 30 to 60 days after infection and can persist and develop into chronic hepatitis B, especially when transmitted in infancy or childhood.[2]

2.1.3 clinical manifestations

The clinical manifestations and natural history of HBV infection vary with age. Clinical acute hepatitis B is more frequent in adults than children, and the probability of becoming a chronic carrier of hepatitis B is greater in children than adults: 80–90% of people perinatally infected compared to <5% of infections occurring in adults [23].

Acute hepatitis B infection

is an illness that begins with prodromal symptoms like

- Anorexia
- Chills
- Headache
- Nausea
- Vomiting
- Malaise and feeling very tired
- Pain in the abdomen
- Development of jaundice and dark urine may then occur but is noted in only 30% of all patients with acute infection.

Acute hepatitis B is often unrecognized in children younger than five years old.

Chronic hepatitis B infection

Chronic infection with the HBV may be either asymptomatic or associated with chronic inflammation of the liver.

After 10 years of chronic infection, about 20% of the patients with hepatitis B have progressed to cirrhosis and about 5% have developed HCC. [24]. Chronically infected HBV patients have a 15–25% risk of dying prematurely due to HBV related cirrhosis and HCC.[25] Hepatitis B is estimated to be the cause of 30% of cirrhosis and 53% of HCC worldwide.[26].

2.1.4 HBV-HIV coinfection

About 1% of persons living with HBV infection (2.7 million people) are also infected with HIV. Conversely, the global prevalence of HBV infection in HIV-infected persons is 7.4%. Since 2015, WHO has recommended treatment for everyone diagnosed with HIV infection, regardless of the stage of disease. Tenofovir, which is included in the treatment combinations recommended as first-line therapy for HIV infection, is also active against HBV.[(2)]

2.1.5 Diagnosis and Investigation

- **History and Physical examination**: It is not possible on clinical grounds to differentiate hepatitis B from hepatitis caused by other viral agents, hence laboratory confirmation of the diagnosis is essential.[(2)]
- **Radiology**: ultrasound, fibroscan can also be performed to assess degree of liver fibrosis and scarring and monitor progression of liver disease[(2)]
- **laboratory**: Several blood tests are available to diagnose and monitor people with hepatitis B. Some laboratory tests can be used to distinguish acute and chronic infections, whilst other can assess and monitor the severity of liver disease., . WHO recommends that all blood donations be tested for hepatitis B to ensure blood safety and avoid accidental transmission[(2)]
    - **blood tests and chemistry:** CBC,CRP, ESR, Liver enzyme, bilirubin, blood profile (PT, INR)
    - **Serology**

Serological tests

A. polymerase chain reaction (PCR) techniques to measure viral DNA levels in peripheral blood means that longitudinal monitoring is now also frequently guided by direct assessment of viral load.[(21)]
B. HBV contains several antigens to which infected persons can make immune responses, these antigens and their antibodies are important in identifying HBV infection :-

1. **Hepatitis B surface antigen (HBsAg)** is an indicator of **active** infection, and a negative test for HBsAg makes HBV infection very unlikely. In acute liver failure from hepatitis B, the liver damage is mediated by viral clearance and so HBsAg is negative, with evidence of recent infection provided by the presence of hepatitis B core IgM. HBsAg appears in

the blood late in the incubation period but before the prodromal phase of acute type B hepatitis; it may be present for a few days only, disappearing even before jaundice has developed, but usually lasts for 3–4 weeks and can persist for up to 5 months. The persistence of HBsAg for longer than 6 months indicates chronic infection.[21]

Antibody to HBsAg (anti-HBs) usually appears after about 3–6 months and persists for many years or perhaps permanently. Anti-HBs implies either a previous infection, in which case anti-HBc (see below) is usually also present, or previous vaccination, in which case anti-HBc is not present.[21]

2. **Hepatitis B core antigen (HBcAg)** is not found in the blood, but antibody to it (anti-HBc) appears early in the illness and rapidly reaches a high titer, which subsides gradually but then persists. Anti-HBc is initially of IgM type, with IgG antibody appearing later. Anti-HBc (IgM) can sometimes reveal an acute HBV infection when the HBsAg has disappeared and before anti-HBs has developed[21]
3. **Hepatitis B e antigen (HBeAg)** is an indicator of viral replication. In acute hepatitis B it may appear only transiently at the outset of the illness; its appearance is followed by the production of antibody (anti-HBe). The HBeAg reflects active replication of the virus in the liver.[21]

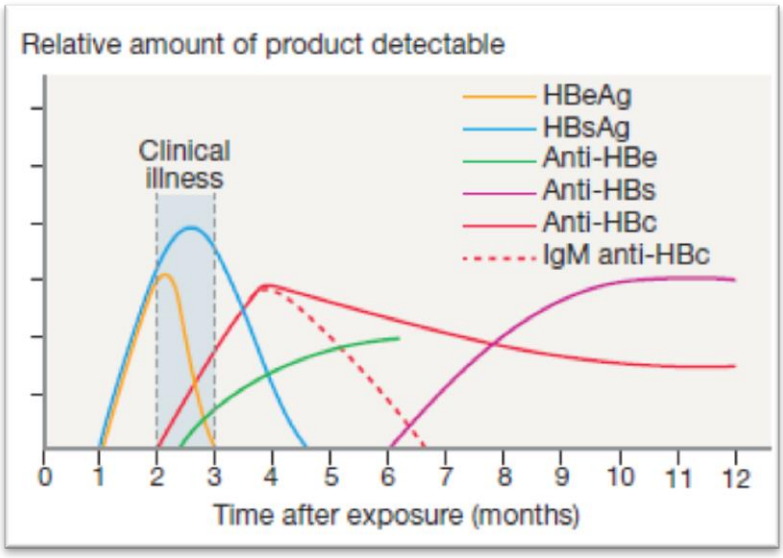

Figure 2 Serological responses to HBV infection

Table 1 How to interpret the Serological tests of acute HBV infection[21]

Interpretation	HBsAg	Anti-HBc IgM	Anti-HBc IgG	Anti-HBs
Incubation period	+	+	–	–
Acute hepatitis				
Early	+	+	–	–
Established	+	+	+	–
Established (occasional)	–	+	+	–
Convalescence				
(3–6 months)	–	±	+	±
(6–9 months)	–	–	+	+
Post-infection	–	–	+	±
Immunisation without infection	–	–	–	+

2.1.6 Treatment

There is no specific treatment for acute hepatitis B. Chronic hepatitis B can be treated with medicines.

Care for acute hepatitis B should focus on making the person comfortable. They should eat a healthy diet and drink plenty of liquids to prevent dehydration from vomiting and diarrhoea.

Chronic hepatitis B infection can be treated with oral medicines, including tenofovir or entecavir.[2]

Treatment can

- slow the advance of cirrhosis
- reduce cases of liver cancer
- improve long term survival. [2]

Most people who start hepatitis B treatment must continue it for life.[2]

With the updated Hepatitis B Guidelines, it is estimated that more than 50% of people with chronic hepatitis B infection will require treatment, depending on setting and eligibility criteria.[2]

In low-income settings, most people with liver cancer present late in the course of the disease and die within months of diagnosis. In high-income countries, patients present to hospital earlier in the course of the disease and have access to surgery and chemotherapy, which can prolong life for several months to a few years. Liver transplantation is sometimes used in people with cirrhosis or liver cancer in technologically advanced countries, with varying success.[2]

2.1.7 Prevention

Hepatitis B is preventable with a vaccine.

All babies should receive the hepatitis B vaccine as soon as possible after birth (within 24 hours). This is followed by two or three doses of hepatitis B vaccine at least four weeks apart.[2]

Booster vaccines are not usually required for people who have completed the three-dose vaccination series.

The vaccine protects against hepatitis B for at least 20 years and probably for life.

Hepatitis B can be passed from mother to child. This can be prevented by taking antiviral medicines to prevent transmission, in addition to the vaccine.

To reduce the risk of getting or spreading hepatitis B:

- practice safe sex by using condoms and reducing the number of sexual partners
- avoid sharing needles or any equipment used for injecting drugs, piercing, or tattooing
- wash your hands thoroughly with soap and water after coming into contact with blood, body fluids, or contaminated surfaces
- get a hepatitis B vaccine if working in a healthcare setting.[2]

2.2 Hepatitis B vaccine

Hepatitis B vaccine is a recombinant vaccine containing the surface antigen of Hepatitis B virus (HBsAg) [27]

2.2.1 History

The first hepatitis B vaccine was available in 1982. A recombinant version came to market in 1986, It is on the World Health Organization's List of Essential Medicines, Both versions were developed by Maurice Hilleman and his team.[28]

2.2.2 Composition and types

The vaccine is produced by recombinant DNA technology. The vaccine is an inactivated non-infectious hepatitis B surface antigen vaccine, and contains between 10 and 40 µg of HB3Ag protein per mL with apparently similar rates of seroconversion. Pediatric vaccines contain no thimerosal.[29]

The United States Food and Drug Administration (FDA) to protect against hepatitis B, it has licensed:

- three single-antigen vaccines (**Engerix-B, Heplisav-B, and Recombivax HB**)
- one three-antigen vaccine (PreHevbrio)
- three combination vaccines (Pediarix, Vaxelis, and Twinrix)[30].

All vaccines contain yeast protein and aluminum adjuvant or a small synthetic immunostimulatory (Heplisav-B).[30]

2.2.3 Dosage

Engerix-B

People aged 19 years and younger should receive three doses. People aged 20 years and older should receive three doses. Adults on hemodialysis should receive four doses. [30]

Heplisav-B

People aged 18 years and older should receive two doses. Data on Heplisav-B are currently insufficient to inform vaccine-associated risks in pregnancy. Thus, providers should vaccinate pregnant people needing HepB vaccination with Engerix-B, Recombivax HB, or Twinrix.[30]

Recombivax HB

People aged 19 years and younger should receive three doses. People aged 20 years and older should receive three doses.[30]

PreHevbrio

People aged 18 years and older should receive three doses. Data on PreHevbrio are currently insufficient to inform vaccine-associated risks in pregnancy. Providers should use Engerix-B, Recombivax HB, or Twinrix for HepB vaccinations during pregnancy.[30]

Pediarix

People between 6 weeks and 6 years of age should receive three doses. [30]

Vaxelis

People between 6 weeks and 4 years of age should receive three doses. [30]

Twinrix

People aged 18 years and older should receive either three or four doses.[30]

2.2.4 Vaccine effectiveness

Each of the HepB vaccines are highly effective in preventing infection. Studies indicate that immunity persists for at least 30 years among healthy people who initiate HepB vaccination at less than 6 months of age.[30]

2.2.5 Hepatitis B Vaccine Recommendations

International: The WHO recommends the hepatitis B vaccine for all newborns, children up to 18 years of age, and all adults at higher risk for infection (see below for risk factors).[2,31]

United States: The U.S. Centers for Disease Control and Prevention (CDC)[30] recommends the hepatitis B vaccine for all newborns, children up to age 18, adults 19-59 years of age, and adults 60 and older who are at high-risk for infection (see below for risk factors).[30,31]

Persons most at risk for infection:

Every person may be at some risk for a hepatitis B infection during their lifetime, so all people should consider getting the hepatitis B vaccine. However, some groups are more likely to be exposed to the hepatitis B virus. See below for the CDC's list of people at increased risk of infection:

A. Infants born to mothers who are living with hepatitis B
B. All infants, beginning at birth
C. Unvaccinated children aged <19
D. Susceptible sexual partners of people with hepatitis B infection
E. Sexually active persons who are not in a long-term, mutually monogamous relationship (e.g., more than one sex partner during the previous six months)
F. Persons seeking evaluation or treatment for a sexually transmitted infection
G. Men who have sex with men
H. People with current or recent drug use
I. Susceptible household contacts of people with hepatitis B infection
J. Healthcare and public safety workers at risk for exposure to blood
K. Persons with end-stage renal disease, including pre-dialysis, hemodialysis, peritoneal dialysis, and home dialysis patients
L. Residents and staff of facilities for persons with developmental disabilities
M. Travelers to and families adopting from countries where hepatitis B is common (e.g. Asia, Africa, South America, Pacific Islands, Eastern Europe, and the Middle East)
N. Persons with chronic liver disease, other than hepatitis B (e.g. cirrhosis, fatty liver disease, etc.)

O. Persons with hepatitis C infection
P. Persons with HIV infection
Q. People with diabetes, as decided by their provider
R. All persons seeking protection from HBV infection — acknowledgment of a specific risk factor is not a requirement for vaccination.[31].

2.2.6 Administration

Clinicians should administer the vaccine intramuscularly into the anterolateral aspect of the thigh or the deltoid muscle of the upper arm, depending on the person's age. When administering multiple vaccines, Clinicians should use different anatomic sites (e.g., separate limbs).[30]

2.2.7 Vaccine Schedule

❖ **Three-Dose Hepatitis B Vaccine Schedule**

The hepatitis B vaccine is available at your doctor's office and local health department or clinic. All doses of the vaccine are required in order to be fully protected against hepatitis B. It is important to remember that babies born to infected mothers must receive the first dose of hepatitis B vaccine in the delivery room or within the first 12 hours of life

a) 1st Shot - At any given time, but newborns should receive this dose in the delivery room
b) 2nd Shot - At least one month (or 28 days) after the 1st shot
c) 3rd Shot - At least 4 months (16 weeks) after the 1st shot and 2 months after the 2nd shot. Infants should be a minimum of 24 weeks old at the time of the 3rd shot.[31].

