SCHOOL OF PUBLIC HEALTH

COLLEGE OF HEALTH SCIENCES

UNIVERSITY OF GHANA

PREVALENCE AND RISK FACTORS OF HEPATITIS B VIRUS INFECTION AMONG MEDICAL LABORATORY SCIENCE STUDENTS IN THE UNIVERSITY OF HEALTH AND ALLIED SCIENCES, HO, VOLTA REGION, GHANA

BY

PHILIP APRAKU TAWIAH

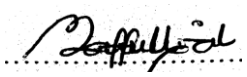
(10635161)

A DISSERTATION SUBMITTED TO THE SCHOOL OF PUBLIC HEALTH, UNIVERSITY OF GHANA IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF PUBLIC HEALTH (MPH) DEGREEE

DECEMBER, 2018

DECLARATION

I, Philip Apraku Tawiah, declare that this research work is my original piece written under the supervision of Dr. Uri Selorm Markakpo. Apart from the materials used in the literature review that have been duly acknowledged, this work has never been presented either in whole or part by anyone to any school or institution for the award of any degree or qualifications. I also declare that all sources of materials used and consulted in the write-up of this research work have been duly acknowledged.



Philip Apraku Tawiah (B.Sc.)
(10635161)

02/10/2019

DATE

Dr. Uri Selorm Markakpo (Ph.D.)
(SUPERVISOR)

02/10/2019

DATE

DEDICATION

This piece of work is dedicated to the Omnipotent God who provided me with the knowledge and understanding as well as the strength to complete it, I also dedicate this work to my elder brother, Mr. Aaron Kofi Tawiah for buying into my vision and providing me with all the necessary support especially financial assistance towards the successful completion of this MPH programme.

ACKNOWLEDGEMENT

I tender my earnest gratitude to my selfless supervisor, Dr. Uri Selorm Markakpo for his enormous encouragement, guidance and support contributing to the accomplishment of this project work.

Further, I am most grateful to the Laboratory Technologists and Assistants of the Department of Medical Laboratory Sciences, University of Health and Allied Sciences (UHAS) for the assistance given to me during the collection of data for this study.

Furthermore, I am highly indebted to my parents, Mr. Emmanuel Kwadjo Tawiah and Nana Adwoa Amponsah, and my siblings for their love, care and support especially my sister, Ms. Rebecca Tawiah and her husband, Mr. Eric Agyapong for hosting me throughout this MPH programme.

In addition, my appreciation goes to my MPH course mates, my colleagues at work and my friends particularly Ms. Eunice Buabeng Odoom, Ms. Priscilla Eghan and Ms. Getrude Nortey whose encouragement and suggestions helped in shaping this research work.

Above all, I extend my immense appreciation to the Almighty God for granting me the ability and grace to successfully complete this postgraduate programme.

ABSTRACT

Rationale: Hepatitis B disease is a critical work-related menace for clinical health facility workers and poses a more serious occupational risk for health care students due to their inexperience in the field of work during their vocational training programmes in various health care facilities across the Country. Among health care students, medical laboratory science students (MLSS) are at a higher risk since laboratory technicians are among the elevated risk groups of hepatitis B virus infection. In spite of these, data on prevalence and risk factors of hepatitis B illness among MLSS in Ghana as a whole is unknown. This study therefore determined the prevalence and risk factors of hepatitis B infection among MLSS at the University of Health and Allied Sciences (UHAS), Ho, Ghana.

Methodology: The research work was conducted among 2nd, 3rd and 4th year students in the Department of Medical Laboratory Sciences, UHAS using a cross-sectional study design. Simple random sampling method was used to recruit students from each year group. A total of 178 students participated in the study. A proportion to size ratio was used to estimate the number of study participants interviewed from each year group. In all, 91(51.1%), 64(36.0%) and 23(12.9%) of the study participants were 2nd, 3rd and 4th year students respectively. Closed-ended questionnaire was used to gather relevant information on risk factors. Food and Drugs Authority approved HBsAg rapid diagnostic test kits were used to test for the presence of hepatitis B infection among study participants. Ethical approval was obtained from the Ghana Health Service Ethical Review Committee (GHS-ERC). Chi-square test, bivariate and multiple logistic regression statistical analyses were

used to estimate chi2 values, crude odds ratios, adjusted odds ratios, confidence intervals and p-values.

Results: Out of the 178 students surveyed, 78.1% were males, majority (66.3%) were of ages between 20-24 years and the least (8.4%) were within the 15-19 years. A greater number (87.1%) students had no work history and 59.0% had less than 2 months vocational training experience. The prevalence of HBV infection among MLSS was 6.7%. Hepatitis B virus exposure through sharp-related injuries and torn gloves was 7.9% and 32.0% respectively. A significant number (43.3%) of students had received at least a dose of Hepatitis B vaccination. Sharp related injury increased the odds of HBV infection among the students by more than 10 times (AOR = 10.35, p-value = 0.034) compared to those who experienced no sharp injury whiles torn gloves increased the odds of HBV infection among the students by almost 6 times (AOR = 5.90, p-value = 0.019) compared to those whose gloves were not torn. Meanwhile, vaccination decreased the odds of HBV infection among the students by almost 91% (AOR = 0.09, p-value = 0.033) compared to students who never received any dose of Hepatitis B vaccination during the period of the study. Hepatitis B risk related factors such as needle prick, splash of blood and other body fluids, sexual activities and use of STD preventive measures were not significantly associated with the prevalence of HBV infection among the students surveyed.

Conclusion and Recommendation: The HBV infection prevalence of this study was 6.7%, which is still high though but not statistically different from the current national rate of 12.3% and endemicity level of 8%. Sharp related injuries, torn gloves and vaccination

were strong predictors of the infection. Preceding the commencement of vocational training programmes, training sessions should be organized by the university on safety procedures involved in handling sharp-related objects and also on the wearing and removal of gloves which appears to account for the endemic prevalence of HBV infection among medical laboratory science students.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

anti-HBc	antibody to hepatitis B core antigen
anti-HBe	antibody to hepatitis B e antigen
anti-HBs	antibody to hepatitis B surface antigen
DMLS	Department of Medical Laboratory Sciences
DNA	Deoxyribonucleic acid
GHS	Ghana Health Service
GHS-ERC	Ghana Health Service Ethical Review Committee
HBcAg	Hepatitis B c antigen
HBeAg	Hepatitis B e antigen
HBsAg	Hepatitis B surface antigens
HBV	Hepatitis B Virus
HCW	Health Care Workers
HIV	Human Immunodeficiency Virus
HCS	Health Care Students
IgM	Immunoglobulin M
MLSS	Medical Laboratory Science Students
RDT	Rapid Diagnostic Test
RNA	Ribonucleic acid
STD	Sexually Transmitted Diseases
UHAS	University of Health and Allied Sciences
WHO	World Health Organization

DEFINITION OF TERMS

Health care worker: A person who works in a health care facility and line of work involves contact with patients' blood or body fluids. This category of workers include physicians, nurses, pharmacists, medical laboratory technicians, morticians, dentists, attending clinicians, public safety worker, emergency response personnel, health care waster handlers and first aid providers or volunteers.

Health care student: A person who studies in a heath related tertiary institution and periodically does internship or vocational training in a health care facility. This category of students include nursing students, medical laboratory sciences students, medical students, pharmacy students and other students in the medical setting.

CHAPTER ONE

INTRODUCTION

1.1 Background

Hepatitis is an inflammatory disease of the liver, caused either by a viral infection or as a reaction to toxic substances such as alcohol or drugs (Robinson & Davidson, 1996). Viral hepatitis are the most common type of hepatitis in the world and it is estimated that viral hepatitis caused 1.34 million deaths in 2015; a number that can be compared to deaths caused by tuberculosis and higher than those caused by Human Immunodeficiency Virus (HIV) (World Health Organization, 2017b).

Hepatitis B is a liver disease caused by hepatitis B virus (HBV). Infection by this virus is still one of the high standing reasons of liver disease. Hepatitis B virus also increases the risk of development of chronic hepatitis, liver cirrhosis and hepatocellular carcinoma as late-term complications (Inan & Tabak, 2015). An approximation of 33% of people in the world has serological confirmation of current contamination with hepatitis B virus (Mauss, Berg, Jurgen, Christoph, & Heiner, 2017).

The 2017 Global Hepatitis Report of WHO indicates that between the years 2000 to 2015, interventions mounted reduced the mortality rate of HIV from 1.46 to 1.06 million deaths, tuberculosis from 1.67 to 1.37 million and malaria from 0.86 to 0.44 million deaths. In contrast, mortality due to hepatitis has rather recorded about 22% increase, from 1.10 million deaths in 2000 to 1.34 million deaths in 2015. (World Health Organization, 2017a).

According to World Health Organization (2017a), approximately 257 million people are living with chronic HBV infection which resulted in 877,000 deaths in 2015, mostly from adverse effects such as hepatocellular carcinoma or cirrhosis of the liver. The Ghana Health Service (GHS) also recorded a total of 51,052 suspected acute viral hepatitis cases; out of which 7,581 were confirmed positive with 108 deaths in the year 2014. These cases included reports from all the regions in Ghana except Northern region. (Ghana Health Service, 2015)

The Hepatitis B viral infection can be contracted through coming into contact with an infected person's blood, semen or other body fluid. This contact can be made through an accidental injury by needle that was used on an infected person, unprotected sex with an infected person, contact with blood or open sores of an infected person, sharing of needles with an infected person, tattooing or piercing of the skin with unsterilized tools used on infected person, or use of person's razor, toothbrush or nail clippers (Bacon, Heller, Garza-Abijaoude, & Thiel, 2012). There can also be transmission through bites from infected person, although this is rare (Department of Health, 2006).

Hepatitis B infection can be contracted by everybody, however, the most likely people include people; born to hepatitis B infected mother, who come in contact with blood, needles or body fluids at work, staying with someone who currently has an active hepatitis B infection, who have had multiple sex partners in the last 6 months or have a history of sexually transmitted diseases (STD), who have stayed in or travels often to sectors of the globe where hepatitis B infection is on the increase, who are diseased with HIV or hepatitis

C, who injects unlawful drugs and people who are workers of prisons or lives within the four corners of the prison (Bacon et al., 2012).

Hepatitis B is a crucial occupational hazard for health care workers (HCW), although, safe and effective vaccines are available to prevent this disease (World Health Organization, 2017b). A study conducted among health care workers in a tertiary hospital in Uganda predicted that out of 370 HCW that participated, the sero-prevalence of HBV disease was 8.1% and prevalence of perceived life time exposure to HBV infection was 48.1% (Zafar, 2014). A comparable research conducted among HCW in Pakistan suggested that nurses and laboratory technicians are more prone to HBV infections (Attaullah et al., 2011).

Hepatitis B disease is a serious job-related risk for students pursuing health care related programmes due to their inexperience in the field of work at the various health facilities. On account of this, nursing students and medical laboratory science students are included among the high risk groups. (Ziraba, Bwogi, Namale, Wainaina, & Mayanja-kizza, 2010). In Ghana, a research conducted among nursing students in the Techiman North and South Districts reported 10.1% prevalence of HBV infection (Kombat, 2016). In another research conducted among biomedical students of African descent attending Usmanu Danfodiyo University Sokoto in North-Western Nigeria, out of the 186 students tested, 25 were positive for HBsAg. This represented a high prevalence of 13.4% (Okwesili et al., 2015).

Recognizing that MLSS are among the high risk groups and that early detection is of utmost importance to prevent complication and death, the conduct of this study among

these group of students would help formulate policy for early management of HBV infection among them as a whole.

1.2 Problem Statement

Hepatitis B virus infection still remains one of the important occupational health perils among HCW all over the world (World Health Organization, 2017b). Health care workers in Ghana are at more risk because the national prevalence of Hepatitis B reported as at 2013 and 2015 was 12.9% and 12.3% respectively which is higher than the endemic level of 8% (Ofori-Asenso & Agyeman, 2016; Schweitzer, HorJ, Mikolajczyk, Krause, & Ott, 2015). In spite of the fact that vaccination of HCW has reduced the infection drastically in some parts of the world, the case is however different in parts of the globe, especially Africa, where health personnel are not regularly screened and vaccinated against the infection.

According to a Ghana Health Service report, 96.8% of all laboratory confirmed cases of viral hepatitis recorded in the Volta region was attributable to chronic hepatitis B infection (Ghana Health Service, 2017). Since health care facilities in the region are the main institutions required to train medical laboratory science students (MLSS) during their vocational internship programmes, lack of evidence-based policy measures to protect them against infectious blood and body fluids may increase the risk of HBV infection among them and other susceptible Health Care students (Kombat, 2016).

Nevertheless, almost all the studies conducted on HBV infection which took place in the period between 1995 and 2015 focused on patients whilst few were among health care practitioners (Kombat, 2016; Ofori-Asenso & Agyeman, 2016). Additionally, all of the few studies conducted among health care workers (HCWs), focused on prediction of spread of the disease to HCWs from patients, with none on the prevalence and risk factors of the disease among HCWs or MLSS (Kombat, 2016; Ofori-Asenso & Agyeman, 2016).

For these reasons therefore, this study sought to determine the prevalence and risk factors of HBV infection among medical laboratory science students (MLSS) of the University of Health and Allied Sciences.

1.2.1 Conceptual framework

Narrative for Conceptual Framework

The diagram below (figure 1.1) is a conceptual framework that shows the link between risk factors, preventive measures and HBV infection.

Socio-demographic factors such as level of experience and job category of students have been associated with the risk of HBV infection. For instance, nursing students and MLSS are at risk of infection because of their work related activities that increase their rate of exposure to contaminated instruments, specimens and persons. In addition, the level of experience may influence the risk of the infection because less experienced students are more likely to engage in activities or practices that expose them to contaminated blood and other body fluids than the more experienced ones which may increase the risk of HBV

infection among them. In addition, students within certain age groups may be more sexually active and inclined to promiscuity than others.