Important Note : You do not need to restart the hepatitis B vaccine series if you miss any of the shots. For example, if you start the vaccine series and stop, then get the 2nd shot when you can and make sure to get the 3rd shot at least two months later. Or, if you get the first two doses of vaccine and miss the third dose, then just schedule the last shot when you can'[31]

To be certain that you are protected against hepatitis B, ask for a simple blood test to check your "antibody titers" that will confirm whether the vaccination was successful.[31]

❖ Two-Dose Hepatitis B Vaccine Schedule for Adults

In November 2017, a vaccine was approved by the FDA for use in the U.S. *Heplisav*-B (Dynavax) is a two-dose vaccine approved for use in adults aged 18 and older. The vaccine is administered as two doses given one-month apart.[31]

2.2.8 Hepatitis B Vaccine Safety and Side Effects

More than 1 billion doses of the hepatitis B vaccine have been given worldwide and it is considered **one of the safest and most effective vaccines ever made**. Numerous studies looking at the vaccine's safety have been conducted by the World Health Organization, U.S. Centers for Disease Control and Prevention, and many different medical societies.[31]

No evidence has been found that the hepatitis B vaccine causes sudden infant deaths (SIDs), autism, multiple sclerosis, or other neurological disorders.

Common side effects from the hepatitis B vaccine may include soreness, swelling and redness at the injection site. The vaccine may not be recommended for those with documented yeast allergies or a history of an adverse reaction to the vaccine.[31]

2.2.9 Vaccine in pregnancy

The Center for Disease Control (CDC) and the American College of Obstetricians and Gynecologists (ACOG) agree that pregnancy is not a contraindication for Hepatitis B vaccination. There are two indications for the administration of HepB vaccine during pregnancy: Completion of the vaccination scheme that started before conception, and high risk of infection with Hepatitis B Virus during pregnancy.High risk groups include pregnant women with many sex partners in the last 6 months or with a HBsAg positive sex partner or women who have been evaluated or treated for a sexually transmitted infection or intravenous drug users[27].The available data regarding vaccine's safety are limited but they indicate no apparent risk for congenital anomalies to the developing fetus.[27]

2.3 PREVIOUS STUDIES

This part contains a review of the previous studies in the world that looked at the Hepatitis B Awareness among medical students and their vaccination status

1. **A cross sectional study conducted in aim to assess the coverage and perceptions of medical sciences students towards hepatitis B virus vaccine in Sana'a city, Yemen, 1999 and 2000.** The participants included only those engaged in clinical training or who had contact with bodily fluids. The students were enrolled at the Faculty of Medicine and Health Sciences, Sana'a University, in the Republic of Yemen. Data collection occurred between 1999 and 2000, utilizing Arabic pre-tested questionnaire forms completed by 840 students.

   The result of this study showed that the vaccination rate was 29.5%. Specifically, the rate among students from the Faculty of Medicine and Health Sciences was 32.3%, while it was only 21.3% for those from the High Institute of Health Sciences. Among the various disciplines, dental students exhibited the highest vaccination rate at 38.8%, whereas nursing students from the High Institute of Health Sciences had the lowest at 17.1%. Notably, the vaccination rate for female students was significantly higher at 46.6% compared to 22.3% for male students, with a P-value of 0.0001. In terms of knowledge, medical assistants from the High Institute of Health Sciences performed the best at 56%, while medical laboratory sciences students demonstrated the highest attitude scores at 43.6%, and dental students achieved the highest practice scores at 35.5%. The mean knowledge levels for both genders were similar; however, females outperformed males in attitudes and practices. Final-year students exhibited superior attitude scores compared to pre-final and intermediate students.

   This study concluded that vaccination coverage among medical sciences students in Sana'a City, Yemen, is low, with medical assistants showing the best knowledge, medical laboratory sciences students displaying the highest attitudes, and dental students excelling in practices. Furthermore, female students demonstrated better attitudes and practices than their male counterparts.[32]

2. **A cross sectional study conducted in aim to study the Hepatitis B Awareness among medical students and their vaccination status at Syrian Private University, 2015.** A.

   The result of this study showed that concerning trends, highlighting a significant number of medical students who are either unvaccinated or uncertain about their vaccination status,

thereby increasing their susceptibility to future infections. Additionally, the overall understanding of this potentially life-threatening infection among the students is alarmingly inadequate. It is evident that the students have not received comprehensive education on the severity of hepatitis B, indicating an urgent need for enhanced educational initiatives. It is strongly advised that SPU offers the hepatitis B vaccine free of charge to all unvaccinated medical students to promote vaccination uptake and revises its educational curriculum to effectively address the serious health implications of this disease.[33]

3. **A study conducted in aim of Knowledge, Attitude and Practice of Hepatitis-B Vaccination among Clinical Medical Students at a Medical College in Bokhara, Nepal, 2020.** In a total of two hundred and four medical students participated in a descriptive cross-sectional study conducted at Manipal College of Medical Sciences in Bokhara, Nepal, following the approval of the Institutional Review Committee. Data were gathered through a pre-tested questionnaire. The study focused on the knowledge, attitudes, and practices related to Hepatitis B vaccination.

   The result of this study showed that all participants exhibited a strong understanding and a positive attitude towards Hepatitis B infection and its vaccination. Nevertheless, a significant number displayed inadequate practices regarding vaccination, with only 47.1% being fully vaccinated. The predominant reason cited for not receiving the vaccine was the belief that vaccination would occur during their internship or upon commencing their professional practice. [34]

4. **Hepatitis B vaccination status and knowledge, attitude, and practice towards Hepatitis B virus among medical sciences students. Duhok province, Kurdistan Region of Iraq. November 2022 to February 2023.**

   The result of this study showed that The average age of the participants was 20.74 ±1.43 years. Among the respondents, only 96 (18.8%) were fully vaccinated against the Hepatitis B virus (received 3 or more doses of the vaccine), while 294 (57.5%) were not vaccinated. Lack of vaccination programs was the major reason for not receiving a vaccination (n = 182, 62%). About 286 (55.96%) of the participants had good knowledge, attitude, and practice on Hepatitis B, manifesting median scores of 26, 18, and 20, respectively.

   This study concluded that half of the students were found to be unvaccinated, mainly due to the absence of vaccination programs. Vaccinated students exhibited better knowledge,

attitude, and practice toward the infection than non-vaccinated students. Therefore, we recommend the implementation of a vaccination program as well as training on infection prevention guidelines to increase awareness and encourage vaccination.[35]

5. **Healthcare students' vaccination status, knowledge, and protective behaviors regarding hepatitis B: a cross-sectional study in Turkey**.

   The result of this study showed that 86.0% of the students had hepatitis B vaccine while 7.6% did not. Vaccination was higher in nursing and midwifery students (aOR = 1.87, CI 95%: 1.26–2.77; aOR = 3.87, CI 95%: 2.14–7.02, respectively). Vaccination was 1.28 times higher in females (CI 95% 1.03–1.60). The ≥23 age group had 1.79 times higher vaccination rate than those in the ≤19 (CI 95%: 1.26–2.53). Vaccination was higher in students whose family's economic status is middle and high (aOR = 1.53, CI 95%: 1.07–2.19; aOR = 1.47, CI 95%: 1.03–2.19, respectively). Vaccination was higher in those living in towns and cities during childhood (aOR = 1.36, CI 95%: 1.06–1.74; aOR = 1.79, CI 95%: 1.34–2.38, respectively). Females had more knowledge of hepatitis B and protective behaviors. Both knowledge and protective behavior scores of vaccinated participants were significantly higher ($p < .05$).

   This study concluded that the vaccination rate in healthcare students was high, but lower than the country's targets. The students were sensitive about the protective behaviors from hepatitis B infection and had sufficient knowledge of HBV contamination.[36]

6. **Assessment of Knowledge and Practice towards Hepatitis B among Medical and Health Science Students in Haramaya University, Ethiopia, February 1–15, 2013.**

   The result of this study showed that Majorities (95.3%) of students were not fully vaccinated against Hepatitis B and 48.4% of the students were not aware about the availability of post exposure prophylaxis for HB. Mean scores for knowledge and practice were 11.5262.37 and 2.7661.1 respectively. Significant and positive linear correlations between knowledge-practice ($r = 0.173$, $p = 0.002$) was observed. Study department was significantly associated with mean knowledge and practice of study respondent.

   This study concluded that lack of awareness about Hepatitis B, its route of transmission and modes of prevention among the medical students entering into the profession. Similarly, 95.3% the students were not fully vaccinated against Hepatitis B, which makes them vulnerable to the disease.[20]

7. **A cross sectional study conducted in Saudi Arabia to study Knowledge about Hepatitis B Virus Infection among Medical Students in University of Dammam, Eastern Region of Saudi Arabia in 2013.**

   The result of this study showed that The mean age of participating students was 21.2 ± 0.72 years and the female participants constituted 52.5% of the study group. The mean knowledge score of all the students was 17.63 ± 4.8. Almost 50% of the students had good knowledge; 39.6% and 10.1% had average and poor knowledge respectively. The level of knowledge about hepatitis B infection among male and female students was not statistically significantly different. Also this knowledge was not significantly related to either vaccination or screening for hepatitis B or Needle stick exposure. There was a significant relationship between marital status and hepatitis B knowledge ($p<0.01$) with more knowledge among unmarried students. Level of hepatitis B knowledge was significantly ($p<0.05$) higher among students with negative family history for HBV infection.

   This study concluded that highlights the satisfactory knowledge of the fourth year medical students but there was a gap which needs to be corrected or modified regarding methods of transmission, prevention and post-exposure management of hepatitis B. Medical students should be well educated about counseling for accidental needle pricks and availability of post-exposure prophylaxis.[37]

8. **A cross-sectional study design was conducted to study Knowledge, attitude and practice towards HepatitisB vaccination among medical undergraduate students of Maharajgunj Medical Campus in Nepal between peroids from May 2022 to July 2022.**

   The result of this study showed that Among 206 students, 93.7% of them had good knowledge and 98.5% had good attitude. The practice was low with only 35% having safe practices. Similarly, only 46.6% of medical students were completely vaccinated. 23.8% had done Hepatitis B testing. Students who had encountered Hepatitis B patients during their posting were 51.9%. There was significant association of socio-demographic variables with knowledge, attitude and practice towards Hepatitis B vaccination.

   This study concluded that Although, the knowledge and attitude towards Hepatitis B vaccination is high, the practice levels are very low. This indicates need for immunizing medical students against Hepatitis B and reforming training curriculum more focusing on preventive practices against HBV.[38]

9. **Hepatitis B Vaccination Rate among Medical Students at the University of Port Harcourt Teaching Hospital (Upth), Nigeria, 2015. .**

The result of this study showed that All (100%) of the respondents had heard of hepatitis B vaccine. Two hundred and twenty two (70.2%) of them thought they were at risk of acquiring hepatitis. Two hundred and seventy (85.4%) had received at least one dose of hepatitis B vaccine while 46 (14.6%) had never received the vaccine. One hundred and ten of the respondents had received 3 doses of hepatitis B vaccine, giving a vaccination rate of 34.8%. One hundred and sixteen (36.7%) had received 2 doses, while 44 (13.9%) had received one dose. There was a statistical significant relationship among marital status ($p = 0.01$), clinical level ($p = 0.02$) and hepatitis B vaccine uptake.

This study concluded that The hepatitis B vaccination rate among medical students at the University of Port Harcourt Teaching Hospital is low. National and institutional legislation for adult vaccination against Hepatitis B should be promulgated for those at higher risk.[39]

10. **Hepatitis B Vaccination Status among Students of a Medical College in Islamabad In August 2015.**

The result of this study showed that Among 269 students who responded, 150 (56%) were female and 119 (44%) were male. 107 (40%) students were unvaccinated, while 73 (27%) were partially vaccinated and 89 (33%) were fully vaccinated. The most common reason of not receiving vaccination is laziness (53%) followed by lack of awareness (23%) and no knowledge about where to get vaccination (15%). According to medical students, the strongest recommendation for improving Hepatitis B vaccination is that vaccine should be mandatory for admission in medical colleges (33 %) followed by provision of vaccine free of cost (26%) and increasing awareness through media and seminars (20%) .

This study concluded that There is alarmingly low rate of vaccination of hepatitis B among students of Islamabad Medical and Dental College, leading to a high occupational risk of HBV infection. Therefore policy be implemented for making hepatitis B vaccination mandatory for admission in medical colleges to prevent student from getting this deadly disease.[40]

11. **Knowledge, attitude, and practice of Egyptian medical students towards healthcare workers' recommended vaccines: a nationwide cross-sectional survey in nine medical schools in Egypt during the 2021–2022 academic year**. A multicenter, cross-sectional study was conducted using a structured, pilot-tested, and self-administered questionnaire among Egyptian medical students and interns. We invited 1332 participants to our survey using a systematic random sampling that included participants across nine medical schools in Egypt during the 2021–2022 academic year.

The result of this study showed that Overall, 43% of the participants had intermediate knowledge (knew 2–3 HCWs' recommended vaccines). Furthermore, 36.7% had received a booster dose of at least one of the HCWs' recommended vaccines over the last 10 years, with only 6.1% having received all recommended vaccines. Hepatitis B vaccine was the most widely known (71%) and received (66.7%). Interns were more likely to know, receive, and recommend HCWs' recommended vaccines. The majority (> 90%) agreed that vaccination is beneficial and safe, with a median score of eight (interquartile range [IQR: Q25- Q75]: 7–9) out of ten for vaccine efficacy and eight (IQR: 7–8) for safety. However, the median score for hesitancy was five (IQR: 2–7). The most common influential and limiting factors for vaccination were scientific facts (60.1%) and fear of vaccine side effects (44.9%).

This study concluded that Although medical students in Egypt have good knowledge of and attitudes towards vaccination, there is a gap in their practices. Interventions are needed to improve vaccination uptake among medical students in Egypt.[41].

12. **Hepatitis B vaccination status and knowledge, attitude, and practice regarding Hepatitis B among preclinical medical students of a medical college in Kathmandu, Nepal, 2020**.