The wearing of personal protective materials such as gloves is essential in handling blood and other body fluids during healthcare delivery especially among students. Gloves protect healthcare workers against exposure to infected blood and fluids. Category of health care worker also influences the risk of HBV infection, for example medical laboratory workers are at more risk than pharmacists owing to their higher level of exposure to contaminated materials than pharmacists. Needle prick is one of the common occupational hazards that can be experienced by students. This implies that the more a student is accidentally pricked by an infected needle, the more likely is the development of the disease by him/her.

Injuries caused by sharp objects increase the risk of HBV infection if exposed to contaminated blood or body fluids of patients owing to the direct access of the viruses into the body.

Furthermore, spillage of infected blood or other body fluids during healthcare activities could lead to HBV infection if such biological materials come into contact with mucus membrane, mouth, eyes and other sensitive body parts of healthcare workers and therefore contributes to the risk of infection.

Vaccination is the best preventive measure against the disease. Health care workers and students that get vaccinated, builds immunity against the disease. Lack of vaccination

among the MLSS would automatically place them at a high risk of the HBV infection. Lack of disinfection of working areas and sterilization of used equipment or instrument could also lead to increased risk of HBV infection since the virus can survive extreme temperature and humidity.

In conclusion, demographic factors, use of gloves, torn gloves, needle pricks, spillage of infected blood and body fluids, exposure to infected sharp injuries, cuts, unprotected sexual intercourse, lack of disinfection and lack of vaccination increased the risk of HBV infection among MLSS and thus can consequently lead to high morbidity and mortality rates of HBV infection.

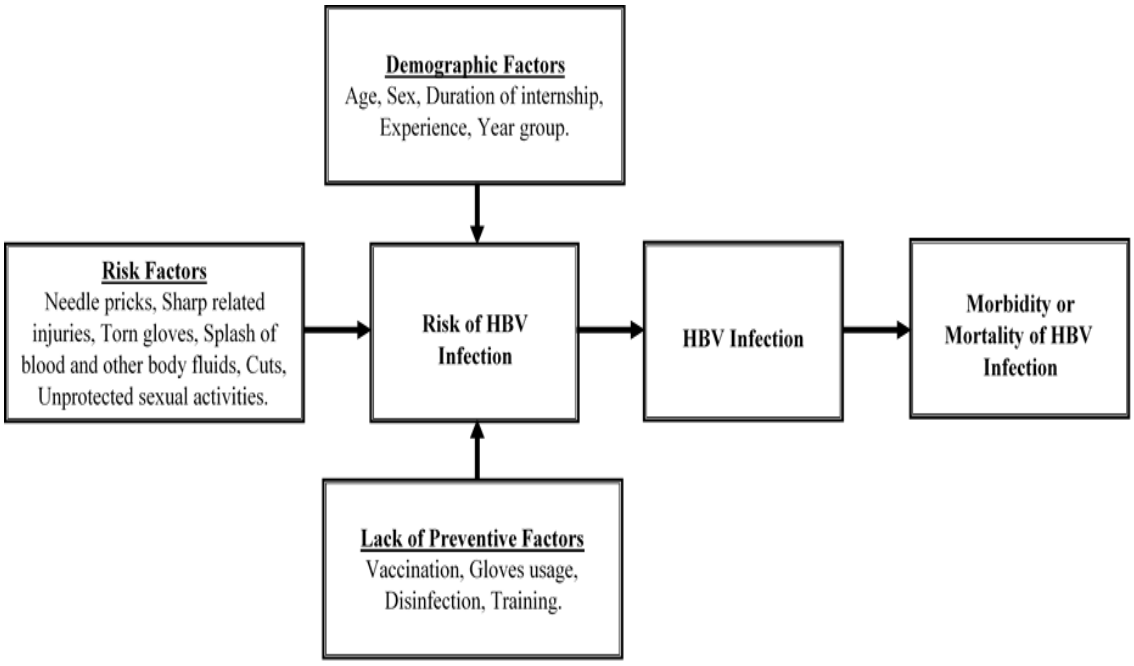


Figure 1.1 Conceptual framework

1.3 Justification of the study

Hepatitis B virus infection is one of the most efficiently transmitted blood borne diseases that occur in health care settings. Health care workers are at risk of exposure if patients are infected and patients too are at risk if HCW are infected (Lewis, Enfield, & Sifri, 2015). Although the transmission of infection from HCWs or HS to patients is rare, it still places patients at high risk if these service delivery personnel including MLSS are infected.

Medical laboratory science students are usually obliged to do attachment or internship within long vacation periods, from June to August every year in the various health care sectors in the Country. The duration of this internship programme is between 8 and 10 weeks, during which MLSS are at a risk of exposure since their job specification in the medical laboratory during this training period includes taking samples from patients as well as performing various tests on them in order to help diagnose various diseases.

Although studies on the prevalence of hepatitis has been done among HCW and HS in nearby countries like Uganda, Tanzania, Ethiopia and Nigeria. Very little research works have been done on Health care workers and students in Ghana.

Studies on the prevalence and risk factors of hepatitis B disease amongst healthcare students would provide evidence-based data and baseline information on the burden of the disease among MLSS. Additionally, it would create the awareness of the need to intensify vaccination of MLSS against HBV infection.

Finally, conduct of the study would help inform managements of tertiary institutions of the need to conduct routine screening of students for infectious diseases for appropriate intervention.

1.4 Research questions

1. What proportion of medical laboratory science students in the University of Health and Allied Sciences have HBV infection?
2. What are the risk factors for HBV infection among medical laboratory science students in the University of Health and Allied Sciences?
3. What are the preventive measures carried out by medical laboratory science students to check HBV infection?

1.5 Objectives

1.5.1 General Objective

To determine HBV burden among medical laboratory science students in the University of Health and Allied Sciences, Ho?

1.5.2 Specific objectives

1. To determine the prevalence of medical laboratory science students in the University of Health and Allied Sciences who have HBV infection.
2. To identify the risk factors for HBV infection among medical laboratory science students in the University of Health and Allied Sciences.

3. To assess the preventive measures carried out by medical laboratory science students to prevent HBV horizontal infection transmission.

CHAPTER TWO

LITERATURE REVIEW

2.1 Anatomy of the liver

The liver is the largest organ in the human body and weighs about 1.2kg – 1.5kg in adults. It lies in the right upper quadrant of the abdomen, fitting comfortably under the dome of the diaphragm and resting on the stomach, duodenum, colon and right kidney and is partially protected by the thoracic rib cage (Israel, 1991). The liver is shaped like a pyramid and divided into right and left lobes. The right lobe is six times larger than the left lobe. These two major lobes are distinguished by ligaments, meanwhile, the whole organ is a continuous parenchymal mass and not restricted by a fibrous septum that passes through the liver. Further, the right lobe is separated into caudate and quadrate lobes. There are tiny units within the lobes known as lobules, these are also made up of hepatocytes (liver cells). The hepatocytes are the operational cells of the liver and the remaining mass is made up of kupffer cells, stellate cells, endothelial cells, blood cells, bile duct cells and supporting structures (Marieb & Hoehn, 2013).

In contrast to most organs, the liver gets blood from two sources; the hepatic artery supplies the liver with blood that is rich in oxygen, and forms about 20% of the blood supply and the portal vein also conveys nutrient-rich blood from the intestines to the liver and constitutes about 80% of the blood supply to the liver. Blood leaves the liver by the hepatic vein which drains into vena cava. One biggest concern may arise when hepatitis develops into cirrhosis or fatty liver; it prevents blood to flow out across the hepatic vein and proceeds through the system (Marieb & Hoehn, 2013).

Some major functions of the liver include; clearing some wastes from the body, purifying blood by breaking down and removing medications and poisons, such as alcohol and nicotine, making hormones, protein and enzymes, storing vitamins, minerals and iron, breaking down and storing most of absorbed nutrients and making bile for digestion (Marieb & Hoehn, 2013). These functions of the liver are essential for life. Hepatitis prevents the liver from playing these vital roles and therefore constitutes a major threat to life.

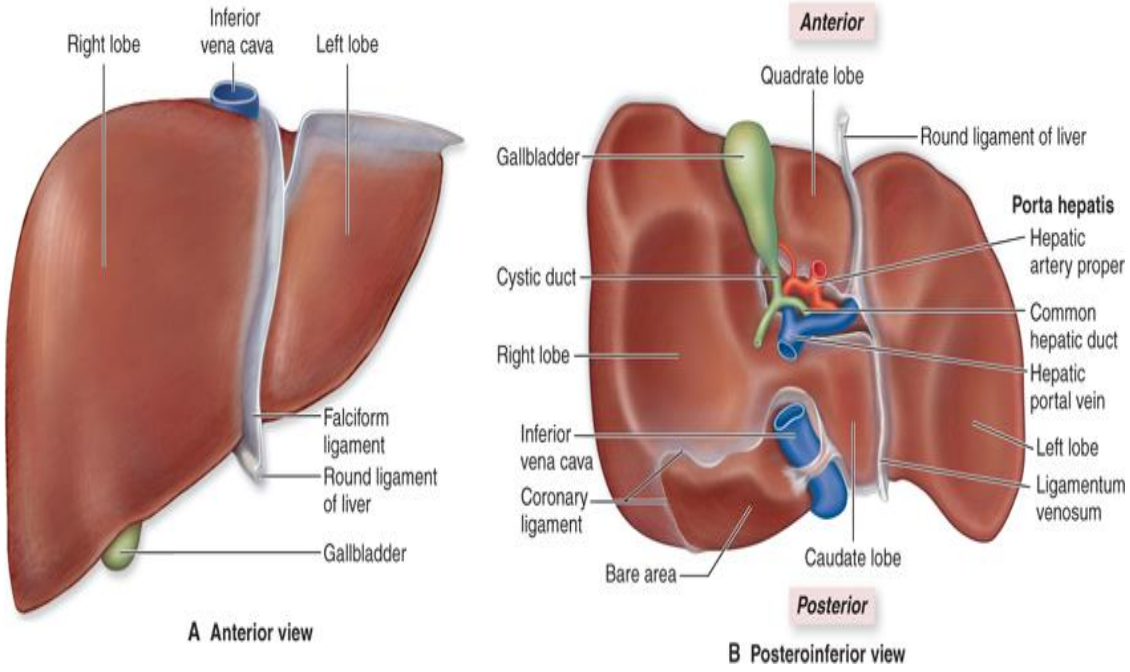


Figure 2.1 Anatomy of the liver (Source: www.accessmedicine.com)

2.2 Hepatitis and its causative agents

Hepatitis is a widespread disease that inflames the liver, a significant organ for metabolism and breaking down food in the digestive system (Marieb & Hoehn, 2013). The inflammations of the liver which may be toxic or infectious in origin are usually characterized by signs due to diffuse injury to the liver. The condition can be self-restrictive or can develop into scarring of connective tissues of liver, cirrhosis or liver cancer.

Hepatitis viruses are the common causative agents of hepatitis on the globe. However, alcohol, certain drugs and autoimmune diseases can also cause hepatitis (World Health Organization, 2017c). Hepatitis can be prevented with good hygiene, engaging in safe sex and avoiding physical contact with blood or anything infected with blood. One of the frequent acute problem of the liver is hepatitis, this changes the structure and work of the liver cells causing deterioration or death of tissues of the liver.

2.3 Types of viral hepatitis

Viral hepatitis applies to infections that affect the liver and are caused by viruses. Viruses remain in high standing as the major cause of hepatitis (Mauss et al., 2017). Viral hepatitis affects half a billion individuals and is still a substantial health warning of the globe. Roughly over 300,000 acute cases occur annually in the United States (Chan, 2004). The disease does not only lead to high morbidity but also puts stress on medical resources and can have severe economic consequences. The majority of all viral hepatitis is preventable.

To date, there are at least five main distinct types of viral hepatitis; which are classified into A, B, C, D and E.

2.3.1 Hepatitis A

Hepatitis A is caused by a non-enveloped single stranded ribonucleic acid (RNA) virus that was observed under an electronic magnifying lens in 1973. Hepatitis A is also called "infectious hepatitis" due to its easy transmission from one person to person and oral-fecal transmission pathways. The outbreak of the disease continues to be in places where sanitation is very poor. The infections are usually related with the virus capability to resist intense surroundings. An approximation of almost 1.5 million cases of hepatitis A is recorded globally on annual basis. Endemics connected with hepatitis A mostly occur in low-income nations. This type of hepatitis usually clears without lasting problems within six months and does not lead to chronic liver disease (Choudhury, 2004).

2.3.2 Hepatitis B

Hepatitis B caused by an enclosed virus called Dane particle. It is also known as "serum hepatitis" and affects a total of 2 billion people, which also comprises of about 360 million people who are suffering from the chronic type of the disease at a global level. It was first unearthed in 1947 when a scientist called MacCallum realised that particular group of individuals were developing hepatitis from blood transfusion. These attest to the fact that the mode of transmission is usually through blood and other body fluids. Hepatitis B continues to be a worldwide problem despite having an effective vaccine. Hepatitis B can be acute or chronic. The risk of developing chronic infection after acute infection varies

with age of the person. Infants who had the disease at birth have about 90% chance of chronic illness compared to 1-10% for young adults and adults. (Choudhury, 2004).

2.3.3 Hepatitis C

Hepatitis C is a blood borne liver infection caused by a single-stranded RNA virus that was identified in 1988. Despite research leading to its decline, about 170 million people are still suffering from the disease making it one of the basic reasons for liver illness comprehensively. Presently, venous drug usage accounts for one of the commonest greatest transmissions of hepatitis C and others may include accidental needle sticks and individuals engaged in multiple sexual relationships. About 85% of Hepatitis C infections develop into chronic disease. Most hepatitis C infected people experience no symptoms and the virus may remain in the liver for years and it is not discovered until much damage is done (Chan, 2004).

2.3.4 Hepatitis D

Hepatitis D is a defective single-stranded RNA virus that depends on the presence of Hepatitis B virus to replicate and cause infections. Hepatitis D is also known as delta hepatitis. The foremost transmission mode for Hepatitis D virus is similar to hepatitis B and all things considered, the main way a person can be diseased with hepatitis D infection is in the event that they are as of now infected with HBV, therefore, exposure pathways through the skin are the most widely recognized method for transmitting the infection from one individual to the other. An approximation of 5% hepatitis B carriers is co-infected with HDV (Chan, 2004).

2.3.5 Hepatitis E

Hepatitis E is a single stranded non-enveloped RNA virus that was first discovered in 1983. Identical to hepatitis A, hepatitis E is a disease that is usually transferred through fecal route. The severity of liver damage caused by hepatitis E depends on the strain of the hepatitis E virus. The virus occurs frequently in low-income countries where sanitary conditions are poor and inadequate. Hepatitis E is the cause of more than half of acute hepatitis cases in endemic territories for example, Afghanistan, China, Burma, Malaysia and others. Mortality can be as high as 25% in pregnant females who acquire the acute form of the disease. (Chan, 2004)

2.4 Hepatitis B virus

The hepatitis B virus is a spherical particle with a diameter of 42 nanometers. It is a virus that is made of DNA and belongs to a family of viruses called hepadnaviridae. When the virus gets inside the host cell, it takes over the cell's usual functions and uses the cell's resources to synthesize more viruses in a process called replication. The hepatitis B virus typically infects the liver cells. Meanwhile, other body cells including white blood cells as well as some tissues can be a habitat for the HBV (Inan & Tabak, 2015).

The virus is made up of an outer coat called the surface antigen (HBsAg, previously known as the Australia Antigen). The surface protein coat envelops the inner core or the key machinery of the virus that contains the genetic material of the virus and some enzymes that are engaged with regenerative procedure process of Hepatitis B virus. When outer

surface protein coat is made in excess, it is then shed into the blood – this usually becomes the indicator for the surface antigen test (Seeger & Mason, 2000).

An individual becomes infected with the virus when blood or certain body fluids carrying the virus enters him or her. Hepatitis B infection can occur through a scratch or cut in the skin or when the virus comes into contact with a mucous membrane including thin lining inside the mouth, around the eyeballs or inside the nose. When the virus finally gets into the bloodstream and encounters the liver cell, the outer coat of the virus stick to the surface of liver cell and consequently release the genetic material into the liver cell (Ian et al., 2001).

The viral core discharges its DNA and DNA polymerase enzymes into the liver cell. The virus uses the cell's resources to begin replicating the component needed to manufacture new hepatitis B viruses. Some of the components include proteins (HBsAg, HBcAg and HBeAg), DNA polymerase and enzymes. These components are assembled to form new viruses and leftovers of the components are discharged into the bloodstream. New hepatitis B viruses then infects other liver cells causing infections in the liver at the end (Ponde, 2012)

2.5 Clinical Course and Clinical Manifestation of HBV infection

Hepatitis B incubation period ranges from 45 to 160 days. Acute Hepatitis B infection is challenging to differentiate and diagnose in comparison to other types of hepatitis due to fairly similar clinical manifestations. Children are usually asymptomatic however they are

increasingly vulnerable to developing chronic liver disease whiles grown-ups are bound to indicate symptoms meanwhile, their ailment resolves totally. The clinical course might be isolated into three particular stages. The first phase (pre-icteric) is mostly characterize by no symptoms lasting 3-10 days. However, in few instances there can be symptoms such as fevers, weariness, loss of appetite, nausea, vomiting, abdominal pains, with or without dark urine and pale stools. The second phase (icteric) may be accompanied with symptoms such as jaundice, liver tenderness and pale stools lasting up to 3 weeks. The final phase is resolution of the disease, also called the convalescent period. At this phase jaundice disappears but fatigue may continue for months. (Chan, 2004)

2.6 Diagnosis and testing of Hepatitis B infection

In general, some main considerations in the diagnosis of hepatitis B such as person's history, age, risk factors, vaccination status and previous tests results guides in appropriate testing. The diagnosis process usually involves observation of clinical symptoms and laboratory testing. The serological laboratory testing is done on either serum or plasma. HBV antigens and antibodies are outstanding ways to determining the status of hepatitis viral infection is the most outstanding methods in recent times (Yogarajah, Lestari, & Yasa, 2011).

On regular basis, serological markers are utilized to diagnose and check for hepatitis B virus infection. Hepatitis B surface antigen is the primary antigen that is usually detected and is actually present in the course of the first three to five weeks in an individual who is recently infected. Hepatitis B surface antigen is again very important since it can be

detected before symptoms manifest clinically. Individuals who are life time carriers of HBsAg are regarded as infectious.

Our body system under normal conditions manufactures antibodies to combat HBsAg as its mechanism of immune response. People with history of anti-HBs antibody have been infected with the disease before and is typically not possible for them to be infected again. Development of anti-HBs are detected in people whose vaccination against hepatitis B infection has been effective.

The usefulness of hepatitis B core antigen (HBcAg) comes into bare since it mostly found in the hepatocytes nuclei only at the period short-lasting stage of the disease. In an acute infection phase, anti-HBs develops after anti-HBc. Although, Anti-HBc becomes visible at the start of symptoms and can be with the individual for life; the manifestation of this antibody depicts past or current illness with HBV in an undefined time setting. Meanwhile, IgM antibody to HBcAg shows recent infection with HBV usually less than 6 months indicating an acute infection stage.

Hepatitis B e antigen (HBeAg) is produced as a result of secretion of nucleocapsid gene of HBV and is present in serum throughout acute and long lasting stages of hepatitis B disease. The manifestation of HBeAg indicates multiplication of virus and the individual infected shows significant higher number of HBV and is very infectious. The occurrence of HBsAg and HBeAg in an infected individual typically shows a weak projection of a disease although, it is an indication of a long-lasting infection stage with chronic liver

damage. Nevertheless, anti-HBe presence shows the person is recovering and is his or her infectivity is on the low side. The production of e antigen to e antibody against e antigen predicts long-term disappearance of HBV in patients receiving antiviral treatment and shows lower levels of HBV (Revier & Sowers, 2015). A summary of hepatitis B serologic test results are interpreted and shown in table 1.1 below.

Table 1.1 Interpretation of Hepatitis B Serologic Test Results

TEST	RESULTS	INTERPRETATION
HBsAg anti-HBc anti-HBs	negative negative negative	Susceptible
HBsAg anti-HBc anti-HBs	negative positive positive	Immune due to natural infection
HBsAg anti-HBc anti-HBs	negative negative positive	Immune due to hepatitis B vaccination
HBsAg anti-HBc IgM anti-HBc anti-HBs	positive positive positive negative	Acutely infected
HBsAg anti-HBc IgM anti-HBc anti-HBs	positive positive negative negative	Chronically infected
HBsAg anti-HBc anti-HBs	negative positive negative	Interpretation unclear; 4 possibilities Resolved infection (most common) False-positive anti-HBc, thus susceptible “low level” chronic infection Passive transfer from positive mother to infant.

2.7 Transmission of Hepatitis B infection

The prevailing transmission modes of hepatitis B infection vary considerably in different geographic areas. For instance, in a low prevalence area like Western Europe, the main

routes are unprotected sexual intercourse and intravenous drug use. However, in a high prevalence area such as sub-Saharan Africa, perinatal infection transmission is predominant and Horizontal transmission is considered as the main pathway of spread in intermediate prevalence areas (Mauss et al., 2017). The following modes of transmissions are discussed below; percutaneous inoculation, horizontal transmission, perinatal transmission, sexual transmission, blood transfusion and nosocomial infection.

2.7.1 Transmission of hepatitis B infection through sex

Sexual transmission is the type of transmission that occurs when one has sexual intercourse with an infected person. Sexual transmission of HBV among unvaccinated people mostly occurs among heterosexual men or women who either have multiple sex partners or have contact with sex workers or among men who engage in sexual relations with men (MSM).

2.7.2 Percutaneous transmission of Hepatitis B infection

Percutaneous inoculation is a type of transmission that occurs through an injection into the skin. The most significant percutaneous transmission pathway is using syringes and needles with people who inject drugs. Using razors or toothbrushes along with others are also potential ways of percutaneous transmission. Furthermore, body piercing, tattooing and acupuncture have also been associated with Hepatitis B viral transmission.

2.7.3 Perinatal transmission of Hepatitis B infection

Perinatal transmission is experienced when a mother who is infected passes the infection to its child through birth. It is a significant issue in retaining the pool of the disease

generally in high prevalence zones. When there is no attempt to treat disease, chronic HBV infection may develop in about 80-90% of infants born to mothers who test positive for HBeAg.

2.7.4 Transmission of Hepatitis B infection by blood transfusion

Transmission through blood transfusion occurs when blood being transferred is infected with hepatitis B virus. This is usually due to poor screening of the blood before transfusion. Risk of acquiring post-transfusion HBV infection is dependent on factors like prevalence and donor testing policy. Most countries use HBsAg screening as a baseline test for donors.

2.7.5 Horizontal transmission of Hepatitis B infection

Horizontal transmission consists of household, familiar and child to child transmission through little breaks in skin or mucous layers. In many widespread regions, before introducing neonatal vaccination, the prevalence rate was high in children 7 to 14 year age groups. Hepatitis B virus is able to survive outside the human body for a prolonged period and is infectious in the environment for at least of 7 days.

2.7.6 Transmission of Hepatitis B virus by nosocomial infection

Nosocomial infection is a kind of infection that occurs in a health care setting. This infection or transmission can result from patient to patient, patient to health care worker and vice versa. Transmission from health care workers to patients is rare if there are routine vaccination exercises for health care workers. However, the risk of transmission from patients to health care workers seems to be relatively higher. The exact risk of nosocomial

infection is usually unknown due to the asymptomatic nature of the HBV infection. (Mauss et al., 2017)

2.8 Managing Hepatitis B virus infection

Management of hepatitis B disease can be exploited in two ways; prevention and treatment. Prevention usually deals with vaccination of individuals against the hepatitis B infection whiles, treatment comprises of drug therapy with interferon (IFN), lamivudine or adefoir dipivoxil.

2.8.1 Prevention of hepatitis B

Immunization with the hepatitis B vaccine is the most efficient method to prevent picking up the virus, developing acute infection and preventing the development of hepatic complications connected with hepatitis B. Vaccination is usually recommended for all risk groups such as health care workers, clinical students, pregnant women and others. Irrespective of the HBsAg status of mothers, all infants should be vaccinated against hepatitis B. Children and adolescents vaccination is usually recommended. The first vaccine became accessible for use in 1981 and it was made up of virus envelope of the HBsAg produced in yeast cells. In infants and children, about 3 to 4 doses are given over a 6 to 18 month period depending on vaccine type and schedule (Centers for Disease Control and Prevention, 2016). The vaccine is administered in three dispersed injections in adults; the second injection follows a month after the first injection is taken and the third injection is taken five months after the second injection. At the end of the three injections,

the body develops an immune response and produces an antibody to HBsAg called as anti-HBsAg. The individual vaccinated is becomes immune to HBV. (Revier & Sowers, 2015)

2.8.2 Treatment of hepatitis B virus infection

Acute Hepatitis B infection will suppress on its own, therefore, there are no particular treatment for someone who has acute hepatitis B infection; meanwhile, resting and staying away from alcohol and certain drugs are recommended (Vildósola, 2000). When infected persons experience severe diarrhea or vomiting, they can be managed by restoring fluid. On the other hand, chronic HBV infection can be managed using antiviral medication. The choice of treating a patient with antiviral drugs is influenced by the degree of liver impairment. The liver is destroyed by the rapid multiplication of virus in it. This can be detected by examining the HBV DNA in the blood on regular basis, running liver function tests and biopsy of the liver. The function of the antiviral medication is to prevent virus from multiplying, reduce the occurrence of cirrhosis and liver failure, although, these might not work as planned on all individuals. The medications are not drugs to cure HBV infection but a provision to heal the liver for a particular period. Some of the antiviral drugs may include Entecavir, Tenofovir and Peginterferon (Chan, 2004).

2.9 Risk groups of hepatitis B infection

Hepatitis B infection is transmitted from one person to another by exposure to blood or body fluid from an acutely or chronically infected person. The virus can be spread through blood to blood contact and unprotected sex. Anybody who has not received HBV vaccine is at risk of hepatitis B infection. However, some people are at greater risk. These groups

of people may include: men who have sex with men, injection drug users, persons who have unprotected sex, healthcare and public safety workers exposed to blood on the job, sexually active heterosexuals, kidney dialysis patients, infants born to infected mothers, immediate relations of persons who are carriers of HBV, travelers to regions with intermediate or high rates of hepatitis, residents and staff of facilities for developmentally disabled persons, persons with a sexually transmitted disease (STD) and prisoners (Revier & Sowers, 2015).

2.10 Risk factors of HBV infection

2.10.1 Age

A study conducted to determine the sero-prevalence of HBsAg among medical students of Usmanu Danfodiyo University in Nigeria found age to be related to the prevalence of the disease. In this study, a highest prevalence was reported among individuals of ages between 21-24 years, which was about 3 times more than the prevalence reported among those aged between 25-28 years and even 5 times more than the prevalence among individuals of ages from 17-20 years (Abdulahi, 2013). A similar study among newly admitted students of University of Jos, Nigeria also predicted the highest HBV prevalence of 28.27% and lowest among (15-19) year group (Ekuma et al., 2014). Another study conducted among biomedical students predicted the significantly highest HBsAg prevalence age group to be 21-25 years (Okwesili et al., 2015).

2.10.2 Gender

A number of research works among students had predicted a higher prevalence rate among males compared to females. Among 120 males tested for hepatitis B infection, 25 tested positive for HBsAg whiles in the same research work among 125 females, only 8 tested positive for HBsAg (Abdulahi, 2013). A comparable study (Ekuma et al., 2014) among University students in Nigeria also confirmed the prevalence trend, thus, to be higher among males, 11.33% compared to females, 5.33%.