The result of this study showed that only 67 (37%) were fully vaccinated against Hepatitis B while 71 (39.2%) were never vaccinated. For the majority (74.6%) of the non-vaccinated participants, the main reason for not getting vaccination was a lack of vaccination programs. Half the study participants (n = 92, 50.8%) had good knowledge, attitude and practice regarding hepatitis B. The median knowledge, attitude and practice scores towards Hepatitis B were 61.00 (57.00–66.00), 20(18.00–21.00) and 21(19.00–23.00) respectively.[42]

13. **Perception and Uptake of Hepatitis B Virus Vaccine Among Healthcare Trainees in A Nigerian University, 2018**.

The result of this study showed that 92.7% of respondents were aware of HBV, 47% knew it was common, and 80.8% believed it was vaccine-preventable. 23.4% had a prior vaccination and 4.6% had at least 3 doses. 34.4% of those unvaccinated did not know of vaccination, and 24.4% lacked interest, 20.6% was due to busy schedule, and 19.4% due to cost. Vaccine uptake was significantly associated with study year but not with the study department.[(43)]

14. **Vaccination Status, Knowledge, Attitudes and Practices Toward Hepatitis B Infection Among Students of Medical Laboratory Sciences at Sudan International University.**

The result of this study showed that a total of 271 students responded to the questionnaire. Among them, 67% were females, and 33% were males with a mean age of 20.93 ± 1.6 years. Only 66 (24.4%) students were vaccinated against hepatitis B, whereas 205 (75.6%) students had never been vaccinated. Out of all study participants, 121 (44.6%) had never been tested for HBV. Among the study participants, 60.4% had good knowledge about HBV, 85% had a positive attitude toward HBV, and 85% had good practices related to HBV. The mean awareness score was 18.3, with 64% of participants having satisfactory awareness about HBV. Moreover, this awareness was significantly predicted by the study level of the student (P = .000). Being on the fourth year of study was associated with satisfactory awareness about HBV (OR = 0.41, 95% CI 0.188–0.889).[(44)]

15. **Assessment of Knowledge, Attitude and Vaccination Status of Hepatitis B among Nursing Training Students in Ho, Ghana, 2017.**

The result of this study showed that majority of participants were between the ages of 20–26 years with the mean age 21.56 (SD ± 2.65). About 78.2% knew the disease is caused by a virus. Also, 69.8% reported transmission through needle stick injuries, and the mean knowledge score was 29.6 (SD ± 6.98). Also, 68.8% recapped needles (P = 0.012), and 49.4% have taken the full three doses of vaccines.[(45)]

Chapter 3

Methodology

3. Methodology

3.1 Study design:

A Cross-section study design was conducted among clinical medical students (4th, 5th, 6th) at Universities of Sana'a City, Yemen, 2024

3.2 Study period:

A study was conducted during 21 Oct. to 16 Nov. 2024.

3.3 Study sitting:

The study was carried out at faculty of medicine in four universities of Sana'a city, including:

a) Emirates International University

b) Sana'a University

c) University of Science and Technology

d) 21 September University

3.4 Study population:

Clinical medical students from selected sitting as the following:

University	4th year			5th year			6th year			total		
	M/F	F	M	M/F	F	M	M/F	F	M	M/F	F	M
Emirates International University	144	34	110	118	30	88	93	27	66	355	91	264
Sana'a University	290	104	186	750	243	507	432	171	261	1472	518	954
University of Science and Technology	142		142	102		102	147		147	391	0	391
21September University	350	128	222	244	79	165	350	150	200	944	357	587
total	926	266	660	1214	352	862	1022	348	674	**3162**	**966**	**2196**

3.5 Sample size:

Key indicator for sample size was vaccination rate 29.5% which it was taken from the result of previous study at Sana'a university[32].

The sample size was calculated using the formula for estimating single proportion;

Where;

$$N = \frac{Z^2 \times P \times Q}{D^2}$$

- ✓ **N** sample size required,
- ✓ **Z** is the critical value for a given confidence interval (1.96),
- ✓ **P** is expected proportion of the event to be studied (estimated based on findings of previous studies). the result of previous study showed that only 29.5% or (0.295) students were take the vaccine.
- ✓ **Q** =1−P (proportion of the population represented with the sample),
- ✓ **D** is margin of error or degree of accuracy desired (0.05).
- ✓ 95% CI and 5% of margin of error = 1.96.

$$N = \frac{1.96^2 \times 0.295 \times 0.705}{0.05^2} = 319.5$$

From the above formula the minimum sample size needed is 319 medical students and added 10% to correct margin of error and for increase the response rate so the sample become 351 but the response rate was in some batch more than the expected number so we got final total 427 samples.

3.6 Sampling technique:

The sample among the Study population was selected using Stratified random sampling technique:

Stratum 1:- Determine the sample size for each university.

Stratum 2 :- Determine the sample size for each level in each university.

Stratum 3 :- Determine the sample size for each gender in each level.

Study population

University	4th year			5th year			6th year			total		
	M/F	F	M	M/F	F	M	M/F	F	M	M/F	F	M
Emirates International University	144	34	110	118	30	88	93	27	66	355	91	264
Sana'a University	290	104	186	750	243	507	432	171	261	1472	518	954
University of Science and Technology	142		142	102		102	147		147	391	0	391
21September University	350	128	222	244	79	165	350	150	200	944	357	587
total	926	266	660	1214	352	862	1022	348	674	**3162**	**966**	**2196**

sample students selected

University	4th year			5th year			6th year			total		
	M/F	F	M	M/F	F	M	M/F	F	M	M/F	F	M
Emirates International University	16	4	12	13	3	10	10	3	7	39	10	29
Sana'a University	32	12	21	83	27	56	48	19	29	163	58	106
University of Science and Technology	16	0	16	11	0	11	16	0	16	43	0	43
21September University	39	14	25	27	9	18	39	17	22	105	40	65
total	103	30	73	135	39	96	113	39	75	**351**	**107**	**244**

We used convenience sampling design to select the sample elements from each level.

3.7 Inclusion Criteria:

The study was target all students (male and female) in clinical years (fourth, fifth and sixth year) of medical school who are attending the selected universities during the study period.

3.8 Exclusion Criteria:

- We was exclude students from other than medical college or medical students in the preclinical phase.

- Medical students who studied in other universities that not selected in the setting of the study
- Any medical students refuse to participate we excluded.

3.9 Data collection method:

Pretested structured questionnaire was used to collect data from each study subject. The questionnaire was designed based on reviewing similar previous studies and related literatures with slight modification in line with the objectives of this particular study and to fit to the local context. The survey consisted of five parts to collect information.

which includes the following parts:

1- Part one includes items regarding socio-demographic characteristics as (name, age, gender, marital state, university and education level).
2- Part two was about Hepatitis B vaccination status for prevalence and for known the reasons for not being vaccinated which includes 4 items
3- Part three was about Knowledge related to viral Hepatitis B which includes 38 items regarding etiopathology, risk factors, transmission, clinical picture, complication, management and prevention
4- Part four was about Knowledge related to Hepatitis B vaccine which includes 6 items regarding availability, safety, affectivity, doses, ideal time of vaccination, contraindication and vaccination in pregnancy.
5- Part five was about Practice related to hepatitis B includes 8 items.

The answers given by the students to the knowledge and practice questions were collected as "true," and "false" . some questions also added choice of "unknown"

The questionnaire will prepared in English. The questionnaire will be pretested in 10 medical students randomly, which will be not part of our study sitting, to identify any unclear questions and to ensure that its content and length are appropriate.

The questionnaire was distributed to the students either by hard copy or electronically method using the Google Forms platform.

3.10 Study Variables:

a. Dependent variables:

Knowledge and prevalence of HBV vaccine among clinical medical students.

b. Independent variables:

Socio demographic variables (age, gender, level of study, universities).

3.11 Data analysis:

The obtained data from the survey was entered into Microsoft Excel 2013. Then entered and analyzed in IBM Statistical Package for the social sciences (SPSS) version 30.0.0.0.

In score of overall knowledge about HBV, a list of 38 correct symptoms was determined to measure the level of the knowledge of the participants toward HBV. Each correct answer was given 1 point, the maximum expected points was 38 and the minimum was 0 . Participants‟ overall knowledge score was categorized using Bloom's cut-off point, as high knowledge for a score ≥ 30 (80%-100%),average knowledge for a score between 19-29 points (50% and 79.9%), and poor knowledge for a score less than < 19 points less than 50% .

In score of overall knowledge about the HB vaccine. A list of 6 correct questions was determined to measure the level of the knowledge of the participants toward the vaccine of hepatitis B virus . Each correct answer was given 1 point, the maximum expected points was 6 and the minimum was 0. Participants‟ overall knowledge score was categorized using Bloom's cut-off point, as high for a score between 5 and 6 points (80%-100%), average for a score between 3-4 points (50% and 79.9%), and poor for a score of less than < 3 points less than 50%.

In score of overall positive practice toward the HBV. A list of 8 practices questions was determined to measure the level of the positive practice among participants toward practice related to HBV. Each positive practice was given 1 point, the maximum expected points was 8 and the minimum was 0. Participants‟ overall positive practice score was categorized using Bloom's cut-off point, as good for a score >6 points (80%-100%), average for a score between 4-6 points (50% - 79.9%), and poor for a score of <4 points (less than 50%).

Qualitative variables were presented using descriptive statistics in the form of categories and summarized as frequencies, percentages, SD and median. Data comparison was interpreted using Pearson’s chi-square, with P-value set at 5%, So a P-value that is less than 0.05 was considered to be significant.

3.12 Ethical Consideration:

All medical students' data is confidential and ethical approval was received from the faculty of medicine and health sciences in the four universities and from the students themselves as informer consent and full explanation of the research purpose and conform that the data we have taken was anonymous and the ability to refuse participation or to withdraw at any point of interview.

We obtained verbal consent from the university research committee from the students on whom the questionnaire was conducted.

Chapter 4

Result

4. Result

A total of 427 students belonging to 4th, 5th, and 6th year from four different universities in Sana'a city were approached for the study and all of them were participated in the study making response rate of 100%.

4.1 Basic socio-demographic characteristics

The basic socio-demographic characteristics of the respondents who participated in this study are as following:-

4.1.1 Description of the sample by age

The mean age of the participants was (24.69) (±2.028SD) years and the median was (25.0). Table 2 show the Majority of the students (48.9%) were Below age of 25.

Table 2 Distribution of sample according to age:

Age	Freq. (%)
Below 25	209 (48.95%)
25	97 (22.7%)
above 25	121 (28.34%)
total	427 (100 %)

4.1.2 Description of the sample by gender

Table 3 revealed that 279 (65.3%) of the respondents were male. while 148 (34.7%) were female

Table 3 Distribution of sample according to Gender

Gender	Freq.	%
Male	279	65.3%
Female	148	34.7%
Total	427	100%

4.1.3 Description of the sample by their marital status:

Figure 3 revealed the Majority of the study participants 348 (81.5%).were single while 77 (18%) were married And only 2 (0.5%) divorce.

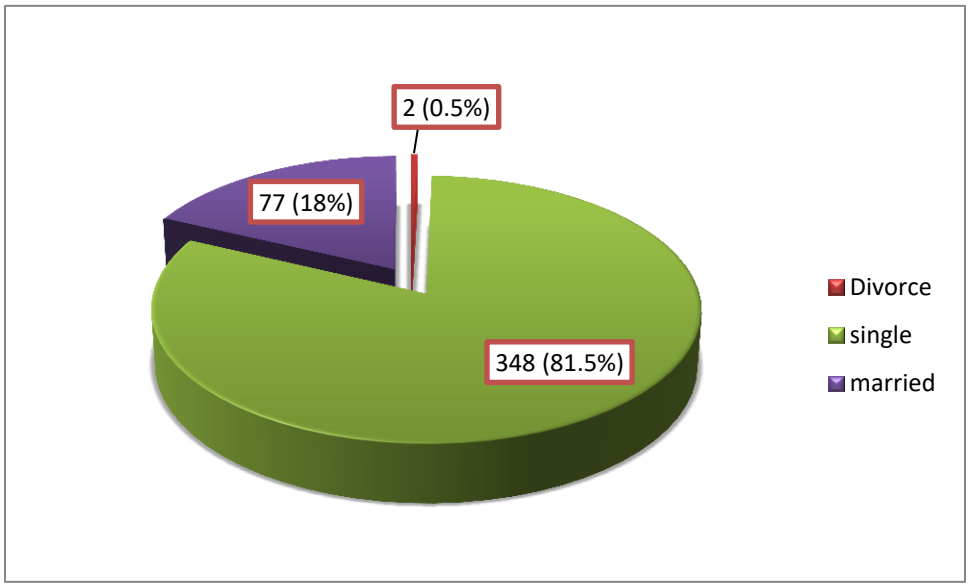

Figure 3 Distribution of sample according to Marital state

4.2 Hepatitis B vaccination status of the participants

Table 4 revealed the vaccination status of the participants. The result show that more than half of students 241 (56.4%) were vaccinated against HBV, while 168 (39.3%) were not vaccinated, and 18 (4.2%) were unknown about their vaccinated state. Among the vaccinated students, 159 (66%) were fully vaccinated (received 3 doses 152 (63.1%) or more than 3 doses of the vaccine 7 (2.9%)). While 83 (34%) were partially vaccinated which 46 (19.1%) received 2 doses and 37 (15.4%) received one dose. Also 147 (61%) of the respondents did not check their immune state after vaccination.

Table 4 Distribution of sample according to HB vaccination status

		Freq. (n=427)	%
Vaccinated against Hepatitis B	Yes	241	56.4%
	No	168	39.3%
	Unknown	18	4.2%
	Total	427	100%
Doses of Hepatitis B vaccine received	One	37	15.4%
	Two	46	19.1%
	Three	152	63.1%
	More than three	7	2.9%
	Total	241	100%
Checked immune status (Anti HbS) after vaccination?	Yes	94	39.0%
	No	147	61.0%
	Total	241	100%

Figure 4 shows that lack of a vaccination program was the major reason for not being vaccinated 51 (27.42%) followed by being busy as the second reason 32 (17.20%). The third reason was lack of motivation 27 (14.52%). Lack of belief was 7 (3.76%).