2.10.3 Duration of vocational training

A logical conclusion can be established concerning the duration of vocational training as far as HBV infection is concerned. This is because the duration a student is trained at a health facility increases with exposure to infection. For instance, it is likely a final year student would be more exposed to infections than students in the lower year groups. An inquiry into HBV infection among students of a nursing training college showed a prevalence rate of 11.3% among 3rd year students and 9.8% among 2nd year students (Kombat, 2016).

2.10.4 Sexual activities

Even though an investigation among nursing students in a nursing training institution predicted that 78.1% of final year students engaged more in sexual activities than 2nd year students who recorded 67.1%. A weak connection was observed between sexual activity and HBV infection among the students (Kombat, 2016).

2.10.5 Needle pricks

A research done among health care workers in Uganda reported needle stick injuries as very a common occupational hazard with prevalence rate of 67.8%, however, that of HBV infection was 8.1% (Ziraba et al., 2010). Additionally, a study also conducted among health care workers in a referral hospital in Ghana reported that among the sharp-injuries experienced by study participants, 35.3% were from needle pricks (Kommogldomo, 2016). Furthermore, a study done among health care workers in Khartoum showed HBV infection prevalence of 4.4%, and also 24.4% of participants had needle prick injuries (Abdalwhab & Nafi, 2014).

2.10.6 Sharp related injury

An investigation conducted among health care workers in a military hospital in Ghana to determine the prevalence of needle stick and sharp related injuries suggested that at the time of the study, 53.7% of participants had experienced needle stick or sharp injuries. It was also found that 10.8% of laboratory workers experienced these sharp related injuries (Kommogldomo, 2016). An inquiry among nursing students also predicted 25.3% of participants experienced sharp-related injuries at the time of the study. (Kombat, 2016).

2.10.7 Splash of blood and body fluids to the eyes and mucous membranes

In a study, out of the 275 nursing students surveyed, 57 (20.7%) of them experienced splash of blood or body fluids during their clinical procedures. The third year students experienced higher incidence 23 (37.1%) compared to incidence of second year students. (Kombat, 2016). In another study where health care workers were participants in a tertiary

hospital in Uganda, 41.0% were exposed to mucous membrane (Ziraba et al., 2010). Using health care workers as study participants in Khartoum, a research found that all the study participants were exposed to body fluids representing 100% of previous exposure to body fluids. (Abdalwhab & Nafi, 2014).

2.10.8 Use and torn of gloves during procedures

A study conducted among students for the nursing profession showed that 56.0% of study participants used gloves during procedures involving blood. The occurrence of torn gloves was common as reported from the study. The incidence of the torn gloves was more among 3rd year students (60.3%) compared to 2nd year students (54.8) (Kombat, 2016). Another study among health care workers reported that 55.4% of study participants were consistent in the use of gloves, however, laboratory technicians were the least likely group of health care workers to frequently use gloves and it was reported that only 18.0% used gloves all the time during procedures (Ziraba et al., 2010).

2.11 Preventive measures for HBV infection

A research work published on seroprevalence of HBsAg among healthcare workers in private Nigeria tertiary health institution showed that 57.1% of the participants had some form of vaccination at the time of the study (Elikwu et al., 1996). Furthermore, another research conducted in a tertiary care hospital among health care workers found that all study participants has no history of vaccination although a prevalence of 1% was predicted in the study (Vipul, Rubee, Deepak, & Chirag, 2012). In Ghana, a study conducted among nursing students in the Techiman North and South Districts showed that 33.2% of the

participants were not vaccinated at the time of the study (Kombat, 2016). A study conducted to determine the prevalence of hepatitis B among HCW also found that 77.1% had received full three doses vaccination as at the time of the study (Mueller et al., 2015).

2.12 Knowledge of HBV infection

Health care workers or health care students especially nursing students and medical laboratory sciences students are expected to have an adequate knowledge about hepatitis B to help them know and plan how to prevent infections of hepatitis B and other blood-borne diseases. A research that was conducted among health care workers in Ibahan, Nigeria suggested that 34.8% of these workers had poor knowledge in hepatitis B preventive measures (Oyewusi, 2015). A comparable study conducted among health care workers and health students in Saudi Arabia indicated poor knowledge among health students and moderate knowledge among HCW regarding transmitted blood-borne diseases, safe injection procedures and standard precautions to prevent these blood-borne diseases including hepatitis B infection (Alqahtani, Abu-eshy, Mahfouz, El-mekki, & Asaad, 2014).

2.13 Prevalence of HBV infection

A number of research works have predicted high occurrence of hepatitis B among clinical health facility workers and health students. In Uganda, among 370 health care workers tested for HBV infection during a research work, the prevalence rate was found to be 8.1% whiles the prevalence of life time exposure to the hepatitis B infection was also predicted to be 48.1% (Ziraba et al., 2010). Another study conducted among medical students

(medicine and surgery students, medical laboratory sciences students and pharmacy students) in Usmanu Danfoyido University in Nigeria suggested a prevalence rate of 15.5%. Furthermore, as far as distribution of HBsAg prevalence rate among each category of students is concerned in the study, medicine and surgery students recorded a prevalence rate of 7.3% followed by 6.5% by medical laboratory sciences students and then 1.6% by pharmacy students (Abdulahi, 2013). In Ghana, a research conducted among 2nd and 3rd Year nursing students of two nursing training colleges found a high prevalence hepatitis B infection to be 10.1% out of 286 students that gave consent to participate in the study (Kombat, 2016). Analogous research work to this study that was done among biomedical students of African descent in Usmanu Danfiyido University in Sokoto Nigeria established a prevalence of 13.4% out of 186 that tested for hepatitis B surface antigen during the time of the study (Okwesili et al., 2015).

CHAPTER THREE

METHODS

3.1 Study design

A cross-sectional survey was conducted among 2nd, 3rd and 4th year medical laboratory science students (MLSS) in the University of Health and Allied Sciences (UHAS). These students were interviewed on their socio-demographic characteristics, risk factors for HBV infection, occurrence of HBV infection and preventive measures of HBV infection. Also, the prevalence of HBV infection among study participants was also assessed by testing for HBV infection using standard diagnostic test kits for HBsAg.

3.2 Study area

This research work was carried out in the University of Health and Allied Sciences (UHAS). It is located in Ho in the Ho Municipality of the Volta region of Ghana is located on 6.5739º N, 0.4410º E. It is among the newest and youngest public universities in Ghana. The University was established by an Act of Parliament (Act 828) which received presidential approbation in December 2011. The main campus including the central administration is located in Ho and another campus is situated at Hohoe. Currently, the University operates under six schools namely; School of Medicine, School of Nursing and Midwifery, School of Public Health, School of Basic and Biomedical Sciences, School of Pharmacy and School of Allied Health Sciences. The School of Allied Health Sciences is situated on the premises of the Volta Regional Hospital, the leading referral hospital in the region and comprises of six departments which include the Department of Medical Laboratory Sciences (DMLS). The strategic location of the School of Allied Health

sciences provides students with an easy access to the facilities and medical equipment of the regional hospital where they usually have practical clinical experience under supervision of experienced allied health professionals.

3.3 Variables

Dependent variable

Hepatitis B virus infection

Independent variables

- Socio-demographic factors (age, sex, religion, duration of internship, year group of the student etc.
- Needle stick injuries
- Use of gloves during working procedures
- Exposure to mucous membranes (mouth and eyes)
- Cuts
- Sharp-related injuries
- Sexual activities
- Preventive factors (training on infectious diseases, safety precautions, disinfection, vaccination etc.)
- Safety standard protocols

3.4 Sampling

3.4.1 Study population

The study population was Medical Laboratory Science Students (MLSS) from the 2nd, 3rd and 4th year clinical groups in the Department of Medical Laboratory Sciences (DMLS) in UHAS. The department trains students to obtain a Bachelor of Science degree in medical laboratory sciences at the end of a four year study. The total student population of the Department from the 1st to the 4th year was 316 at the time of data collection.

3.4.2 Sample size

The sample size for the study was calculated using the Cochran formula below;

$$N = \frac{Z^2 * P\,(1-P)}{D^2}$$

Where;

N represents the estimated minimum sample size

Z represents the constant for 95% confidence interval given as 1.96

P represents the average prevalence of HBV infection. A 10.1% HBV prevalence adopted from a similar study conducted among nursing students in the Techiman North and South Districts of the Brong Ahafo Region of Ghana (Kombat, 2016) was used for this study.

D represents the percentage margin error taken as 5%.

$$N = \frac{1.96^2 \times 0.101 \times 0.899}{0.05^2}$$

N = 140

In addition, making a 10% allowance against mitigating circumstances such as attrition or non-response gives $N = 140 + \left(\frac{10 \times 140}{100}\right)$

$$N = 154$$

Therefore, 154 participants were estimated for inclusion in the study. However, in order to increase the power of the study and make generalizations, the sample size was increased to 178. In view of this, 178 participants in all, were recruited in the study.

3.4.3 Sampling procedure

The total population of 2nd, 3rd, and 4th year students was 241. This entire population was made up of 123, 87 and 31 2nd, 3rd and 4th year students respectively. The number of respondents from each year group of students recruited into the study was proportionately determined as follows:

2nd year: $\frac{123}{(123 + 87 + 31)} \times 178 = 91$

3rd year: $\frac{87}{(123 + 87 + 31)} \times 178 = 64$

4th year: $\frac{31}{(123 + 87 + 31)} \times 178 = 23$

Simple random sampling method was used to recruit participants from each year for the study. For instance, in selecting participants from the 4th year group of students, 23 was selected from 31 eligible participants. A paper was cut into pieces and labeled 'Y' and 'N' denoting 'Yes' and 'No'. The first 23 pieces of paper was labeled 'Y' and the last 8 labeled 'N' and thoroughly mixed together in a bag. Each potential participant was then asked to pick one piece of paper from the bag. Participants who picked 'Y' were recruited into the study after completion of informed consent forms and participants who picked 'N' were exempted from the study. This procedure was employed to select all the 178 participants. This method of selecting participants gave all students equal chance of being selected.

3.5 Data collection technique

Data collection was done in two parts, namely, (1) administration of questionnaire to obtain information on risk factors and preventive measures of HBV infection and (2) blood-based RDT testing for HBV surface antigens.

3.5.1 Administration of questionnaire

Structured questionnaire was used to collect data. Closed ended questions were used to gather relevant data on the study objectives and research questions. The participants were assured of confidentiality and the purpose of the research was explained to them. The questionnaires were then administered to students who gave informed consent to take part in the study. This took place before and after lecture periods.

3.5.2 Testing for HBV infection of participants

Hepatitis B surface antigen Rapid Diagnostic Test (RDT) kits approved by the Food and Drugs Authority (FDA) were used to test for hepatitis B infection among the participants. The test kit usually comes with a pouched strip with desiccant, blood diluents in a dropper bottle (buffer) and a micropipette. The Hepatitis B surface antigen RDT is a standard chromatographic immunoassay (CIA) for direct qualitative identification of HBsAg in human serum/plasma or whole blood, it is manufactured by the Standard Diagnostic Inc. (Korea).

Test procedure

The testing was done by wiping the area to be lanced (thumb) with an alcohol swab, followed by a prick on the thumb with a sterile lancet after the end of the thumb has been squeezed. The first drop of blood was wiped off with a sterile alcohol impregnated gauze or cotton. Micropipette was used to take about 100ul fresh blood. One drop of the whole blood obtained was added into a sample pad of the pouched strip. After the blood had adsorbed onto the pad, a drop of a whole blood diluents was added. The result was finally observed in 5-20 minutes and read for positivity or negativity. A positive result was indicated by the presence of two horizontal lines on test strip whilst a negative reading was shown by a single horizontal line.

These testing processes were carried out after all information about the study was given and consent form signed by study participants. This was done with the assistance of professional medical laboratory technologists from the DMLS laboratories. The results

were interpreted according to manufacturer's instructions. Students were counseled by a doctor and a referral form written for further treatment at the Volta Regional Hospital for cases that were positive. Fifteen (15) minutes was used to test one participant and a total of 30 minutes spent by each participant for questionnaire administration and conduct of HBV diagnostic test.

3.6 Pre-testing and review of instrument

The questionnaire was pre-tested in the University of Ghana among medical laboratory science students to evaluate willingness of the respondents to answer the questionnaires, the reliability and consistency of the questions being asked, accuracy of the questionnaires, coherence and clarity of the questions and determine the success of the training given to the research assistants. After pre-testing, the questionnaire was reviewed according to the information gathered before the main survey took place.

3.7 Quality Control: As a way of ensuring the quality of information gathered, the questionnaire was pretested to allow for reviewing of questionnaire before actual data collection took place. The data was also cleaned before analysis. The Hepatitis B test kits used for study were approved by the Food and Drug Authority of Ghana.

3.8 Data processing and analysis

The completed questionnaires were checked for errors for correction and data were then entered into Microsoft Excel and imported into stataSE version 15 (64-bit) for editing and analysis. Descriptive statistics was used to analyze the demographic factors, risk factors,

preventive factors and prevalence of HBV infection. A chi square test and fisher's exact test was used to test for the association between gender, age, work history, year group, vocational training period, risk factors, preventive measures and HBV infection based on a statistical significance at 95% confidence interval. These variables were analyzed using bivariate and multiple logistic regression. Crude odds ratios, adjusted odds ratios, 95% confidence intervals and p-values were calculated using a two sided test.

3.9 Ethical consideration

3.9.1 Potential risk/benefit

The study did not pose any risk to respondents as sterile materials were used to test for HBV infection among participants. The potential risks included uneasiness that arose during the period finger was pricked with lancet to obtain blood for conduct of the HBV test. In all, the respondents spent about 30 minutes in answering questionnaires and testing for HBV infection status.

There was a direct benefit of the study to participants as it provided a chance to check and update their HBV infection status. Consequently, it also provided an opportunity to refer students who tested positive to the hospital for confirmation and treatment. Indirectly, the study was used to formulate measures to address the problem caused by the disease and exposures among medical laboratory science students in the laboratory and other areas in the hospital.

3.9.2 Privacy and confidentiality

No space for names of participants was created on questionnaire; instead, it was coded with serial numbers for the purpose of correct identification and also to prevent others from seeing other people's HBsAg status. Privacy of the participants was ensured during the testing stage since one student was attended to at a time in an enclosed room with the medical laboratory technologist.

3.9.3 Data storage and usage

Materials for the study such as questionnaires and informed consent documents were labelled and given a unique study identification numbers for easy processing of data and storage. The study materials were stored under lock and key in the office of the principal investigator Mr. Philip Apraku Tawiah, School of Public Health, University of Ghana, Legon. The Data were cleaned and imported into stataSE version 15 (64-bit) software with the identification numbers. The electronic files were made available only to the research team.

3.9.4 Description of the process of consent

Approval of the study protocol was obtained from the Ethical Review Committee of the Ghana Health Service (GHS-ERC) before commencement of the study. Permission was sought from the Department of Medical Laboratory Sciences, University of Health and Allied Sciences before the data collection. Study participants were briefed about the purpose, risk and benefits of the study before appending their signature on the consent form to take part in the survey.

3.9.5 Voluntary consent/withdrawal

All eligible students for the study were informed accordingly that it was purely out of free will to take part in the study and one could decide otherwise at any point of the survey. Students were assured that declining to complete questionnaire or test for HBV infection would have no negative effects on them.

3.9.6 Compensation

Selected students who participated in the survey were not given any monetary compensation. However, there was a presentation on the hepatitis B virus infection to the students before the survey took place. Findings of the study was disseminated to the university to be used as a reference material on hepatitis B viral infection. Some recommendations were made from the study that could be used to formulate institutional policies to serve as a precaution against some risk factors for hepatitis B disease in health care settings in the region.

3.9.7 Declaration of conflict of interest

There was no conflict of interest in the study.

3.9.8 Research funding

The study was self-sponsored by the principal investigator, Philip Apraku Tawiah.

CHAPTER FOUR

RESULTS

4.1 Socio-demographic characteristics of study participants

Table 4.1 below, summarizes the demographic characteristics of 178 medical laboratory science students who were recruited into the study. As shown, 139 (78.09%) of these participants were males, majority, 118 (66.29%) were within 20-24 years and the least were between 15-19 years old. A lot of the students were Christians 166 (93.26%) and the rest being Muslims. Most of them, 165 (92.70%) were single whiles the remaining were married.

With respect to residence, 143 (80.34%) lived outside campus whiles only 35 (19.66%) lived on campus. In addition, more than half of students were 2nd year students, 91 (51.12%), followed by 3rd year, 64 (35.96%) and 4th year, 23 (12.92%) groups. A considerable number of students, 155 (87.08%) had no working experience before University education. During the time of the study, most students had embarked on vocational training for 105 (58.99%) for "<2 months"

Table 4.1: Demographic characteristics of study participants

Demographic factors	Frequency (N=178)	Percentage (%)
Gender		
Male	139	78.09
Female	39	21.91
Age in years		
15-19	14	7.87
20-24	118	66.29
25-29	31	17.42
> 29	15	8.43
Religion		
Christianity	166	93.26
Islamic	12	6.74
Marital status		
Single	165	92.70
Married	13	7.30
Residence		
On campus	35	19.66
Off campus	143	80.34
Year group		
2nd year	91	51.12
3rd year	64	35.96
4th year	23	12.92
Work history		
Never worked	155	87.08
Ever worked	23	12.92
Vocational Training		
< 2 months	105	58.99
2-4 months	52	29.21
5-6 months	15	8.43
> 6 months	6	3.37

4.2 Students who checked for HBV infection from 2010-2018

Among the 178 students that participated in the study (Figure 4.1), 138 students in all, indicated that they had checked their HBV infection status before recruitment into this present study. A significant number of them checked their HBV infection status during their annual obligatory vocational training programmes from the years 2016, 2017 and 2018 as indicated in the figure below as; 30 (21.74%), 56 (40.58%) and 25 (18.12%) respectively. A smaller number of them, however, checked their HBV infection status earlier from the years 2010-2015 before admission into the university.

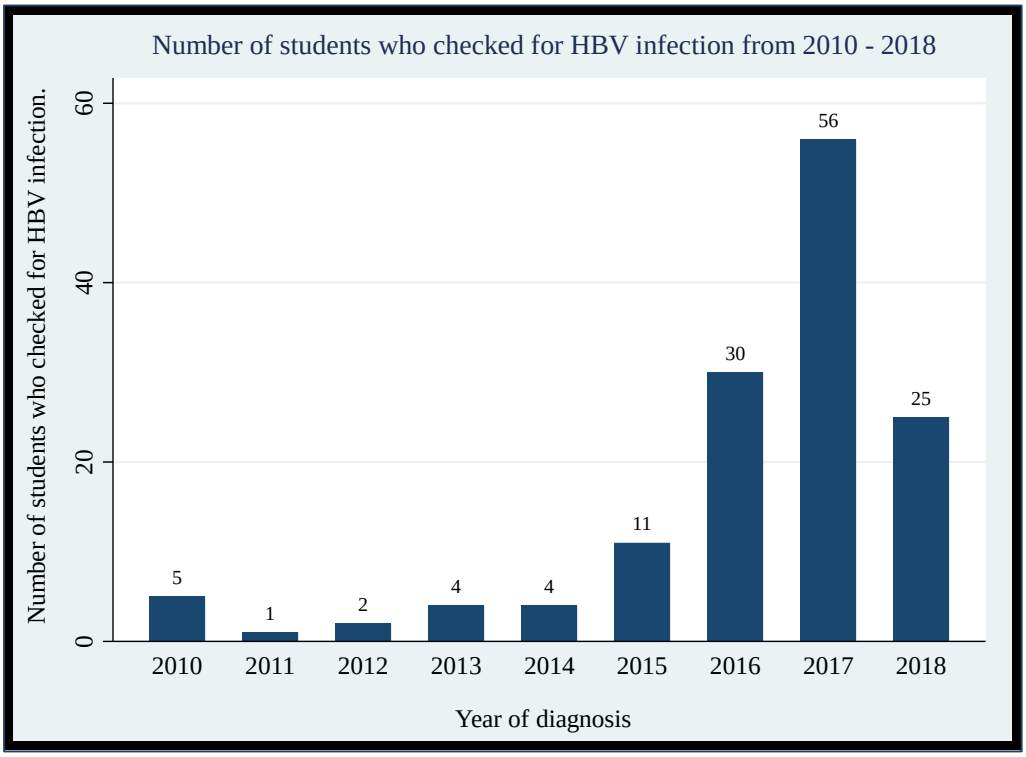


Figure 4.1: Number of students who checked for HBV infection from 2010 – 2018

4.3 Prevalence of HBV infection among participants

Out of the 178 participants that tested for Hepatitis B Virus infection during the study, 12 (6.74%) (95% CI=3.8%-11.6%) were confirmed positive (Reactive) as shown in Figure 4.2 below.

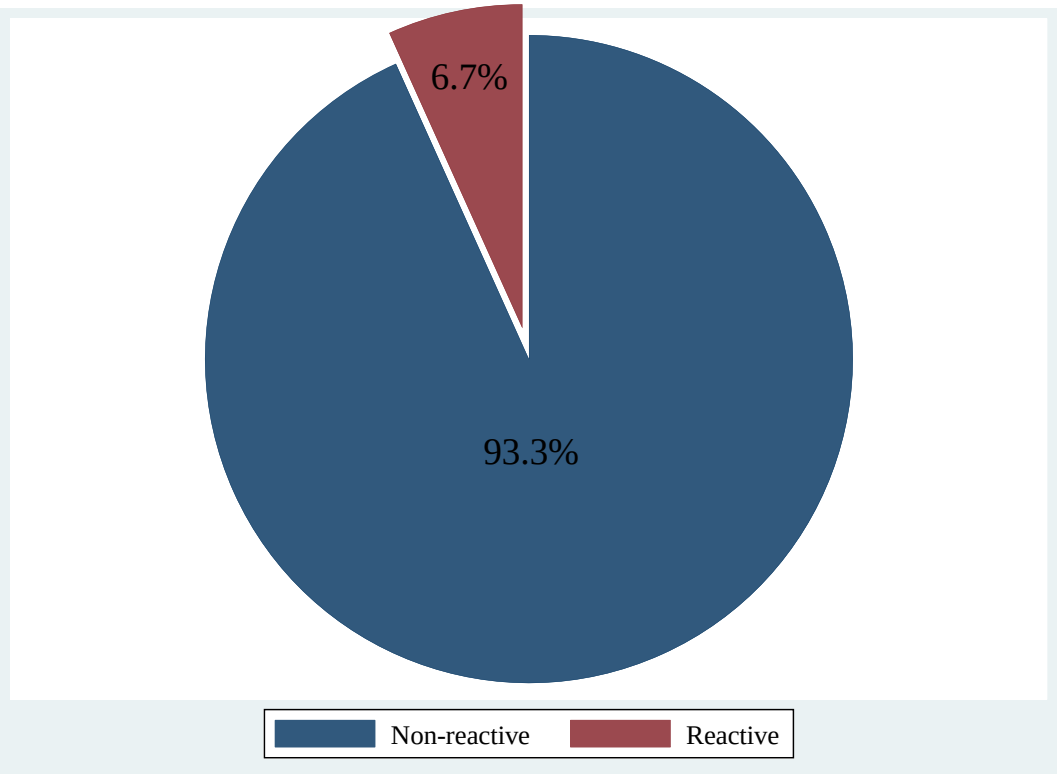


Figure 4.2: Prevalence of HBV infection among participants

4.3.1 Prevalence of HBV infection among participants in relation to age

As depicted in figure 4.3 below, the prevalence of HBV infection in relation to age was highest (9.68%) (95% CI=3.1%-26.6%) among 25-29 year group and least among 20-24 year group as (5.93%) (95% CI=2.8%-12.0%).

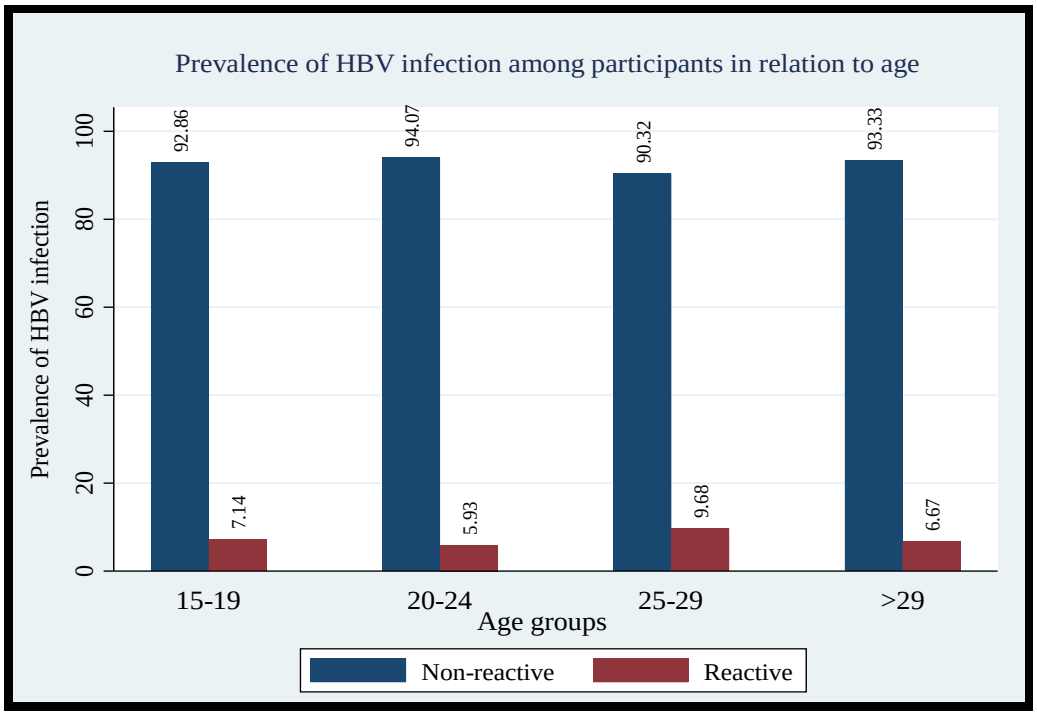


Figure 4.3: Prevalence of HBV infection among participants versus age

4.3.2 Prevalence of HBV infection among participants in relation to year group

The figure 4.4 below illustrates the prevalence of HBV infection among students with respect to class levels or year groups. The HBV prevalence among final year students was highest, (17.39%) (95% CI=6.5%-40.0%) and the least recorded among 3rd year students as (4.69%) (95% CI=1.5%-13.8%).