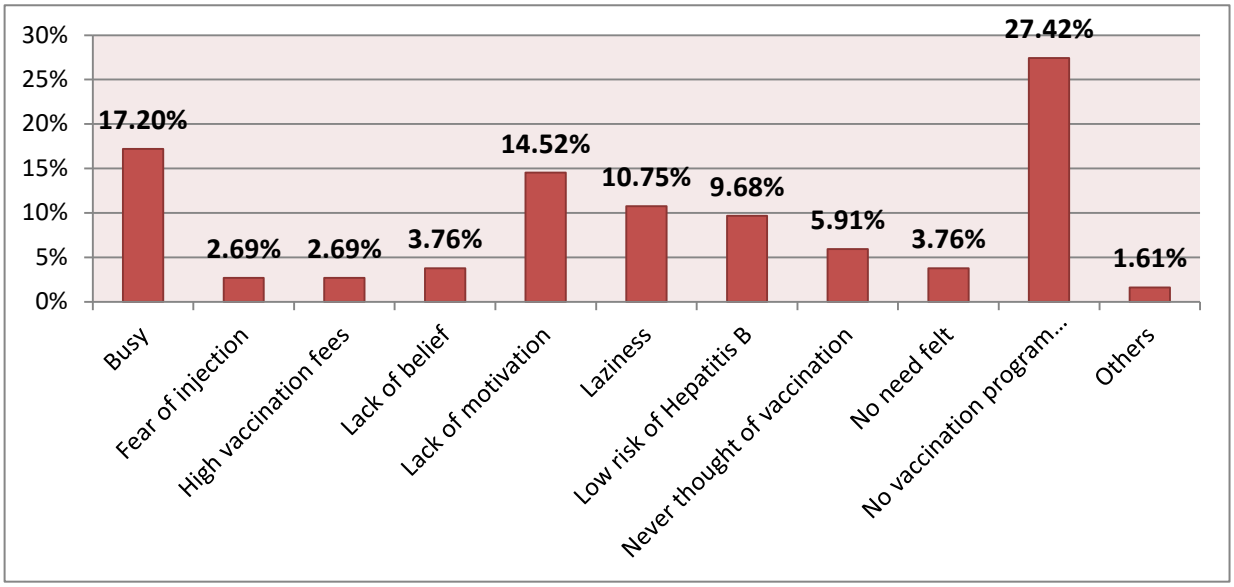

Figure 4 Reasons for not being vaccinated against Hepatitis B in unvaccinated students n=186

❖ **Association of vaccination state with basic socio-demographic characteristics**

Table 5 shows the relationship between some socio-demographic factors and vaccination state and the result showed the following:-

There were statistically significant association between the vaccination state of HBV and some factor (Gender and universities groups). The difference was clear as (p valve < 0.05) for the gender and university groups. This deference indicate that female were more vaccinated than male. Also Sana'a university had highest vaccinated rate and this finding explained that they had vaccination program.

There was no association between some factors (Age, education level and marital state) and the vaccination state of HBV, the result of chi-square test showed that the P-value was more than 0.05.

Table 5 Association of vaccination state with basic-demographic characteristics

Association of vaccination state with basic-demographic characteristics		vaccination state				P value
		No N(%)	Unknown N(%)	Yes N(%)	Total N(%)	
Age groups	less than 25	87(41.6%)	10(4.8%)	112(53.6%)	209(100%)	0.183
	25	30(30.9%)	6(6.2%)	61(62.9%)	97(100%)	
	more than 25	51(42.1%)	2(1.7%)	68(56.2%)	121(100%)	
	Total	168(39.3%)	18(4.2%)	241(56.4%)	427(100%)	
Gender	Female	42(31.1%)	2(1.5%)	91(67.4%)	135(100%)	**0.004**
	Male	126(43.2%)	16(5.5%)	150(51.4%)	292(100%)	
	Total	168(39.3%)	18(4.2%)	241(56.4%)	427(100%)	
University	Emirates International University	32(50.0%)	5(7.8%)	27(42.2%)	64(100%)	**<.001**
	University of Science and Technology	28(51.9%)	5(9.3%)	21(38.9%)	54(100%)	
	21 September University	75(56.8%)	4(3.0%)	53(40.2%)	132(100%)	
	Sana'a University	33(18.6%)	4(2.3%)	140(79.1%)	177(100%)	
	Total	168(39.3%)	18(4.2%)	241(56.4%)	427(100%)	
Level of study	4th year	49(43.0%)	8(7.0%)	57(50.0%)	114(100%)	0.133
	5th year	47(33.6%)	6(4.3%)	87(62.1%)	140(100%)	
	6th year	72(41.6%)	4(2.3%)	97(56.1%)	173(100%)	
	Total	168(39.3%)	18(4.2%)	241(56.4%)	427(100%)	
Marital state	Divorce	0(0.0%)	0(0.0%)	2(100%)	2(100%)	0.652
	married	33(42.9%)	2(2.6%)	42(54.5%)	77(100%)	
	single	135(38.8%)	16(4.6%)	197(56.6%)	348(100%)	
	Total	168(39.3%)	18(4.2%)	241(56.4%)	427(100%)	

4.3 Assessment of knowledge related to Hepatitis B virus

Knowledge of HBV was assessed by questions focusing on pathology, sign and symptoms, transmission, risk factor, treatment and prevention as the following:-

4.3.1 General knowledge about HBV

Table 6 shows the knowledge of the participants on Hepatitis B. Most of the respondents knew that Hepatitis B is caused by a virus 421 (98.6%) and can cause liver cancer 376(88.1%). About 402 (94.1%) of the participants know that healthcare workers are at risk of Hepatitis B infection more than the general population . Only 245 (57.4%) who know that chronic HBV is mostly asymptomatic and 94 (22.0%) did not know that HBV has post exposure prophylaxis . 404 (95%) know that HBV is preventable . less than half 205 (48%) knew that HBV is not curable /treatable .

Table 6 Distribution of sample according to general knowledge about HBV

		Freq.	%
Hepatitis B is caused by a virus?	No	6	1.4%
	Yes	421	98.6%
Hepatitis B can cause liver cancer?	No	51	11.9%
	Yes	376	88.1%
Health care workers are at increased risk of getting Hepatitis B than general population?	No	25	5.9%
	Yes	402	94.1%
most Chronic hepatitis B infection symptomatic? *	No	245	57.4%
	Yes	182	42.6%
Hepatitis B patients can be allowed to work? *	No	124	29.0%
	Yes	303	71.0%
Do you think HBV has laboratory test?	No	20	4.7%
	Yes	407	95.3%
Is Hepatitis B curable/treatable? *	No	205	48.0%
	Yes	222	52.0%
Could we prevent HB transmission?	No	23	5.4%
	Yes	404	94.6%
Is hepatitis B infection preventable?	No	22	5.2%
	Yes	405	94.8%
Is HBV has post exposure prophylaxis	No	94	22.0%
	Yes	333	78.0%

* No is correct answer

4.3.2 knowledge about transmission of HBV

Table 7 show the knowledge of the participants on the mode of transmission. The majority of the students knew that HBV can be transmitted by contaminated blood 416 (97.4%), Unsterilized syringes/needles 406 (95.1%), Infected mother to fetus 387 (91%) and unprotected sex 372 (87%). While some participants mentioned that HBV transmitted by shaking hands 56 (13%), coughing/sneezing 76 (18%), contaminated food/water 69 (16%), kissing168 (39.3%), saliva 222 (52%) and breast feeding 260 (61%) .

Table 7 Distribution of sample according to knowledge about transmission of HBV

Hepatitis B can be transmitted by		Freq.	%
Infected mother to fetus	No	40	9.4%
	Yes	387	90.6%
Transfusion blood	No	11	2.6%
	Yes	416	97.4%
Saliva	No	205	48.0%
	Yes	222	52.0%
Unprotected sex with infected ones	No	55	12.9%
	Yes	372	87.1%
Casual contact (shaking hands) *	No	371	86.9%
	Yes	56	13.1%
Unsterilized syringes/needles	No	21	4.9%
	Yes	406	95.1%
Coughing/sneezing*	No	351	82.2%
	Yes	76	17.8%
Contaminated food/water*	No	358	83.8%
	Yes	69	16.2%
Kissing*	No	259	60.7%
	Yes	168	39.3%
Breastfeeding*	No	167	39.1%
	Yes	260	60.9%

* No is correct answer

4.3.3 knowledge about prevention of HBV

Table 8 revealed that the majority of the students Knew that HBV can be prevented by vaccination 415 (97.2%), using gloves 315 (74%) and avoiding sharp needles/syringe injury 414 (97.0%). More than half of students disagreed that Hepatitis B can be prevented by antiviral 240 (56%) and avoiding contaminated water/food 300 (70%).

Table 8 Distribution of sample according to knowledge about prevention of HBV

Hepatitis B can be prevented by		Freq.	%
Vaccination	No	12	2.8%
	Yes	415	97.2%
Antivirals*	No	240	56.2%
	Yes	187	43.8%
Avoiding sharp needle/syringe injury	No	13	3.0%
	Yes	414	97.0%
Avoiding contaminated water/food*	No	300	70.3%
	Yes	127	29.7%
Using gloves when handling body fluid	No	112	26.2%
	Yes	315	73.8%

* No is correct answer

4.3.4 knowledge about signs and symptoms of HBV

Table 9 show that most of participants knew that signs and symptoms of HBV as the following, loss of appetite 394 (92%) , nausea /vomiting 359 (84%) ,jaundice 411 (96%) and fever 360 (84%).

Table 9 Distribution of sample according to knowledge about signs and symptoms of HBV

hepatitis B infections signs and symptoms		Freq.	N %
Fever	No	67	15.7%
	Yes	360	84.3%
Loss of appetite	No	33	7.7%
	Yes	394	92.3%
Nausea and Vomiting	No	68	15.9%
	Yes	359	84.1%
Jaundice	No	16	3.7%
	Yes	411	96.3%

4.3.5 knowledge about risk factors of HB

Table 10 revealed the knowledge toward risk factors of HBV and the result show that most participants agree (piercing/tattoo 88.5% and dental visit 96%) are risk factors .while more than half Disagree (overcrowded 62% , smoking 65% , alcohol 34%) that these are risk factors of HBV .

Table 10 Distribution of sample according to knowledge of HB risk factors

risk factors of hepatitis B		Freq.	%
Smoking*	No	278	65.1%
	Yes	149	34.9%
Alcohol*	No	145	34.0%
	Yes	282	66.0%
Piercing and tattoo	No	49	11.5%
	Yes	378	88.5%
Dental visits	No	60	14.1%
	Yes	367	85.9%
overcrowding*	No	263	61.6%
	Yes	164	38.4%
* No is correct answer			

4.3.6 knowledge about complication of HB

Depending on the knowledge about the complication of HBV. Table 11 show that liver disease 97.2% , liver cirrhosis 97.4% and liver cancer 89% are the complications of HBV . while only 37% of participants believe kidney disease as complication of HBV.

Table 11 Distribution of sample according to knowledge of HB complication

chronic hepatitis B infection lead to		Freq.	%
Liver disease	No	12	2.8%
	Yes	415	97.2%
Cirrhosis	No	11	2.6%
	Yes	416	97.4%
Kidney disease	No	271	63.5%
	Yes	156	36.5%
Liver cancer	No	47	11.0%
	Yes	380	89.0%

4.3.7 Overall knowledge score of HBV

A list of 38 correct symptoms was determined to measure the level of the knowledge of the participants toward HBV. Each correct answer was given 1 point, the maximum expected points was 38 and the minimum was 0 . Participants‟ overall knowledge score was categorized using Bloom's cut-off point, as high knowledge for a score ≥ 30 (80%-100%),average knowledge for a score between 19-29 points (50% - 79.9%), and poor knowledge for a score less than < 19 points (less than 50%) .

The mean knowledge of HBV was 30.01 with Std. Deviation (3.329) and the Median was (30.00). The Minimum result was (18) and the Maximum was (36).

Figure 5 show that Out of the 427 participants, 208 (48.7%) have high knowledge and 217 (50.8%) have average knowledge while only less than one percent 2 (0.5%) have poor knowledge.

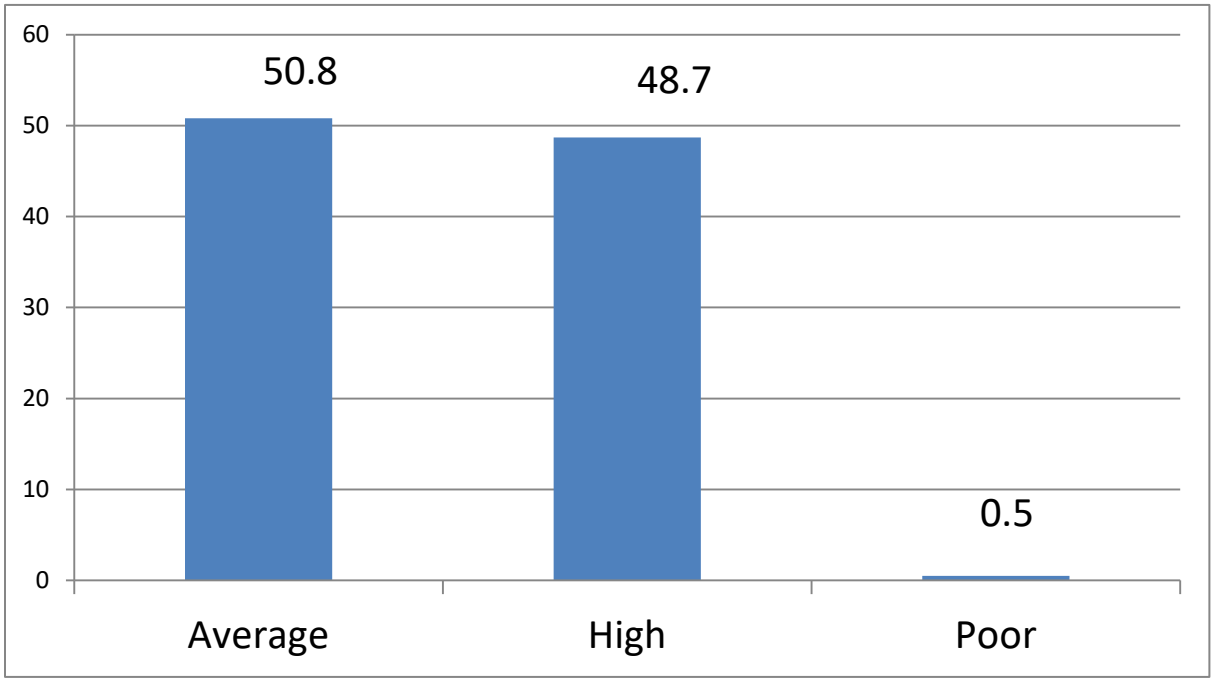

Figure 5 Distribution of study sample according to knowledge of HBV

4.3.8 Relationship between the Knowledge score of hepatitis B virus and socio-demographic characteristics.

The Table 12 show the relationship between socio-demographic characteristics and knowledge of HBV . The result showed the following:

There were no significant associated between socio-demographic factors (Age ,Gender, Universities, Marital state , level of study) and knowledge of HBV, the result of chi-square test showed that the P-Value was more than 0.05.