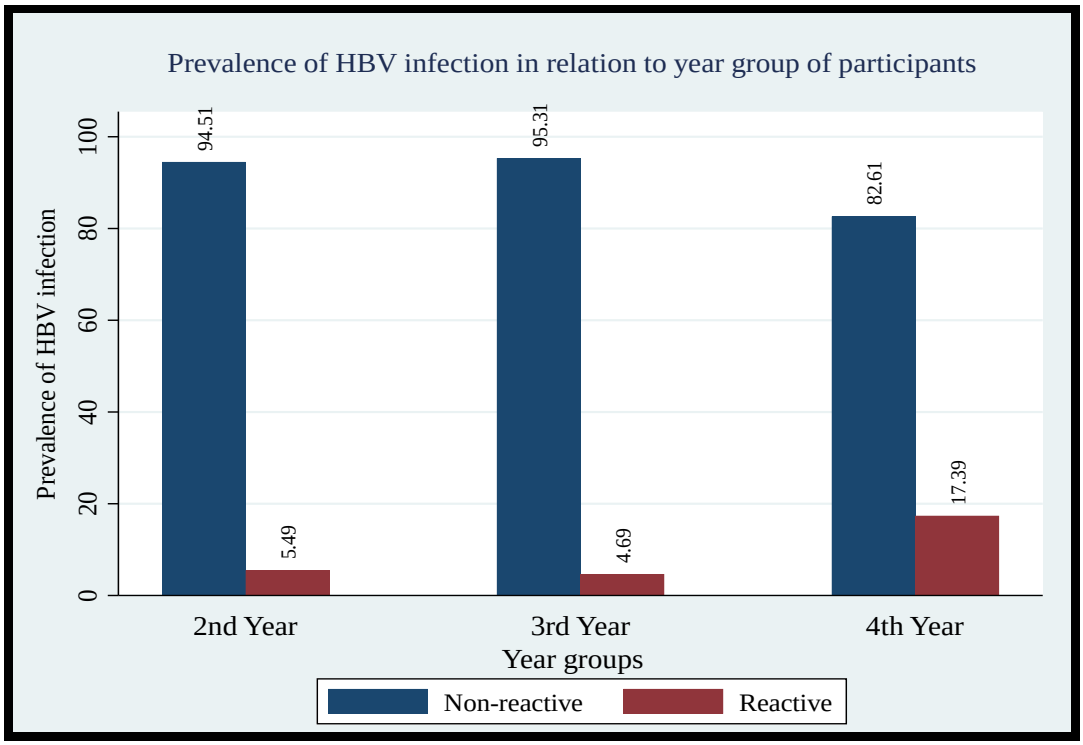


Figure 4.4: Prevalence of HBV infection in relation to year group of participants

4.3.3 Prevalence of HBV infection among participants in relation to duration of vocational training.

The figure 4.5 below portrays the prevalence of HBV infection among the participants according to the total duration of vocational training students embarked on. The highest prevalence (33.33%) (95% CI=7.1%-76.5%) was found among students who had > 6 months duration of vocational training compared to the other periods of duration of vocational training. However, there was no prevalence of the disease among students who embarked on 5-6 months duration of vocational training.

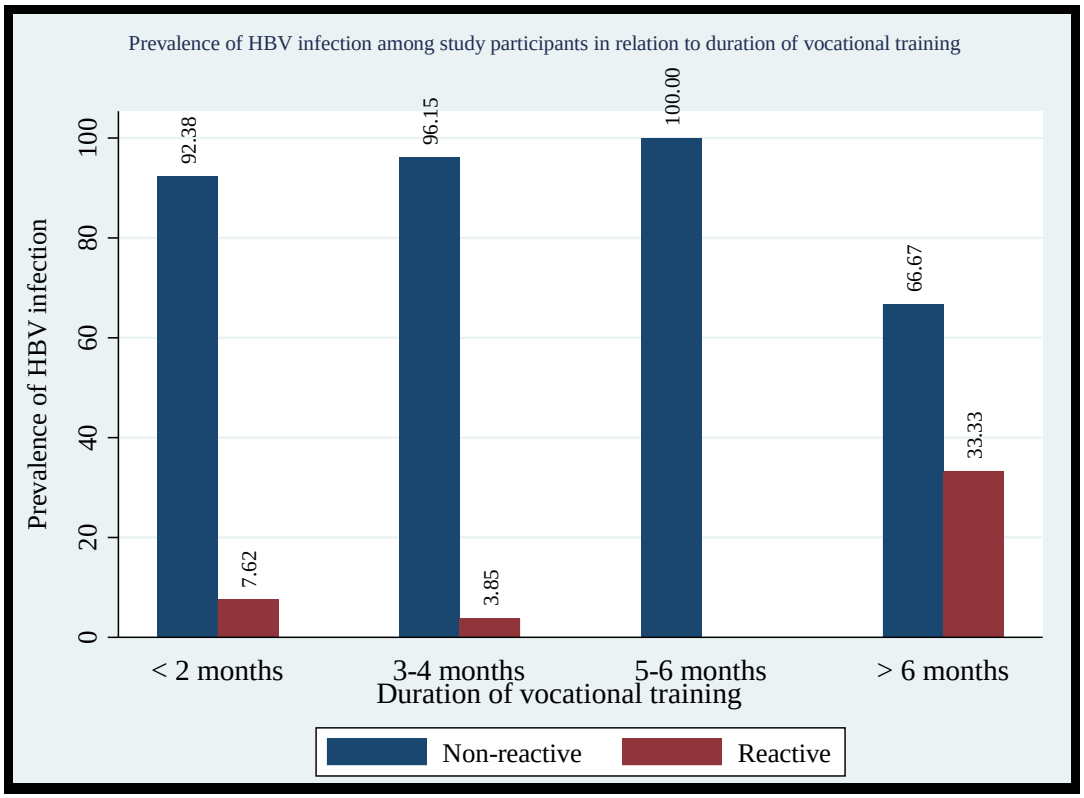


Figure 4.5: Prevalence of HBV infection in relation to duration of Vocational training

4.4 Risk factors for HBV infection among study participants

Table 4.2 below, summarizes the results of the assessment of the prevalence of risk factors of hepatitis B virus infection among the participants. Of the participants surveyed, 57 (32.02%) experienced torn gloves, 38 (21.35%) experienced splash of blood and body fluids, 26 (14.61%) had practiced sex within the last six months, 25 (14.04%) experienced needle pricks and 14 (7.87%) had some form of sharp related injuries. Almost all participants 177 (99.44%) and 176 (98.88%) disinfected their working areas and wore gloves respectively. Out of those that disinfected their working areas, 156 (88.64%) of them disinfected regularly. More than half, 92 (51.98) received some form of training on

infectious diseases, out of these, 33 (35.87) had received such training only once. A considerable number, 77 (43.26%) had received at least one dose of HBV vaccination.

Table 4.2 Prevalence of risk factors for HBV infection among study participant

Variable	N		Frequency	Percentage (%)
Needle prick	178	Yes	25	14.04
		No	153	85.96
Sharp injury	178	Yes	14	7.87
		No	164	92.13
Splash	178	Yes	38	21.35
		No	140	78.65
Torn gloves	178	Yes	57	32.02
		No	121	67.98
Sex	178	Yes	26	14.61
		No	152	85.39
STD preventive	26	Yes	22	84.62
Method		No	4	15.38
Use of gloves	178	Yes	177	99.44
		No	1	0.56
Disinfection	178	Yes	176	98.88
		No	2	1.12
Frequency of	176	Always	156	88.64
Disinfection		Once a while	16	9.09
		Not often	4	2.27
Training on	177	Yes	92	51.98
Diseases		No	85	48.02
Frequency of	92	Once	33	35.87
Training		Twice	20	21.74
		Thrice	6	6.52
		> Thrice	33	35.87
Vaccinated	178	Yes	77	43.26
		No	101	56.74
Frequency of	77	Once	30	38.96
Vaccination		Twice	13	16.88
		Thrice	34	44.16

4.4.1 Prevalence of risk factors for HBV infection in relation to work history

Table 4.3 below, summarizes the prevalence of risk factors of hepatitis B virus infection according to work history of participants. The prevalence of vaccination (78.26%), torn gloves (39.13%), splash of blood and other body fluids (30.43%), sexual affairs (30.43%), needle pricks (21.74%), sharp injuries (8.70%) among students who worked before university education was greater than their other counterparts who never worked before admission into the university.

Table 4.3: Prevalence of risk factors for HBV infection in relation to work history

Risk factors		Ever (N=23)	Never (N=155)
Needle prick	Yes	5 (21.74%)	20 (12.90%)
	No	18 (78.26%)	135 (87.10%)
Sharp injury	Yes	2 (8.70%)	12 (7.74%)
	No	21 (91.30%)	143 (92.26%)
Splash	Yes	7 (30.43%)	31 (20.00%)
	No	16 (69.57%)	124 (80.00%)
Torn gloves	Yes	9 (39.13%)	48 (30.97)
	No	14 (60.87%)	107 (69.03%)
Sexual	Yes	7 (30.43%)	21 (13.55%)
affairs	No	16 (69.57%)	134 (86.45%)
Vaccinated	Yes	18 (78.26%)	59 (38.06%)
	No	5 (21.74%)	96 (61.94%)

4.4.2 Prevalence of risk factors for HBV infection in relation to duration of vocational training.

Table 4.4 below, summarizes the prevalence of risk factors of hepatitis B virus infection according to duration of vocational training embarked by students. The prevalence of vaccination (60.00%), splash of blood and other body fluids (46.67%) and sharp injury (13.33%) among students that had vocation training for 5-6 months were highest compared to the other duration of vocational training. In contrast, the prevalence of torn gloves (50.00%) and sexual affairs (33.33%) among study participants who had > 6 months were greatest compared to the other periods of vocational training. Additionally, the prevalence of needle pricks (16.19%) among students who had only < 2 months of vocational training was highest compared to the other periods of vocational training.

Table 4.4: Prevalence of risk factors for HBV infection in relation to duration of VT

Variables		Duration of vocational training (months)			
		< 2 (N=105)	3-4 (N=52)	5-6 (N=15)	> 6 (N=6)
Needle prick	Yes	17 (16.19%)	7 (13.46%)	1 (6.67%)	0 (0.00%)
	No	88 (83.81%)	45 (86.54%)	14 (93.33%)	6 (100.00%)
Sharp injury	Yes	11 (10.48%)	1 (1.92%)	2 (13.33%)	0 (0.00%)
	No	94 (89.52%)	51 (98.08%)	13 (86.67%)	6 (100.00%)
Splash	Yes	19 (18.10%)	11 (21.15%)	7 (46.67%)	1 (16.67)
	No	86 (81.90%)	41 (78.85%)	8 (53.33%)	5 (83.33%)
Torn gloves	Yes	28 (26.67%)	23 (44.23%)	3 (20.00%)	3 (50.00%)
	No	77 (73.33%)	29 (55.77%)	12 (80.00%)	3 (50.00%)
Sexual	Yes	16 (15.24%)	6 (11.54%)	4 (26.67%)	2 (33.33%)
Affairs	No	89 (84.76%)	46 (88.46%)	11 (73.33%)	4 (66.67%)
Vaccinated	Yes	46 (43.81%)	20 (38.46%)	9 (60.00%)	2 (33.33%)
	No	59 (56.19%)	32 (61.54%)	6 (40.00)	4 (66.67%)

4.4.3 Prevalence of risk factors for HBV infection in relation to participants year group

Figure 4.6 below, summarizes the prevalence of risk factors of hepatitis B virus infection according to year group of participants. The prevalence of needle pricks (18.7%), sharp injuries (8.8%) and vaccination (44.0%) were highest among 2nd year students compared to the other year groups. However, the prevalence of sexual activities (21.7%) and Splash of blood and other body fluids (34.8%) were greatest among 4th year group compared to the other year groups. In addition, the prevalence of torn gloves (42.2%) was highest among 3rd year group compared to the other groups.

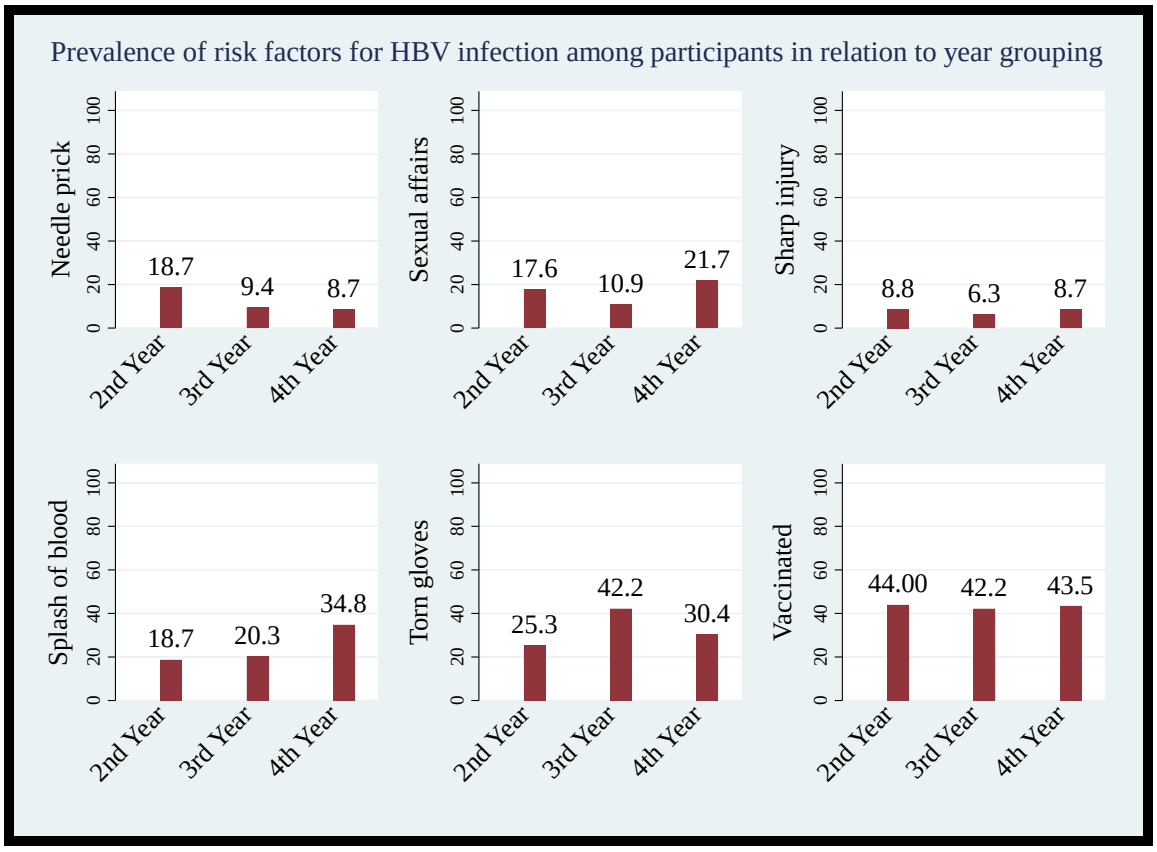


Figure 4.6: Prevalence of risk factors for HBV infection in relation to year grouping