Table 12 Association of Knowledge score of HBV with socio-demographic characteristics

Association of Knowledge score of HBV with basic-demographic characteristics		HBV knowledge level Average N(%)	High N(%)	Poor N(%)	Total N(%)	P value
age groups	less than 25	107(51.2%)	102(48.8%)	0(0.0%)	209(100%)	0.137
	25	47(48.5%)	48(49.5%)	2(2.1%)	97(100%)	
	more than 25	63(52.1%)	58(47.9%)	0(0.0%)	121(100%)	
	Total	217(50.8%)	208(48.7%)	2(0.5%)	427(100%)	
Gender	Female	72(53.3%)	63(46.7%)	0(0.0%)	135(100%)	0.512
	Male	145(49.7%)	145(49.7%)	2(0.7%)	292(100%)	
	Total	217(50.8%)	208(48.7%)	2(0.5%)	427(100%)	
University	Emirates International University	34(53.1%)	30(46.9%)	0(0.0%)	64(100%)	0.742
	University of Science and Technology	31(57.4%)	23(42.6%)	0(0.0%)	54(100%)	
	21 September University	70(53.0%)	61(46.2%)	1(0.8%)	132(100%)	
	Sana'a University	82(46.3%)	94(53.1%)	1(0.6%)	177(100%)	
	Total	217(50.8%)	208(48.7%)	2(0.5%)	427(100%)	
Level of study	4th year	67(58.8%)	47(41.2%)	0(0.0%)	114(100%)	0.291
	5th year	64(45.7%)	75(53.6%)	1(0.7%)	140(100%)	
	6th year	86(49.7%)	86(49.7%)	1(0.6%)	173(100%)	
	Total	217(50.8%)	208(48.7%)	2(0.5%)	427(100%)	
Marital state	Divorce	0(0.0%)	2(100%)	0(0.0%)	2(100%)	0.426
	married	35(45.5%)	42(54.5%)	0(0.0%)	77(100%)	
	single	182(52.3%)	164(47.1%)	2(0.6%)	348(100%)	
	Total	217(50.8%)	208(48.7%)	2(0.5%)	427(100%)	

4.3.9 Relationship between the Knowledge score of hepatitis B virus and vaccinated state of participants

The Table 13 show no significant associated between knowledge of HBV and vaccinated state of participants , the result of chi-square test showed that the P-Value was more than 0.05

Table 13 Association of Knowledge score of HBV with vaccinated state of participants

Association of Knowledge score of HBV with vaccinated state of participants		vaccinated state				P value
		No N(%)	Unknown N(%)	Yes N(%)	Total N(%)	
HBV knowledge level	Average	93(42.9%)	10(4.6%)	114(52.5%)	217(100%)	0.566
	High	74(35.6%)	8(3.8%)	126(60.6%)	208(100%)	
	Poor	1(50.0%)	0(0.0%)	1(50.0%)	2(100%)	
	Total	168(39.3%)	18(4.2%)	241(56.4%)	427(100%)	

4.4 Knowledge related to Hepatitis B vaccine

Vaccine Knowledge was assessed by questions focusing on availability, safety, affectivity, doses, ideal time of vaccination, contraindication and vaccination in pregnancy as following:-

4.4.1 knowledge about HB vaccine availability, affectivity, safety and contraindication

Table 14 revealed that Majority 405 (94.8%) students knew about availability of HB vaccine, 388 (90.9%) students knew about effective Hepatitis B vaccine. Its safety was known to 380 (89.0%) but only 195 (45.7%) knew that it safe in pregnancy.

Table 14 Distribution of sample according to knowledge of HB vaccine

		Freq.	%
Is vaccination available for Hepatitis?	No	22	5.2%
	Yes	405	94.8%
Is Hepatitis B vaccine safe?	No	47	11.0%
	Yes	380	89.0%
hepatitis B vaccination protect against the infection?	No	39	9.1%
	Yes	388	90.9%
HBV vaccination is contraindicated in pregnancy? *	no	3	0.7%
	No	195	45.7%
	Yes	229	53.6%

* No is correct answer

4.4.2 knowledge about dose of HB vaccine

Table 15 revealed that Majority of students 355 (83.1%) selected Three doses of vaccine while 39 (9.1%) unknown about number of doses of HB vaccine and only 25 (6%) selected two doses.

Table 15 Distribution of sample according to knowledge of HB vaccine dose

		Freq.	%
HBV vaccine has …?	one dose	8	1.9%
	three dose	355	83.1%
	two dose	25	5.9%
	unknown	39	9.1%

4.4.3 knowledge about ideal age for HB vaccine

Table 16 revealed only 133 (31.1%) of students knew that infancy is ideal age of vaccination whereas Majority of students selected adulthood 134 (31.4%) and youth 65 (15.2%), Also 95 (22.2%) of student selected unknown so this distribution reveals significant portion of students had poor knowledge about ideal age of vaccine.

Table 16 Distribution of sample according to knowledge of ideal time of HB vaccination

		Freq.	%
Do you know What is ideal age of vaccination?	Adulthood	134	31.4%
	Infancy	133	31.1%
	unknown	95	22.2%
	Youth	65	15.2%

4.4.4 Score of overall correct answers about the HB vaccine :

A list of 6 correct questions was determined to measure the level of the knowledge of the participants toward the vaccine of hepatitis B virus . Each correct answer was given 1 point, the maximum expected points was 6 and the minimum was 0. Participants‟ overall knowledge score was categorized using Bloom's cut-off point, as high for a score between 5 and 6 points (80%-100%), average for a score between 3-4 points (50% and 70.9%), and poor for a score of less than < 3 points less than 50%.

The result showed that 208 (48.7 %) of the participants had high knowledge about HB Vaccine and 199 (46.6%) had average knowledge , while only 20 (4.7%) had poor knowledge about HB Vaccine.

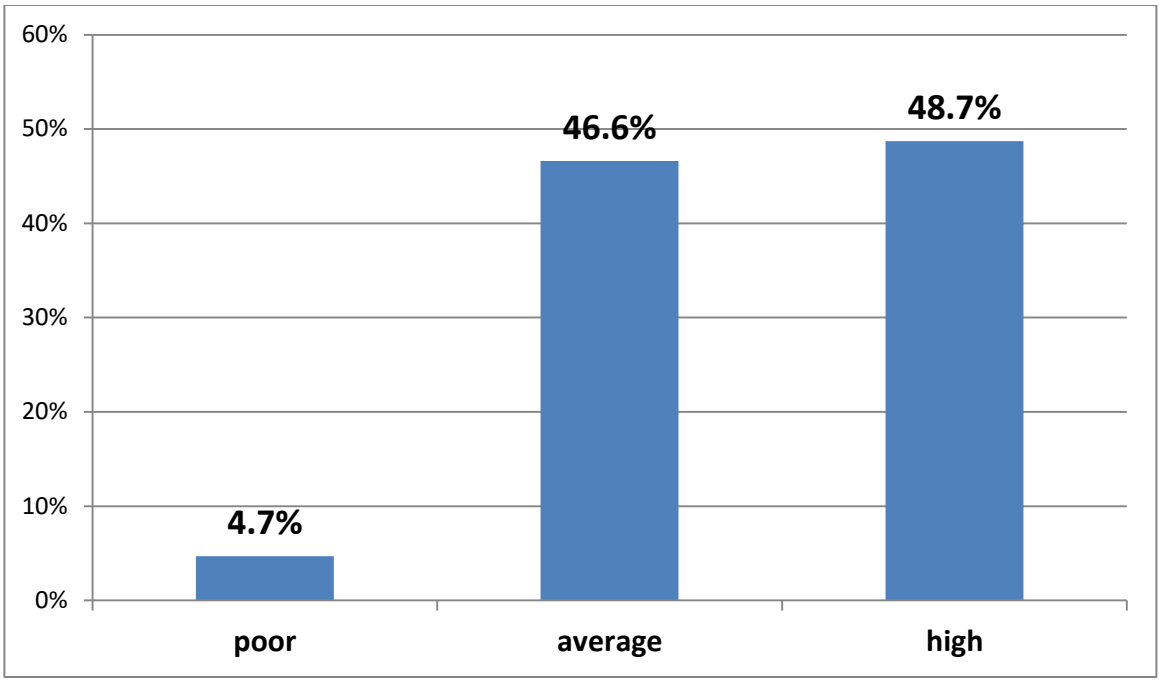

Figure 6 Distribution of sample according to level of knowledge toward HB vaccine

4.4.5 Relationship between socio-demographic factors and the knowledge about HB vaccine

Table 17 below shows the relationship between some socio-demographic factors and the knowledge about the HB vaccine and the result showed the following

There was statistically significant association between the knowledge about HB vaccine and the universities factor of participant. The difference was clear and statistically significant as (the p valve = 0.05). This difference indicate that 59% students of Sana'a university have high knowledge , while students of emirates International University 55% ,University of Science and Technology 52% and 21 September University 49.2% have average knowledge).

There was no association between the some factors (Age, Gender, education level and marital state) and the knowledge about HB vaccine , the result of chi-square test showed that the P.value was more than 0.05.

Table 17 Association of Knowledge score of HB Vaccine with basic-demographic characteristics

Association of Knowledge score of HB Vaccine with basic-demographic characteristics		HB Vaccine knowledge level				P value
		Average N(%)	High N(%)	Poor N(%)	Total N(%)	
age groups	less than 25	109(52.2%)	94(45.0%)	6(2.9%)	209(100%)	0.065
	25	35(36.1%)	56(57.7%)	6(6.2%)	97(100%)	
	more than 25	55(45.5%)	58(47.9%)	8(6.6%)	121(100%)	
	Total	199(46.6%)	208(48.7%)	20(4.7%)	427(100%)	
Gender	Female	63(46.7%)	66(48.9%)	6(4.4%)	135(100%)	0.987
	Male	136(46.6%)	142(48.6%)	14(4.8%)	292(100%)	
	Total	199(46.6%)	208(48.7%)	20()4.7%	427(100%)	
University	Emirates International University	35(54.7%)	24(37.5%)	5(7.8%)	64(100%)	0.006
	University of Science and Technology	28(51.9%)	22(40.7%)	4(7.4%)	54(100%)	
	21 September University	65(49.2%)	58(43.9%)	9(6.8%)	132(100%)	
	Sana'a University	71(40.1%)	104(58.8%)	2(1.1%)	177(100%)	
	Total	199(46.6%)	208(48.7%)	20(4.7%)	427(100%)	
Level of study	4th year	63(55.3%)	48(42.1%)	3(2.6%)	114(100%)	0.060
	5th year	63(45.0%)	73(52.1%)	4(2.9%)	140(100%)	
	6th year	73(42.2%)	87(50.3%)	13(7.5%)	173(100%)	
	Total	199(46.6%)	208(48.7%)	20(4.7%)	427(100%)	
Marital state	Divorce	0(0.0%)	2(100%)	0(0.0%)	2(100%)	0.359
	married	33(42.9%)	38(49.4%)	6(7.8%)	77(100%)	
	single	166(47.7%)	168(48.3%)	14(4.0%)	348(100%)	
	Total	199(46.6%)	208(48.7%)	20(4.7%)	427(100%)	

4.4.6 Relationship between the knowledge about HB vaccine and vaccinated state of participants

Table 18 show there is significant associations was observed in this study between knowledge of vaccine of HBV and vaccination state of participants, in which more vaccination rate seems to be based on good knowledge of vaccine, while poor knowledge is most probably associated with less vaccinated rate . The result of chi-square test showed that the P.value was less than 0.05 .

Table 18 **Association of Knowledge score of HB Vaccine with vaccinated state of participants**

Association of Knowledge score of HB Vaccine with vaccinated state of participants		vaccinated state				P value
		No N(%)	Unknown N(%)	Yes N(%)	Total N(%)	
HB Vaccine knowledge level	Average	91(45.7%)	10(5.0%)	98(49.2%)	199(100%)	0.001
	High	65(31.3%)	6(2.9%)	137(65.9%)	208(100%)	
	Poor	12(60.0%)	2(10.0%)	6(30.0%)	20(100%)	
	Total	168(39.3%)	18(4.2%)	241(56.4%)	427(100%)	

4.5 Assessment of positive practice towards Hepatitis B virus

Table 19 shows the practice of the respondents toward Hepatitis B virus. Among the participants, 398 (93.2%) ask/use a new blade for shaving/hair cutting. About 400 (93.7) of the respondents ask for a new syringe before injection. About 379 (88.8%) of the students ask for sterilized equipment for ear/nose piercing. While 345 (80.8%) stated that they reporting their needle prick/ sharp injuries whereas 82(19.2%) don't . Approximately 300 (70.3%) of students attending Hepatitis B-related awareness programs and 127 (29.7%) don't attend. Also, more than half of the respondents, 228 (53.4%) never screened for HBV.

Table 19 **positive practice towards Hepatitis B virus**

		Freq.	%
I ask/use a new blade for shaving/hair cutting"	No	29	6.8%
	Yes	398	93.2%
I ask for a new syringe before injection.	No	27	6.3%
	Yes	400	93.7%
I ask for sterilized equipment for ear/nose piercings.	No	48	11.2%
	Yes	379	88.8%
I always report for needle pricks / sharp injuries	No	82	19.2%
	Yes	345	80.8%
I attend hepatitis B related awareness program	No	127	29.7%
	Yes	300	70.3%
All healthcare worker should receive the HBV vaccination	No	24	5.6%
	Yes	403	94.4%
Training programs for HBV should be offered for all healthcare providers	No	29	6.8%
	Yes	398	93.2%
Have you done screening for Hepatitis B?	No	228	53.4%
	Yes	199	46.6%

❖ Score of overall positive practice toward the HBV

A list of 8 practices questions was determined to measure the level of the positive practice among participants toward practice related to HBV. Each positive practice was given 1 point, the maximum expected points was 8 and the minimum was 0. Participants‟ overall positive practice score was categorized using Bloom's cut-off point, as high for a score >6 points (80%-100%), moderate for a score between 4-6 points (50% and 70.9%), and poor for a score of less than 4 points less than 50%.

Figure 7 show about 24% of the participants have high positive practice and 72% of the participants have average positive practice, While 4% of the participants have poor positive practice about HBV .

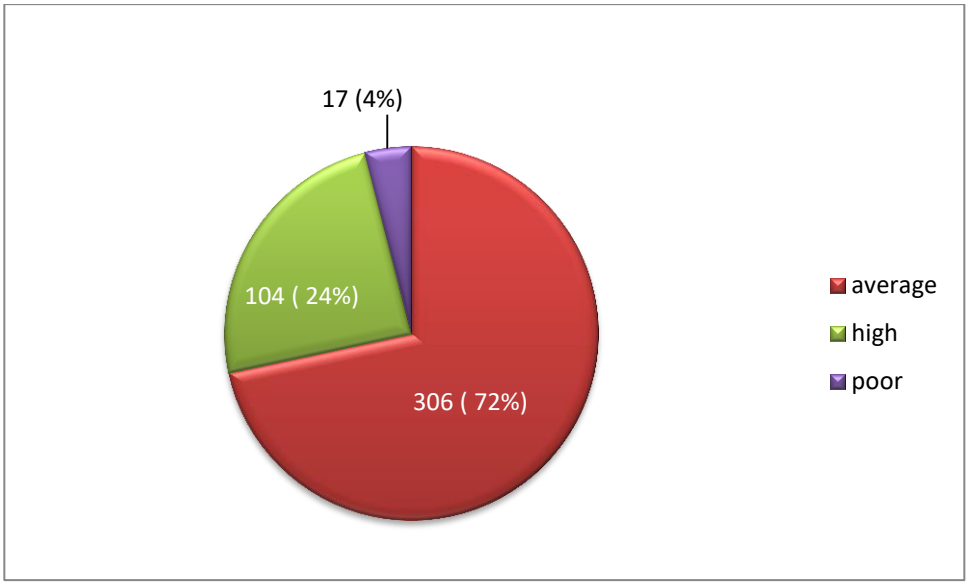

Figure 7 Practice towards Hepatitis B virus

❖ Relationship between socio-demographic factors and the positive practice toward HBV

Table 20 below shows the relationship between some socio-demographic factors and the practice toward HBV and the result showed the following

There were statistically significant association between the practice toward HBV and some factors (Gender and universities groups) of participant. The difference was clear as (the p valve <0.05) with female had more positive score than male and Sana'a University was higher than others universities.

There was no association between the three (Age, education level and marital state) and the practice toward to HBV, the result of chi-square test showed that the P.value was more than 0.05 for the three factors.

Table 20 Association of practice score toward HBV with basic-demographic characteristics

Association of practice score toward HBV with basic-demographic characteristics		Practice level				P value
		Average N(%)	High N(%)	Poor N(%)	Total N(%)	
age groups	less than 25	153(73.2%)	49(23.4%)	7(3.3%)	209(100%)	0.381
	25	68(70.1%)	22(22.7%)	7(7.2%)	97(100%)	
	more than 25	85(70.2%)	33(27.3%)	3(2.5%)	121(100%)	
	Total	306(71.7%)	104(24.4%)	17(4.0%)	427(100%)	
Gender	Female	84(62.2%)	48(35.6%)	3(2.2%)	135(100%)	<.001
	Male	222(76.0%)	56(19.2%)	14(4.8%)	292(100%)	
	Total	306(71.7%)	104(24.4%)	17(4.0%)	427(100%)	
University	Emirates International University	54(84.4%)	8(12.5%)	2(3.1%)	64(100%)	<.001
	University of Science and Technology	41(75.9%)	8(14.8%)	5(9.3%)	54(100%)	
	21 September University	100(75.8%)	25(18.9%)	7(5.3%)	132(100%)	
	Sana'a University	111(62.7%)	63(35.6%)	3(1.7%)	177(100%)	
	Total	306(71.7%)	104(24.4%)	17(4.0%)	427(100%)	
Level of study	4th year	87(76.3%)	21(18.4%)	6(5.3%)	114(100%)	0.349
	5th year	102(72.9%)	34(24.3%)	4(2.9%)	140(100%)	
	6th year	117(67.6%)	49(28.3%)	7(4.0%)	173(100%)	
	Total	306(71.7%)	104(24.4%)	17(4.0%)	427(100%)	
Marital state	Divorce	2(100.0%)	0(0.0%)	0(0.0%)	2(100%)	0.885
	married	54(70.1%)	19(24.7%)	4(5.2%)	77(100%)	
	single	250(71.8%)	85(24.4%)	13(3.7%)	348(100%)	
	Total	306(71.7%)	104(24.4%)	17(4.0%)	427(100%)	

❖ Relationship between the positive practice score and HBV knowledge level of participants

In table 21 there is significant associations was observed in this study between knowledge and practice scores, in which good practice seems to be based on good knowledge, while poor knowledge is most probably associated with malpractices. The result of chi-square test showed that the P.value was <0.05.

Table 21 Relationship between the practice positive score and HBV knowledge level of participants

Association of practice score toward HBV with HBV knowledge level of participants		Positive Practice level				P value
		Average N(%)	High N(%)	Poor N(%)	Total N(%)	
HBV knowledge level	Average	148(68.2%)	56(25.8%)	13(6.0%)	217(100%)	0.001
	High	157(75.5%)	48(23.1%)	3(1.4%)	208(100%)	
	Poor	1(50.0%)	0(0.0%)	1(50.0%)	2(100%)	
	Total	306(71.7%)	104(24.4%)	17(4.0%)	427(100%)	

Chapter 5

Discussion

Discussion

This chapter discuss in detail the major findings and the implications of them. The results put in the context of the previous and recent research in form of comparing our finding with other researchers finding (where applicable) and comparing the current study findings based on the background variables. The main topics are: socio-demographic factors, knowledge about HBV, HB vaccination state of participant's and practice of participant's toward HBV.

Medical students are at high risk of exposure to blood-borne infections such as Hepatitis B virus, as they provide direct patient care throughout the clerkship phase of the program, this places them in a similar risk category as healthcare professionals. Therefore, it is imperative that all students should be vaccinated and acquire sufficient knowledge about the virus to minimize the risk of infection.

5.1 Socio-demographic factors

Regarding to the age of the participants, the current study showed that the mean and the standard deviation of the age (24.69) (±2.028SD).This result is slightly in line with other studies conducted in Maharajgunj Medical Campus in Nepal (22.73±1.969)[{38}] and in Dammam university, Saudi Arabia the mean of (21.2 ± 0.72)[{37}] and in Turkey (21.1 ± 2.3)[{36}] and Ghana (21.46 ± 2.65)[{45}.] In the other side the current study result is not in the line with other study conducted among preclinical medical students of a medical college in Kathmandu, Nepal (19.93 ±1.436)[{42}] and in Sudan Among Students of Medical Laboratory Sciences at Sudan International University (20.93 ± 1.62)[{44}] and in Kurdistan, Iraq (20.74 ±1.43)[{35}].

5.2 Knowledge about HBV

Current study showed a favorable level of knowledge as 48.7% of the study participants had high knowledge about HBV and 50.8% had average knowledge. This finding was in line with other similar studies, including the study conducted among medical students of Dammam University, Saudi Arabia, in which 50 % of students had good knowledge about HBV but only 39.6% had average knowledge[{37}], also a study conducted among preclinical medical students of a medical college in Kathmandu, Nepal reported that 50.8% had good knowledge regarding hepatitis B[{42}]. On the other hand, the level of knowledge observed in this study was lower than that observed in other similar studies, including the study conducted Among Students of Medical Laboratory Sciences at Sudan International University wherein 60.4% of the

participants had good knowledge about HBV[44]. A study at Haramaya University showed that 56.2% of students were knowledgeable regarding HBV infection prevention[20]. Moreover, a study conducted in Iraq reported that the knowledge level among medical students was 56% [35]. The reason is that Higher result of level of knowledge about the disease among above studies could be due to their some different in rout of data analysis of knowledge score, in which graded as only good and poor levels without average level.

Out of the 38 knowledge items used in the questionnaire, the mean knowledge score for the study sample was 30.01. This figure is similar to the study conducted among Nursing Training Students in Ghana, in which the mean knowledge score was 29.6+- 6.98 out of 18 knowledge items[55]. In addition, the mean in this study was comparable with that of another studies, including the study at Haramaya University in which 16 items were used to assess knowledge and the mean score was 11.52+- 2.37[20], a study in Sudan showed that the mean knowledge was 13.79 out of 19 knowledge items[44]. Moreover, a study conducted in Dammam University, Saudi Arabia reported that the mean knowledge was 17.36+-4.8 [37]. However, this finding was not consistent with study of medical college in Nepal, in which the median knowledge of participants was 61.00 (57.00–66.00)[42].

The current study showed no relation between some socio-demographic factors and the knowledge about HBV, the result of the chi-square test showed the P value was more than 0.05. This finding is similar with the previous study, which was the mean knowledge levels for both genders and all age were similar. Also, this finding is in line with study in Haramaya University[20] and in Kathmandu, Nepal[42]. In the other side this finding is not in line with study in Saudi Arabia in which there was a significant relationship between marital status and hepatitis B knowledge (P <0. 01) with more knowledge among unmarried students[37]. Also study in Iraq showed that there was significant association between the KAP score and age (P =0.00002) with more knowledge among students age 21 and above[35].

5.3 Knowledge about HBV vaccine

In our study 48.7 % of the participants had good knowledge about HB Vaccine and 46.6% had average knowledge , while only 4.7% had poor knowledge about HB Vaccine. This finding is in line with study conducted among medical students of Maharajgunj Medical Campus

in Nepal but they used only two graded in data analysis (good and poor) and we find the good knowledge of their study (93.2%)[38] equal to high and average knowledge in our study (95.3%).

The current study showed 94.8% of students knew about available of Hepatitis B vaccine. This finding was in line with other similar studies, including the study conducted among medical students of Maharajgunj Medical Campus in Nepal in which 94.7% students knew about effective Hepatitis B vaccine[38] and a study at Haramaya University showed that 93.2% of students were knowledgeable regarding HBV available[20]. However, our result is higher than result observed in study conducted Among Students of Medical Laboratory Sciences at Sudan International University wherein 70.8% of the participants had knowledge about HBV availability[44]. Also, similar to the findings of a study in Maharajgunj Medical Campus, Nepal (82.5%)[38], a percentage of 83.1% of the study participants knew that HBV vaccine doses are three in the recommended schedule, also their finding (86.9%) is similar to our result In a bout vaccine effectiveness was known to 90.9% of participants and similar in study in Syria (89.8%)[33].

Our study showed only 31.1% of students knew that infancy is ideal age of vaccination. This finding is lower than that study observed in Syria wherein 55.46% of participants said infant is ideal age for vaccine[33].

5.4 HB vaccination state of participant's

Regarding to vaccination state of the participants toward HBV the result of current study showed that, about more than half 56.4% were vaccinated and 39.3% of participants were not vaccinated while only 4.2% unknown of their vaccinated state . This finding is in line with studies in Bokhara, Nepal where 58.8%[34], in Kathmandu, Nepal where 60.8% of student were vaccinated[42] and in Pakistan where 60% of students were vaccinated[4]. In other side, our result is lower than the findings of a study in Turkey, where 91.2% of Medical students were immunized [36] and in Nigeria 85.4%[43]. In addition, our finding is slightly lower than study in Ghana 66.8%[55]. However, our results are slightly higher than a studies from Iraq , where 42.5% of students reported that they had been vaccinated[35] and in Syria where 43.75% of the students had taken the hepatitis B vaccine[33]. In addition, our finding is higher than research carried out in Sudan , where it was found that 24.5% of the participants had received vaccinations[44].

Out of all, 66% of participants were fully vaccinated (3 doses or more), in line with Bokhara 60.9 %[{34}] and is much greater than a study in Pakistan , where just 33% of students were fully vaccinated[{4}] and in Ghana which 49.4 of their students had completed all three doses of vaccination[{55}].