4.5 Association between risk factors and prevalence of HBV infection

Table 4.5 below summarizes the significance of the association between risk factors and prevalence of hepatitis B virus infection on the chi square test. The association between sharp injury and hepatitis B virus infection was significant ((Pearson chi2 = 11.5, p-value = < 0.001). Also, the relationship between torn gloves and hepatitis B virus infection was also significant (Pearson chi2 = 10.9, p-value = < 0.001). Furthermore, the association between duration of vocational training and hepatitis B virus infection was also significant (Pearson chi2 = 8.7, p-value = 0.03)

Table 4.5: Association of HBV infection with risk factors for HBV infection

Variable		HBV-	HBV+	Chi2	p-value
Gender	Male	129 (92.81%)	10 (7.19%)	0.2	0.64
	Female	37 (94.87%)	2 (5.13%)		
Age in years	15-19	13 (92.86%)	1 (7.14%)	0.6	0.91
	20-24	111 (94.07%)	7 (5.93%)		
	25-29	28 (90.32%)	3 (9.68%)		
	> 29	14 (93.33%)	1 (6.67%)		
Work History	Ever worked	22 (95.65%)	1 (4.35%)	0.2	0.62
	Never worked	144 (92.90%)	11 (7.10%)		
Year group	2nd year	86 (94.51%)	5 (5.49%)	4.8	0.09
	3rd year	61 (95.31%)	3 (4.69%)		
	4th year	19 (82.61%)	4 (17.39%)		
Vocational Training	< 2 months	97 (92.38%)	8 (7.62%)	**8.7**	**0.03**
	3-4 months	50 (96.15%)	2 (3.85%)		
	5-6 months	15 (100.00%)	0 (0.00%)		
	> 6 months	4 (66.67%)	2 (33.33%)		
Needle prick	Yes	24 (96.00%)	1 (4.00%)	0.4	0.60
	No	142 (92.81%)	11 (7.19%)		
Sharp injury	Yes	10 (71.43%)	4 (28.57%)	**11.5**	**<0.001**
	No	156 (95.12%)	8 (4.88%)		

Splash	Yes	34 (89.47%)	4 (10.53%)	1.1	0.30
	No	132 (94.29%)	8 (5.71%)		
Torn gloves	Yes	48 (84.21%)	9 (15.79%)	**10.9**	**<0.001**
	No	118 (97.52%)	3 (2.48%)		
Sex	Yes	27 (96.43%)	1 (3.57%)	0.5	0.47
	No	139 (92.67%)	11 (7.33%)		

All p-values from fisher's exact test.

4.6 Association between preventive measures and prevalence of HBV infection

Table 4.6 below summarizes significance of the association between preventive measures and prevalence of hepatitis B virus infection on the chi square test. The association between prevalence of hepatitis B virus infection and Sexual transmitted diseases methods was significant (Pearson chi2 = 5.7, p-value = 0.02). In addition, the association between vaccination and prevalence of hepatitis B virus infection was also significant (Pearson chi2 = 6.4, p-value = 0.01).

Table 4.6: Association of HBV infection with preventive measures for HBV infection

Variable		HBV-	HBV+	Chi2	p-value
STD preventive	Yes	22 (100.00%)	0 (0.00%)	**5.7**	**0.02**
Method	No	3 (75.00%)	1 (25.00%)		
Use of gloves	Yes	165 (93.22%)	12 (6.78%)	0.1	0.79
	No	1 (100.00%)	0 (0.00%)		
Disinfection	Yes	164 (93.18%)	12 (6.82%)	0.1	0.70
	No	2 (100.00%)	0 (0.00%)		
Training on	Yes	86 (93.48%)	6 (6.52%)	0.0	0.89*
Diseases	No	79 (92.94%)	6 (7.06%)		
Vaccinated	Yes	76 (98.70%)	1 (1.30%)	**6.4**	**0.01**
	No	90 (89.11%)	11 (10.89%)		

Vaccinated	Yes	10 (100.00%)	0 (0.00%)	1.3	0.25
before VT	No	83 (88.30%)	11 (11.70%)		

Apart from *p-value from chi-square test, all other p-values from fisher's exact test.

4.7 Bivariate analysis and multiple logistic regression of the association of HBV infection among participants with risk factors of HBV

Table 4.7 below summarizes the association of prevalence of hepatitis B infection and risk factors among study participants using bivariate and multiple logistic regression analyses to calculate the crude odd ratios (COR), adjusted odd ratios (AOR), 95% confidence intervals and p-values.

After adjusting for gender of students, needle prick, sharp injury, splash of blood, torn gloves, sexual activities and vaccination, sharp related injury increased the odds of HBV infection among the students by more than 10 times (AOR = 10.35, 95% CI = 1.28 - 83.99, p-value = 0.034) compared to those who never experience sharp related injuries.

Also, after adjusting for gender of students, needle prick, sharp injury, splash of blood, torn gloves, sexual activities and vaccination, torn gloves increases the odds of HBV infection among the students by almost 6 times (AOR = 5.90, 95% CI = 1.33 - 26.29, p-value = 0.019) compared to those who did not experience torn gloves.

However, after adjusting for gender of students, needle prick, sharp injury, splash of blood, vaccination, torn gloves and sexual activities, vaccination decreases the odds of HBV infection among the students by almost 91% (AOR = 0.09, 95% CI = 0.01 - 0.79, p-value

= 0.033) compared to those students who have never taken any vaccine of Hepatitis B at the time of the study.

Table 4.7: Bivariate analysis and multiple logistic regression of the association of HBV infection among participants with risk factors for HBV

Variable	N	Unadjusted OR	Unadjusted 95%CI	p-value	Adjusted OR	Adjusted 95%CI	p-value
Gender							
Male	139	1.43	0.30 – 6.84	0.651	1.43	0.21 – 9.60	0.767
Female	39	1			1		
Needle prick							
Yes	25	0.54	0.06 – 4.36	0.561	0.09	0.00 – 1.57	0.104
No	153	1			1		
Sharp injury							
Yes	14	7.80	2.00 – 30.34	0.003	**10.35**	**1.28 – 83.99**	**0.034**
No	164	1			1		
Splash							
Yes	38	1.94	0.55 – 6.83	0.301	1.27	0.27 – 5.99	0.736
No	140	1			1		
Torn gloves							
Yes	57	7.38	1.91 – 28.42	0.004	**5.90**	**1.33 – 26.29**	**0.019**
No	121	1			1		
Sex							
Yes	28	0.47	0.06 – 3.78	0.476	0.22	0.02 – 2.87	0.297
No	150	1			1		
Vaccination							
Yes	77	0.11	0.01 – 0.85	0.035	**0.09**	**0.01 – 0.79**	**0.030**
No	101	1			1		

All p-values from bivariate and multiple logistic regression analysis

In summary, sharp related injuries, torn gloves and vaccination were the main contributing factors of HBV infection status among students. Sharp related injuries and torn gloves increased the risk of acquiring or transmitting the disease whiles vaccination declined the

risk of developing or transferring the disease among students as well as patients in the study.

CHAPTER FIVE

DISCUSSION

Medical Laboratory Science students (MLSS), like all other health care students are at a high risk of hepatitis B virus infection partly due to their inexperience in the field of work. In addition, they undertake vocational training which constantly exposes them to contaminated body fluids such as blood thereby increasing their risk of exposure to the infection. Though evidence based data are required to formulate policy needed to devise measures to protect MLSS against hepatitis B virus infection all the studies conducted have focused on patients rather than health care workers or MLSS. To fill this gap in research therefore, this study assessed the prevalence and risk factors of hepatitis B virus infection among medical laboratory science students at the University of Health and Allied Sciences, Ho. Assessment of the prevalence and risk factors of HBV infection among the students would help advice management of tertiary institutions of the necessity to conduct screening of students for hepatitis B virus infection on routine basis. This concluding chapter therefore, presents the discussion of findings made in reference to relevant literature on the subject matter as follows:

5.1 Prevalence of HBV infection

A greater number of students checked their HBV status from the years 2016-2018 before this study commenced. Prospective students of the university are usually required to undertake medical screening as part of the admission process of the University. In addition, during vocational training, students have the opportunity to check for their HBV infection. These factors might have contributed to why a majority of the participants had checked

their HBV infection status before the commencement of the study. The finding of this study stated above. was not different from that of a study done among nursing students in Ghana by Kombat (2016). These two events, thus suggest that when mass screening exercises are organized in schools, on routine basis, they could provide opportunity for majority of students to be tested for terminal diseases whose early detection and control are essential in order to save life.

The current study also revealed an overall prevalence rate of 6.7% for HBV infection among medical laboratory science students of the University of Health and Allied Sciences, Ho. This endemic prevalence proportion of HBsAg is comparable to the prevalence level of 4.2% and 10.1% reported in similar studies among medicine and health science students in Northeast Ethiopia and nursing students in Ghana respectively (Demsiss, Seid, & Fiseha, 2018; Kombat, 2016).

However, the HBV prevalence proportion (6.74%) (95% CI=3.1%-10.4%, p-value=0.024) of this study was lower and different from the national HBsAg prevalence of 12.3% as reported in a meta-analysis review HBV infection study in Ghana (Ofori-Asenso & Agyeman, 2016) and 13.4% prevalence reported among biomedical students of African descent in Usmanu Danfodiyo University, Sokoto, Nigeria (Okwesili et al., 2015).

Even though the 6.7% prevalence of HBV infection among MLSS was significantly lower (p-value < 0.05) than those reported elsewhere (Ofori-Asenso & Agyeman, 2016; Okwesili et al., 2015) and also below the 8% endemic level, the situation is alarming and must not

be treated with complacency. This is because the MLSS are health care attendants and per the nature of their jobs, come in contact with several clients whom they could easily pass the infection to and lead to a massive spread of the disease.

In addition, MLSS carry out diagnostic tests for patients including testing for HBV infection. Since there is the possibility of contaminating the diagnostic samples leading to the production of false positive results which could adversely affect the decisions to be made on treatment, it is highly important that they are free from any disease that could mar the integrity of the diagnostic tests they perform and jeopardize the health of their clients in general.

5.2 Demographic characteristics and prevalence of HBV infection

The highest prevalence of the HBV infection was recorded among the "25-29" age group. This age group, "25-29" was slightly different from the age group, "21-25" that recorded a significantly higher HBsAg prevalence in a study among biomedical students in Nigeria (Okwesili et al., 2015).

In this present study, participants aged 25 years and above were mostly students in their final year (level 400) of study. They had the highest and the second highest exposure to risk factors of HBV infection which comprised 21.7% prevalence of practicing sex, 34.8% prevalence of splash of blood over the body, 8.7% prevalence of sharp injuries and 30.4% prevalence of tearing of gloves in the course of examining biological specimens. Since the prevalence of HBV infection increases with prevalence of exposure to risk factors of the

disease. It is highly probable that the highest prevalence of HBV infection among participants aged 25 years and above was as a result of their highest or most predominant exposure to the risk factors of HBV infection. It was therefore not surprising that this age groups of students had the highest prevalence of HBV infection among all the participants.

Among the 12 students that tested positive for the infection in this present study, only 1 had working experience, this finding was consistent with the fact that less or no experience medical laboratory science students are likely to be infected with the HBV infection as evidenced by the study among healthcare workers in Uganda where the HBV prevalence among workers who had "< 10 years" experience was higher (8.9%) compared to those who had "> 20 years" experience (6.5%) (Ziraba et al., 2010). This is because experience provides one with the critical knowledge required to take precautionary measures needed to prevent unnecessary exposure to the risk factors and infection of the disease.

Although, this study showed that students who had some working experience before university education had the higher prevalence of risk factors of the disease such as needle prick (21.74%), sharp injury (8.70%), splash of blood (30.43%) torn gloves (39.13%) and practicing sex (30.43%) it did not result into higher HBV prevalence among them. This observation suggests that these factors alone might not be the ultimate determinants of the prevalence of the infection. Other factors such as the immune status of the exposed persons and the intensity of exposure to the viruses also contribute to the prevalence even though such factors were not investigated in this study.

The general knowledge that the more students are exposed to infections, the higher their risk of infection was revealed in the study as the HBV prevalence among 4th year student was greatest because they had had the highest level of exposure to the viruses in conformity to their longest duration of vocational training than students in the lower class level in the school. This result was analogous to the finding of a study done in Northeast Ethiopia among medicine and health science students where 3rd year students had a higher (4.6%) prevalence, in comparison to 2nd year students who had a 3.4% prevalence of HBsAg (Demsiss et al., 2018).

5.3 Demographic factors, prevalence of risk factors and HBV infection

The relationship between HBV infection and needle prick was weak and statistically not significant and majority (85.86%) of students did not experience needle prick injuries. A higher needle prick prevalence of 21.74% was however recorded among students who had some form of work experience in a medical laboratory before university education. This could probably be because these students by virtue of some level of experience, were complacent and did not take serious precautionary measures in order to prevent needle prick exposures.

Furthermore, in this study, higher needle prick prevalence (16.19%) was recorded among students who were new to vocational training and this was consistent with prevalence of 18.7 among 2nd year students who were also new comers to vocational training programmes. According to Kombat (2016) study among nursing students, inexperience was a key factor for exposure to needle pricks. This higher prevalence of needle pricks

among newly admitted vocational training students may have resulted from capping of needles after usage as reported in some studies that capping of needles usually results in needle prick (Kommogldomo, 2016). New comer students to vocational training usually lack the experience and knowledge of handling of needles after usage and therefore resort to capping them and become exposed high incidence of pricks.