The primary reason for why 39.3% of the participants in our study were not vaccinated is due to having no vaccination programs (27.42%) followed by being busy (17.20%) and lack of motivation (14.5%). Our results are in line with other studies conducted in Iraq and Bokhara which found the main reasons for non-vaccination is due to having no vaccination programs (62%)[{35}], (74.6)[{34}] respectively. These findings highlight the need for urgent implementation of vaccination programs for medical science students in the region. In addition, Pakistan , the laziness (53%) was the most common obstacle for non-vaccination[{4}].

In present study, there is relation between some socio-demographic factors (gender and universities factor) and the vaccination state of HBV, the result of the chi-square test showed the P value was less than 0.05 with more knowledge among female students. This finding was agreed by the previous study in Yemen, wherein the vaccination rate for female students was significantly higher at 46.6% compared to 22.3% for male students, with a P-value of 0.0001[{32}]. Also, This finding is in line with study conducted in turkey which there is significant association between vaccination state and age, gender, family economic state and resident[{36}].

The current study showed relation between knowledge score and the vaccination state of HBV, the result of the chi-square test showed the P value was less than 0.05 with more vaccination rate among high knowledge students. This finding is in line with studies in turkey, Iraq and Ghana.

5.5 Practice of participant's toward HBV

Depending on the practices of the participants toward HBV the result of this study showed that 93.7% of the students stated that they requested a new syringes before injection to avoid infection. This finding is in line with study in Kathmandu, Nepal 96.2% where the participants asked for new syringes before injection[{42}]. However, our result is higher than a studies conducted in Iraq (84.6%)[{35}], Sudan (84.1%)[{44}] and Ethiopia (83.5%)[{20}] where the

participants asked for new syringes before injection.

In our survey, 66.4%, and 76.7% of the students stated that they requested a new blade for shaving/hair cutting and sanitized equipment for piercing their ears and nose, respectively. This finding reported better safety practices than a Studies in Iraq (66.4%, and 76.7% respectively)[35] and Kathmandu, Nepal (89.3% and 77.3% respectively)[42]. 80.8% of the students stated that they would report needle prick/sharp injuries. Our findings presented higher percentages than those indicated by studies conducted in Kathmandu, Nepal (64.6%), and Iraq (72%), where the participants will report needle injuries[42 , 35].

In our survey 70.3% of the participants said that they have attended Hepatitis B related awareness programs this finding is higher than studies from Sudan (35.8%)[44], Ethiopia (23.9%)[20], Iraq (45.2%)[35] and Kathmandu, Nepal (44.2%)[42].
In this study, less than half of the respondents (46.6%) were previously screened for hepatitis B, this similar to the findings of a study In Sudan wherein 44.6% had been tested for HBV infection[44]. In other side our result is higher than studies in Maharajgunj Medical Campus in Nepal (22.8%)[38], in Syria (16.4%)[33] and in Ethiopia (14.3%) were previously screened for hepatitis B[20].

In our study there is significant association was observed between knowledge and practice scores. This finding is in line with study done in Ethiopia, which showed significant positive but weak linear relation between knowledge and practice (r =0.173, p = 0.002) [20] and this reaffirms the relationship between knowledge and practice with infection control measures even though the relation is weak in this study. However, this finding differs from a Sudan survey, in which no significant relation between knowledge and practice components.

Also. there were statistically significant association between the practice toward HBV and some factors (Gender and universities groups). This finding was agreed by the previous study in Yemen, wherein females outperformed males in practices[32]. In other side, this finding is not in line with study in Iraq that showed there was significant association between the KAP score and age (P =0.00002) with more safe practice among students age 21 and above but was no significant association between gender (p-value = 0.093) and KAP score[35]. Also, in Kathmandu, Nepal There is no significant association observed[42].

5.6 Limitations and strengths of the study

The main limitation of this research is that vaccination status was self-reported and not confirmed by the measurement of the anti-Hepatitis B surface antibody (HBsAb) titer of the students. Therefore, recall bias and erroneous information might have affected the findings of the research. Since the study was conducted only in Sana'a city in Yemen, the results cannot be generalized to all medical science colleges in the Yemen, but they will undoubtedly serve as a background for future studies in the region. Finally, the nature of the study was cross-sectional, and it did not measure the cause-and-effect relationship. Despite the limitations, the study was strengthened by the large sample size used to measure individuals' vaccination status against the Hepatitis B virus, which minimized the likelihood of bias.

Chapter 6

Conclusions

and

Recommendation

6.1 Conclusion

This study concluded that :

- The knowledge about the HBV arrange between average and high knowledge. However the knowledge about the post-exposure prophylaxis was poor.

  There was no relation between socio-demographic factors (age ,gender , Marital state , level of study) and knowledge of HBV.

- The overall knowledge about HB vaccination showed satisfactory outcomes compared to other studies arranged between average and high knowledge.

  There was relation between the knowledge about HB vaccine and the universities factor of participant. However, no relation with the others socio-demographic factors (Age, Gender, education level and marital state).

- More than half of a study participants was vaccinated against HBV.

  The main barrier prevents students from doing the HBV vaccine in this study were lack of vaccination program, being busy and lack of motivation.

  There is relation between the vaccination state of HBV and some socio-demographic factors (Gender and universities groups) and no relation with the others factors (Age, education level and marital state).

  Also there is relation between the vaccination state and knowledge about HBV vaccine while there is no relation with knowledge about HBV disease.

- The study showed average positive practice toward the HBV among the participants.

  There was relation between the practice toward HBV and some socio-demographic factors (Gender and universities groups) of participants and no relation with the others (Age, education level and marital state).

  Also, there is significant associations was observed in this study between knowledge of HBV and positive practice scores, in which good practice seems to be based on good knowledge, while poor knowledge is most probably associated with malpractices.

6.2 Recommendation:

- We recommended to raise Awareness about hepatitis B vaccination among medical students before starting their clinical training.
- For every medical student we recommended ensuring documented vaccination card and immune status for hepatitis BV before starting their clinical training.
- Medical students should be well educated about counseling for accidental needle pricks and availability of post-exposure prophylaxis.
- Another suggestion for a **new initiative** could be providing free HBV vaccines program to all the non-vaccinated students attending medical faculty to encourage universal vaccinations for all students upon their entry.
- Future studies may be directed at measuring the hepatitis B antibody titers and evaluating the response to the hepatitis B vaccine among the medical students.

References

References:

1. Singh A, Jain S. Prevention of hepatitis B; knowledge and practices among medical students. Healthline. 2011;2(2):8–11.

2. Hepatitis B. [cited 2024 Aug 11]. Available from: https://www.who.int/news-room/fact-sheets/detail/hepatitis-b

3. Hutin YJ, Harpaz R, Drobeniuc J, Melnic A, Ray C, Favorov M, et al. Injections given in healthcare settings as a major source of acute hepatitis B in Moldova. International journal of epidemiology. 1999;28(4):782–6.

4. Khan N, Ahmed SM, Khalid MM, Siddiqui SH, Merchant AA. Effect of gender and age on the knowledge, attitude and practice regarding hepatitis B and C and vaccination status of hepatitis B among medical students of Karachi. Pakistan J Pak Med Assoc. 2010;60(6):450–5.

5. Noubiap JJN, Nansseu JRN, Kengne KK, Tchokfe Ndoula S, Agyingi LA. Occupational exposure to blood, hepatitis B vaccine knowledge and uptake among medical students in Cameroon. BMC Med Educ. 2013 Dec;13(1):148.

6. Mitchell: Hepatitis and liver cancer: a national strategies for prevention and control of hepatitis B and C Available from: https://scholar.google.com/scholar_lookup?title=Hepatitis+and+Liver+Cancer:+A+National+Strategy+for+Prevention+and+Control+of+Hepatitis+B+and+C&author=HM+Colvin&author=AE+Mitchell&publication_year=2010&

7. Hou: Epidemiology and prevention of hepatitis B virus infection. Available from: https://scholar.google.com/scholar_lookup?journal=Int+J+Med+Sci&title=Epidemiology+and+Prevention+of+Hepatitis+B+Virus+Infection&author=J+Hou&author=Z+Liu&author=F+Gu&volume=2&issue=1&publication_year=2005&pages=50-7&pmid=15968340&doi=10.7150/ijms.2.50&

8. Wasfi OAS, Sadek NA. Prevalence of hepatitis B surface antigen and hepatitis C virus antibodies among blood donors in Alexandria, Egypt. EMHJ-Eastern Mediterranean Health Journal, 17 (3), 238-242, 2011 [Internet]. 2011 [cited 2024 Aug 11]; Available from: https://apps.who.int/iris/bitstream/handle/10665/118109/17_3_2011_0238_0242.pdf

9. Al-Shamahy H. Prevalence of Hepatitis B Surface Antigen and Risk Factors of HBV Infection in a Sample of Healthy Mothers and Their Infants in Sana'a, Yemen. Ann Saudi Med. 2000 Sep;20(5–6):464–6.

10. Bajubair MA, Elrub AA, Bather G. Hepatic viral infections in Yemen between 2000-2005. Saudi Medical Journal. 2008;29(6):871.

11. Gacche RN. Epidemiology of viral hepatitis B and C infections in Ibb city, Yemen. Hepatitis monthly. 2012;12(7):460.

12. Wong GL, Hui VW, Yip TC, Liang LY, Zhang X, Tse Y, et al. Universal HBV vaccination dramatically reduces the prevalence of HBV infection and incidence of hepatocellular carcinoma. Aliment Pharmacol Ther. 2022 Sep;56(5):869–77.

13. Malewezi B, Omer SB, Mwagomba B, Araru T. Protecting health workers from nosocomial Hepatitis B infections: A review of strategies and challenges for implementation of Hepatitis B vaccination among health workers in Sub-Saharan Africa. JEGH. 2016;6(4):229.

14. Awoke N, Mulgeta H, Lolaso T, Tekalign T, Samuel S, Obsa MS, et al. Full-dose hepatitis B virus vaccination coverage and associated factors among health care workers in Ethiopia: A systematic review and meta-analysis. PLoS One. 2020;15(10):e0241226.

15. Health care workers and hepatitis B. Sciencedirect web site. Available from: https://www.sciencedirect.com/science/article/abs/pii/S0168827803003131

16. Al Huraibi MA et al. Seroprevalence of markers of viral hepatitis in Yemen health care workers. Journal of Medical Virology, 2004, 73(4):562–565. also available through : https://www.emro.who.int/emhj-volume-17/issue-6/article2.html

17. Daw MA et al. Seroepidemiology of hepatitis B virus markers among hospital health care workers. Analysis of certain potential risk factors. Saudi Medical Journal, 2000, 21(12):1157–1160.

18. Jadallah RI et al. Prevalence of hepatitis B virus markers among high risk groups in Palestine. Medical Journal of Islamic World Academy of Sciences, 2005, 15(4):157–160.

19. A. Pr¨uss- ¨ Ust¨un, E. Rapiti, and Y. Hutin, "Estimation of the global burden of disease

attributable to contaminated sharps injuries among health-care workers," The American Journal of Industrial Medicine, vol. 48, no. 6, pp. 482–490, 2005.

20. Yonatan Moges Mesfin, Kelemu Tilahun Kibret, Assessment of Knowledge and Practice towards Hepatitis B among Medical and Health Science Students in Haramaya University, Ethiopia, PLOS ONE | www.plosone.org, November 2013 | Volume 8 | Issue 11 | e79642 doi:10.1371/journal.pone.0079642

21. Davidson's Principles and Practice of Medicine. 23rd Edition. CLINICAL MEDICINE. Hepatology chapter. viral infection. page(873).

22. Hepatitis B Vaccine, Hepatitis B Foundation, Doylestown, Pa, USA, 2009.

23. B. J. McMahon, W. L. M. Alward, D. B. Hall et al., "Acute hepatitis B virus infection: relation of age to the clinical expression of disease and subsequent development of the carrier state," Journal of Infectious Diseases, vol. 151, no. 4, pp. 599–603, 1985

24. K. Ikeda, S. Saitoh, Y. Suzuki et al., "Disease progression and hepatocellular carcinogenesis in patients with chronic viral hepatitis: a prospective observation of 2215 patients," Journal of Hepatology, vol. 28, no. 6, pp. 930–938, 1998.

25. R. P. Beasley and L. Y.Hwang, "Overviewof the epidemiology of hepatocellular carcinoma," in Viral Hepatitis and Liver Disease: Proceedings of the International Symposium on Viral Hepatitis and Liver Disease: Contemporary Issues and Future Prospects, F. B.Hollinger, S.M.Lemon, andH. S.Margolis,Eds., pp. 532–535, Williams &Wilkins, Baltimore, Md, USA, 1991.

26. J. F. Perz, G. L. Armstrong, L. A. Farrington, Y. J. F.Hutin, and B. P. Bell, "The contributions of hepatitis B virus and hepatitis C virus infections to cirrhosis and primary liver cancer worldwide," Journal of Hepatology, vol. 45, no. 4, pp. 529–538, 2006.

27. European Journal of Obstetrics & Gynecology and Reproductive Biology, 2019. available through: https://www.sciencedirect.com/science/article/pii/S0301211519303057

28. *World Health Organization (July 2017). "Hepatitis B vaccines: WHO position paper – July 2017". https://iris.who.int/bitstream/handle/10665/255873/WER9227-369392.pdf?sequence=1&isAllowed=y*

29. Drugs During Pregnancy and Lactation (Third Edition) Treatment Options and Risk Assessment 2015, Pages 705-710. available through: https://www.sciencedirect.com/science/article/pii/S0301211519303057

30. Centers for Disease Control and Prevention (CDC). Hepatitis B Vaccine Administration. available through: https://www.cdc.gov/hepatitis-b/hcp/vaccine-administration/index.html

31. Hepatitis B foundation. Vaccine for Hepatitis B. available through: https://www.hepb.org/prevention-and-diagnosis/vaccination/

32. Yheia A R, Gehad G S, AbdulRaheem A AH, Mansour H AA, Arif A M, Nabil M AA. Coverage and perceptions of medical sciences students towards hepatitis B virus vaccine in Sana'a city, Yemen. 2002 [cited 2024 Aug 11]; Available from: https://pesquisa.bvsalud.org/portal/resource/pt/emr-60824

33. Ibrahim N, Idris A. Hepatitis B Awareness among Medical Students and Their Vaccination Status at Syrian Private University. Hepatitis Research and Treatment. 2014 Nov 12;2014:1–7.

34. Bhattarai S, Gyawali M, Sapkota S, Karki D, Lamsal S. Knowledge, attitude and practice of hepatitis B vaccination among clinical medical students at a medical college in Nepal. Europasian Journal of Medical Sciences. 2020;2(2):17–23.

35. 4- Hepatitis B vaccination status and knowledge, attitude, and practice towards Hepatitis B virus among medical sciences students. Duhok province, Kurdistan Region of Iraq. November 2022 to February 2023.

36. Healthcare students' vaccination status, knowledge, and protective behaviors regarding hepatitis B: a cross-sectional study in Turkey

37. [Magdy A. Darwish and Nuha M.Al Khaldi Knowledge about Hepatitis B Virus Infection among Medical Students in University of Dammam, Eastern Region of Saudi Arabia] Life Sci J 2013; 10(2):860-867] (ISSN: 1097-8135). http://www.lifesciencesite.com

38. Krishna Dahal, Laba Rawal, Sangam Shah, Mahesh Dahal, Gambhir Shrestha, Knowledge, attitude and practice towards Hepatitis B vaccination among medical undergraduate students of Maharajgunj Medical Campus in Nepal: a cross-sectional study, October 2023. Annals of

Medicine & Surgery (2024) 86:782–788. 3 January 2024 http://dx.doi.org/10.1097/MS9.0000000000001658.

39. Paul, N. and Peterside, O. (2015) Hepatitis B Vaccination Rate among Medical Students at the University of Port Harcourt Teaching Hospital (Upth). World Journal of Vaccines, 5, 1-7. http://dx.doi.org/10.4236/wjv.2015.51001.

40. Mohsin Butt1, Imran Mahmood Khan2, Muhammad Waqas Ashfaq3, Mahmood Jamal4. Hepatitis B Vaccination Status among Students of a Medical College in Islamabad 2015, Journal of Islamabad Medical & Dental College (JIMDC); 2015:4(4):157-161.

41. Mohamed Shawqi et al. Knowledge, attitude, and practice of Egyptian medical students towards healthcare workers' recommended vaccines: a nationwide crosssectional survey. BMC Medical Education (2024) 24:876 https://doi.org/10.1186/s12909-024-05712-8.

42. Hepatitis B vaccination status and knowledge, attitude, and practice regarding Hepatitis B among preclinical medical students of a medical college in Nepal from 6th July to 14th July 2020

43. Kelechi R Onyenemezu1, Tobechukwu C Ezike1, Obinna V Ikwuka1, Ogochukwu A Duru2. Perception and Uptake of Hepatitis B Virus Vaccine Among Healthcare Trainees in A Nigerian University. February-March 2018. INTERNATIONAL JOURNAL OF HEALTH & MEDICAL RESEARCH. Volume 2 Issue 11 November 2023. www.ijhmr.com .Page 431-437

44. Ahmed Elhadi, Eman Elfaki, Mustafa E Yassin. Vaccination Status, Knowledge, Attitudes and Practices Toward Hepatitis B Infection Among Students of Medical Laboratory Sciences at Sudan International University. research squire. DOI: https://doi.org/10.21203/rs.3.rs-322289/v1

45. Aniaku JK, et al. Assessment of Knowledge, Attitude and Vaccination Status of Hepatitis B among Nursing Training Students in Ho, Ghana. Annals of Global Health. 2019; 85(1): 18, 1–9. DOI: https://doi.org/10.5334/aogh.750

APPENDICES

Appendix (Questionnaire)

Demographic characteristics

Name : …….

Age : …….

Sex : ☐ Male ☐ Female

Marital state : ☐ Married ☐ Single ☐ Divorced

level of study : ☐ 4th year ☐ 5th year ☐ 6th year

University : ☐ Emirates International University

☐ Sana'a University

☐ University of Science and Technology

☐ 21 September University

Hepatitis B vaccination status

(Please select the most appropriate option)

1. Have you been vaccinated against Hepatitis B? ☐ Yes ☐ No ☐ Unknown

(*Only if vaccinated)

How many doses of Hepatitis B vaccine did you receive?

- ☐ One dose
- ☐ Two doses
- ☐ Three doses
- ☐ More than three doses

Checked immune status (Anti HbS) after vaccination?

- Yes
- No

(*If not vaccinated)

What are the reasons for you not being vaccinated?

- ☐ Low risk of Hepatitis B
- ☐ No vaccination program offered
- ☐ High vaccination fees
- ☐ Lack of motivation
- ☐ No need felt
- ☐ Never thought of vaccination
- ☐ Lack of belief
- ☐ Fear of injection
- ☐ Laziness
- ☐ Busy
- ☐ Others (Please specify).....

Knowledge related to Hepatitis B

(Please select the most appropriate option)

1. Hepatitis B is caused by a virus? ☐ Yes ☐ No
2. Hepatitis B can cause liver cancer? ☐ Yes ☐ No
3. Health care workers are at increased risk of getting Hepatitis B than general population? ☐ Yes ☐ No
4. most Chronic hepatitis B infection symptomatic? ☐ Yes ☐ No
5. Hepatitis B patients can be allowed to work? ☐ Yes ☐ No
6. Do you think HBV has laboratory test ☐ Yes ☐ No
7. Is Hepatitis B curable/treatable ? ☐ Yes ☐ No
8. Could we prevent HB transmission ? ☐ Yes ☐ No
9. Is hepatitis B infection preventable? ☐ Yes ☐ No
10. Is HBV has post exposure prophylaxis? ☐ Yes ☐ No

10. Hepatitis B can be transmitted by

a) Infected mother to fetus ☐ Yes ☐ No
b) Transfusion blood ☐ Yes ☐ No
c) Saliva ☐ Yes ☐ No
d) Unprotected sex with infected ones ☐ Yes ☐ No
e) Casual contact (shaking hands) ☐ Yes ☐ No
f) Unsterilized syringes/needles ☐ Yes ☐ No
g) Coughing/sneezing ☐ Yes ☐ No
h) Contaminated food /water ☐ Yes ☐ No
i) Kissing ☐ Yes ☐ No
j) Breastfeeding ☐ Yes ☐ No

11. Hepatitis B can be prevented by

a) Vaccination ☐ Yes ☐ No
b) Antivirals ☐ Yes ☐ No
c) Avoiding sharp needle/syringe injury ☐ Yes ☐ No
d) Avoiding contaminated water/food ☐ Yes ☐ No
e) Using gloves when handling body fluid ☐ Yes ☐ No

12. hepatitis B infections signs and symptoms?

a) Fever ☐ Yes ☐ No
b) Loss of appetite ☐ Yes ☐ No
c) Nausea and Vomiting ☐ Yes ☐ No
d) Jaundice ☐ Yes ☐ No

13. Risk factors of hepatitis B?

a) Smoking ☐ Yes ☐ No
b) Alcohol ☐ Yes ☐ No
c) Piercing and tattoo ☐ Yes ☐ No
d) Dental visits ☐ Yes ☐ No
e) overcrowding ☐ Yes ☐ No

14. chronic hepatitis B infection lead to?

a) Liver disease ☐ Yes ☐ No
b) Cirrhosis ☐ Yes ☐ No
c) Kidney disease ☐ Yes ☐ No
d) Liver cancer ☐ Yes ☐ No

Knowledge related to Hepatitis B vaccine

(Please select the most appropriate option)

Statement	YES	NO
Is vaccination available for Hepatitis ?		
I believe Hepatitis B vaccine is safe?		
hepatitis B vaccination protect against the infection?		
HBV vaccination is contraindicated in pregnancy?		

- HBV vaccine has ……..?
  - one dose
  - two doses
  - three doses
  - unknown
- Do you know What is ideal age of vaccination?
  - Infancy
  - Youth
  - Adulthood
  - Unknown

Practice related to hepatitis B

(Please select the most appropriate option)

Statement	YES	NO
I ask/use a new blade for shaving/hair cutting.		
I ask for a new syringe before injection.		
I ask for sterilized equipment for ear/nose piercings.		
I always report for needle pricks / sharp injuries.		
I attend hepatitis B related awareness program		
All healthcare worker should receive the HBV vaccination		
Training programs for HBV should be offered for all healthcare providers		
Have you done screening for Hepatitis B?		

أو جرعتين). من بين المشاركين في الدراسة، كان لدى 50.8% معرفة متوسطة حول فيروس التهاب الكبد البائي ، وكان 48.7% لديهم معرفة عالية بلقاح التهاب الكبد البائي ، وكان 72% لديهم ممارسة إيجابية معتدلة تتعلق بفيروس التهاب الكبد البائي.

الاستنتـــاج والتوصيـــــات:

وجهت الدراسة إلى تقييم المعرفة وحالات التطعيم والممارسات ضد فيروس التهاب الكبد البائي ، والتي كانت جيدة ولكن هناك نقاط أخرى مثل وجود علاقة بين المعرفة حول لقاح التهاب الكبد البائي وعامل الجامعات للمشاركين الذين يحتاجون إلى تحسينها من خلال التثقيف الصحي المنتظم لزيادة الوعي والمعرفة حول فيروس التهاب الكبد البائي وتحفيزهم على أخذ لقاح التهاب الكبد البائي. وينبغي تنفيذ هذه البرامج في الجامعات الحكومية و الجامعات الخاصة والمراكز المجتمعية.

الملخص العربي

المقدمـــــــة :

تسبب عدوى فيروس التهاب الكبد البائي (HBV) معدلات مرضية ووفيات كبيرة في جميع أنحاء العالم. مما يزيد العاملين في مجال الرعاية الصحية وطلاب الطب من خطر الإصابة بعدوى فيروس التهاب الكبد البائي، وتوصي العديد من الجهات المعنية بالتطعيم. ومع ذلك، فإن جزء كبيرة من العاملين في مجال الرعاية الصحية لا يتلقون التطعيم ضد فيروس التهاب الكبد البائي، ويظلون معرضين لخطر زيادة الإصابة بفيروس التهاب الكبد البائي. يمكن الوقاية من عدوى التهاب الكبد البائي بين العاملين في مجال الرعاية الصحية من خلال استراتيجيات مثل التطعيم وزيادة الوعي واتباع الاحتياطات العالمية. أجريت هذه الدراسة على طلاب الطب في المرحلة السريرية لتقييم المعرفة المتعلقة بفيروس التهاب الكبد البائي ومعرفة حالة التطعيم الخاصة بهم. كما تم استخدام هذه المناسبة لتحفيز الطلاب على أخذ لقاح التهاب الكبد البائي إذا لم يتم أخذه مبكرًا وللتثقيف حول الاحتياطات العالمية.

الأهـــــــــــداف :

هذه الدراسة تهدف لتقييم المعرفة والممارسة وانتشار التطعيم ضد التهاب الكبد البائي بين طلاب الطب السريري (الرابع والخامس والسادس) في أربع جامعات في مدينة صنعاء، اليمن، 2024م.

مـــــنهجية البـــحث :

تم إجراء تصميم دراسة مقطعية على 427 طالب طب سريري (الرابع والخامس والسادس) في أربع جامعات مختلفة في مدينة صنعاء، في الفترة من 21 أكتوبر 2024 إلى 16 نوفمبر 2024.. من أصل 427 استبيانًا تم توزيعه، تم إرجاع 427 استبيانًا معدل الاستجابة 100.0%. تم استخدام استبيان منظم ذاتي لجمع المعلومات مقسم إلى خمسة أجزاء، الجزء الأول يتضمن البيانات الاجتماعية والديموغرافية. أما الجزء الثاني فقد تضمن حالة التطعيم ضد التهاب الكبد البائي. أما الجزء الثالث فقد تضمن المعرفة المتعلقة بفيروس التهاب الكبد البائي. الجزء الرابع تضمن المعرفة المتعلقة بلقاح التهاب الكبد البائي. الجزء الخامس تضمن الممارسة المتعلقة بفيروس التهاب الكبد البائي وتم إدخال البيانات التي تم الحصول عليها في برنامج Microsoft Excel 2013 ثم إدخالها وتحليلها في الحزمة الإحصائية IBM للعلوم الاجتماعية (SPSS) الإصدار 30.0 ثم عرض البيانات في الجداول والأرقام

الـنتـــــــائج:

استجاب للاستبيان 427 طالباً ، منهم 65.3% ذكور، و34.7% إناث، بمتوسط عمر 24.69 ± 2.028 سنة. تم تطعيم أكثر من نصف الطلاب (56.4%) ضد التهاب الكبد البائي ، في حين أن 39.3% من الطلاب لم يتم تطعيمهم مطلقًا و4.2% فقط لا يعرفون حالة تطعيمهم. السبب الرئيسي لعدم التطعيم هو عدم وجود برنامج التطعيم 27.42%. من بين المشاركين الذين تم تطعيمهم، تم تطعيم 66% منهم بشكل كامل (ثلاث جرعات أو أكثر) بينما تم تطعيم 34% جزئيًا (جرعة

الجمهورية اليمنية
وزارة التربية والتعليم
والبحث العلمي
الجامعة الإماراتية الدولية
كلية الطب والعلوم الصحية

المعرفة والممارسة تجاه التطعيم ضد فيروس التهاب الكبد البائي بين طلاب الطب السريري, في جامعات مدينة صنعاء - اليمن, 2024م

بحث مقدم إلى قسم طب المجتمع كلية الطب والعلوم الصحية الجامعة الإماراتية الدولية كمتطلب للحصول على درجة البكالوريوس في الطب والجراحة العام

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كلية الطب والعلوم الصحية

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