According to Konlan, Aarah-bapuah, Kombat, & Wuffele, (2017) study among nurses, the prevalence of splash of blood or other body fluids was 38.3% which was more than prevalence of 21.4% recorded in this study. Splash of blood and other body fluid is a major risk factor of hepatitis B infection. This is because one may protect him or herself from splash, however, one cannot predict when splash of blood is likely to occur. This factor had probably contributed to the higher risk of exposure to splash of blood among those with higher contacts with the facility than the others.

In this study, 8.7% and 10.48% prevalence of sharps related injuries were found among students with some level of experience before university enrolment and students who had spent only less than two months on internship programmes respectively. A similar conclusion was drawn by Bhattarai, KC, Pradhan, Lama, & Rijal, (2014) who also showed that the higher ones level of experience in the training the lower the prevalence of sharps related injuries.

Tearing of gloves were more frequent among students who had some history of work experience (39.13%) and those who had embarked on more than six months of vocational

training (50.00%) than their other counterparts with a lower level of experience. This finding also confirmed that of the study by Kombat (2016), which showed that 3rd year students had higher frequency of tearing of gloves than students in the lower year levels in the nursing training school.

The frequency of tearing of gloves is associated with the frequency of use of gloves such that the higher the frequency of use of gloves, the higher the possibility of tearing of the gloves. Since the deterioration of gloves increases with the frequency of use of gloves which in turn increases with class level or year, it was not surprising that students in higher class levels or year experienced the higher frequency of tearing of gloves than their counterparts in the lower class levels in the training institution since it was consistent with general knowledge.

5.4 Demographic factors, Preventive Measures and prevalence of HBV infection

Although sexual activities were more dominant among experienced and 4th year students as well as students who had more than six months of vocational training, majority (84.62%) of them used condoms to prevent infection by HBV. In a study by Biradar, Kamble, & Reddy, (2015), among medical students it was also reported that 86.1% of the students identified condom use as one of the important STD preventive methods in preventing HBV infection. The knowledge of students on condom and its usage could have also accounted for the low prevalence of HBV infection recorded among the students recruited in this study.

In spite of the fact that over 90% of the students frequently used gloves, disinfected their working areas and received training on prevention of infectious diseases transmission, there was no association between these risk factors and prevalence of HBV infection among the participants. This observation suggests that the above mentioned factors were not the only determinants of the disease but other risk factors could be involved which probably played a more decisive role on the prevalence of the disease among the students.

Nevertheless, association between vaccination and HBV infection was statistically significant (P-value <0.05), thus suggesting that vaccination against HBV infection is one of the most important ways of protecting oneself against infection by the disease and transmission among the students.

However, the lower prevalence (44.16%) of complete vaccination among students in this study compared to that (83.7) among students of the earlier study (Suraj et al., 2014) indicated that vaccination coverage among our students is woefully inadequate and need to be improved. Vaccination against hepatitis B virus infection still continues to be one of the important ways of protecting oneself against HBV infection and it is the most significant measure to prevent HBV infection.

5.5 Limitation of the study

Some students participated in the research only by answering questionnaires and not partaking in the checking of their hepatitis B infection status and this might have weakened or strengthened the link between HBV infection and risk factors.

There was possibility of recall bias among the students for exposure to the risk factors of HBV infection in the laboratory during the past vocational training programmes and this might have contributed to distortion in the prevalence of risk factors.

The rapid diagnostic test kit used could only determine the prevalence of HBsAg in comparison to advanced diagnostic tests that can be used to identify other HBV infection antibodies to ascertain true hepatitis B prevalence.

Finally, generalization of the results of this study is limited since participants were drawn from only one institution. A large sample size of participants from different institutions could have presented a different picture.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The research work revealed the prevalence of hepatitis B virus infection among medical laboratory science students in the University of Health and Allied Sciences to be 6.7%, which was not different from the national prevalence rate of 11.0%. However, this confirmed the report that the disease is endemic in Ghana.

The risk factors, sharp related injuries (AOR = 10.35, 95% CI = 1.28-83.99, p-value = 0.034) and tearing gloves (AOR = 5.90, 95% CI = 1.33-26.29, p-value = 0.019) were the most significant and strong predictors for spread of hepatitis B virus infection among medical laboratory science students. These factors proved to be positively and significantly associated with prevalence of hepatitis B virus infection when analysis using chi2 test and bivariate multiple logistic regression was ran. However, vocational training programme was positively associated with prevalence hepatitis B virus infection using the chi2 test though was not significantly related when bivariate multiple logistic regression was used for analysis.

Vaccination (AOR = 0.09, 95% CI = 0.01-0.79, p-value = 0.030) was the most significant and strong predictor preventive method against transmission of hepatitis B virus infection among medical laboratory science students. Vaccination was confirmed to be negatively associated with the prevalence of hepatitis B virus infection after chi2 test and bivariate and multiple logistic regression was used for analysis.

On the other hand, use of sexual transmitted diseases preventive measures was significantly associated with prevalence of hepatitis B virus infection when the chi2 test was used for analysis but proved otherwise after the bivariate multiple logistic regression was used.

Finally, sharp related injuries and tearing gloves were the most significant risk factors for hepatitis B infection whiles vaccination was the only significant preventive measure in this study. All these factors might have contributed to the prevalence rate of 6.7% hepatitis B virus infection among students.

6.2 Recommendation

Although a low prevalence of HBV infection was observed among medical laboratory science students, measures should be put in place to further reduce the prevalence below the 6.7% obtained. This could be facilitated by strict adherence of safety precautionary measures such as engagement in unprotected sex and used of personal protective equipment and preventive measures such as increase in vaccination coverage.

Prior to commencement of vocational training programmes, the university should educate students on the use and precautions associated with sharp related objects so that in the process of doing their internship they can reduce this exposure. Additionally, students should be oriented on the wearing and removal of gloves in order to minimize the rate of tearing of gloves during use by students.

Furthermore, health facilities used for vocational training programmes should promote and use high quality consumables such as gloves as this will prolong the life span of such materials and minimize breakages.

REFERENCES

Abdalwhab, M., & Nafi, M. (2014). Sero-frequency of Hepatitis B Infection among Health Care Workers in Khartoum. *American Journal of Research Communication*, *2*(12).

Abdulahi, H. (2013). Seroprevalence of hepatitis b surface antigen (HBsAg) among the medical students of Usmanu Danfodiyo University , Sokoto , Sokoto State , Nigeria, *3*(3), 666–671.

Alqahtani, J. M., Abu-eshy, S. A., Mahfouz, A. A., El-mekki, A. A., & Asaad, A. M. (2014). Seroprevalence of hepatitis B and C virus infections among health students and health care workers in the Najran region , southwestern Saudi Arabia : The need for national guidelines for health students, 1–7.

Attaullah, S., Khan, S., Naseemullah, Ayaz, S., Khan, S. N., Ali, I., & Hoti, N. (2011). Prevalence of HBV and HBV vaccination coverage in health care workers of tertiary hospitals of Peshawar , Pakistan. *Virology Journal*, *8*(275), 1–8.

Bacon, B., Heller, T., Garza-Abijaoude, L., & Thiel, T. (2012). *What I need to know about Hepatitis B*. National Institutes of Health. https://doi.org/13

Biradar, S. M., Kamble, V. S., & Reddy, S. (2015). Hepatitis B infection and vaccination : knowledge and attitude among medical students, *2*(4), 395–398.

Centers for Disease Control and Prevention. (2016). The ABCs of Hepatitis (pp. 1–2).

Chan, J. (2004). Viral hepatitis. In D. M. Brundage, K. F. Marlowe, & R. H. Parrish (Eds.), *Pharmacotherapy Self-Assessment Program* (5th ed., pp. 1–26).

Choudhury, A. (2004). Epidemiology of hepatitis B virus infection in India. *Hepatitis B Annual*, *1*(17), 224.

Demsiss, W., Seid, A., & Fiseha, T. (2018). Hepatitis B and C: Seroprevalence, knowledge, practice and associated factors among medicine and health science students in Northeast Ethiopia. *PLoS ONE*, *13(5)*, 1–12.

Department of Health. (2006). *Immunisation against infectious disease*. (D. Salisbury, M. Ramsay, & K. Noakes, Eds.) (6th ed.). The Stationery Office of Department of Health.

Ekuma, O. O., Mawak, J. D., Uwakwe, A., Ogbu, O., Okohs, F. N., Agah, M. V., & Nnachi, A. U. (2014). Prevalence of Hepatitis 8 surface antigen among the newly admitted students of University of Jos, Nigeria, *2*(1), 35–39. https://doi.org/10.11648/j.ajls.2014020

Elikwu, C., Shonekan, O., Shobowale, E., Nwadike, V., Tayo, B., Okangba, C., & Omeonu, A. (1996). Seroprevalence of hepatitis B surface antigenaemia among healthcare workers in a private Nigerian tertiary health institution. *International Journal of Infection Control*, *12*(2), 1–6. https://doi.org/10.3396/IJIC.v12i2.013.16

Ghana Health Service. (2015). *Ghana Health Service 2014 Annual Report*. Accra, Ghana.

Ghana Health Service. (2017). *Ghana Health Service 2016 Annual Report*. Accra, Ghana.

Ian, Z., Liu, J., Pan, J., Satiroglu, T. N., Zhu, M., Arbuthnot, P., … Feitelson, M. (2001). A Cellular Gene Up-Regulated by Hepatitis B Virus-Encoded X Antigen Promotes Hepatocellular Growth and Survival. *Hepatology*, *34*(1), 146–57.

Inan, N., & Tabak, F. (2015). Hepatitis B Virus : Biology and Life Cycle. *Viral Hepatitis Journal*, *21*(1), 1–7. https://doi.org/10.4274/vhd.36036

Israel, J. (1991). Liver Structure , Function , and Anatomy : Effects of Hepatitis B Virus, *168*, 1–2.

Kombat, S. M. (2016). *Hepatitis B Viral (HBV) Infection Among Nursing Students in the Techniman North and South Districts*. University of Ghana.

Kommogldomo, E. D. (2016). *Needle Stick and Sharp Injuries among Health Care Workers at 37 Military Hospital*. University of Ghana.

Konlan, K. D., Aarah-bapuah, M., Kombat, J. M., & Wuffele, G. M. (2017). The level of nurses ' knowledge on occupational post exposure to hepatitis B infection in the Tamale metropolis , Ghana, 1–7. https://doi.org/10.1186/s12913-017-2182-7

Lewis, J. D., Enfield, K. B., & Sifri, C. D. (2015). Hepatitis B in healthcare workers : Transmission events and guidance for management. *World Journal of Hepatology*, *7*(3), 488–497. https://doi.org/10.4254/wjh.v7.i3.488

Marieb, E. N., & Hoehn, K. (2013). *Human Anatomy & Physiology*. (S. Beauparlant, Ed.) (9th ed.). New York, NY, USA: Pearson.

Mauss, S., Berg, T., Jurgen, R., Christoph, S., & Heiner, W. (2017). *Hepatology - A clinical textbook* (8th ed.). Druckerei Heinrich GmbH, , Hans-Böckler-Str. 4, 56070 Koblenz.

Mueller, A., Stoetter, L., Kalluvya, S., Stich, A., Majinge, C., Weissbrich, B., & Kasang, C. (2015). Prevalence of hepatitis B virus infection among health care workers in a tertiary hospital in Tanzania. *BMC Infectious Diseases*, 1–9. https://doi.org/10.1186/s12879-015-1129-z

Ofori-Asenso, R., & Agyeman, A. A. (2016). Hepatitis B in Ghana : a systematic review & meta-analysis of prevalence studies. *BMC Infectious Diseases*, *16*(130), 1–15. https://doi.org/10.1186/s12879-016-1467-5

Okwesili, A. N., Onuigwe, F. U., Ibrahim, K., Buhari, H., Ibrahim, A., Jafaru, H., … Udoma, F. (2015). Prevalence of Hepatitis B surface antigen among biomedical students of African descent in Usmanu Danfodiyo University, Sokoto, Nigeria. *Human Antibodies*, *23*(3–4), 1–7. https://doi.org/10.3233/HAB-150282

Oyewusi, C. O. (2015). Knowledge and Utilization of Hepatitis B Infection Preventive Measures and Influencing Factors among Health Care Workers in Ibahan , Nigeria, *8*(1), 164–176.

Ponde, R. (2012). virus infection. *European Journal of Clinical Microbiology and Infectious Diseases.*, *31*(12), 1–18. https://doi.org/10.1007/s10096-012-1781-9

Revier, L., & Sowers, H. M. (2015). Viral Hepatitis 2015: Causes, Diagnosis and Treatment.

Robinson, M., & Davidson, G. W. (1996). Chambers 21st century dictionary. Retrieved July 2, 2017, from http://www.worldcat.org/title/chambers-21st-century-dictionary/oclc/35829706?page=citation

Schweitzer, A., HorJ, J., Mikolajczyk, R., Krause, G., & Ott, J. (2015). Estimates of worldwide prevalence of chronic hepatitis B virus infection: a systematic review of data published between 1965 and 2013. *Lancet*, *386*(10003), 1546–1555. https://doi.org/10.1016/S0140-6736(15)61412-X

Seeger, C., & Mason, W. S. (2000). Hepatitis B Virus Biology. *Microbiology and Molecular Biology Reviews*, *64*(1), 51–68.

Suraj, B., Smriti, K., Pranil, P. M., Sami, L., & Suman, R. (2014). Hepatitis B vaccination status and needle-stick and sharps-related Injuries among medical school students in Nepal: a cross-sectional study. *BMC Research Notes*, *7*(1), 1–7. https://doi.org/10.1186/1756-0500-7-774

Vildósola, G. (2000). Hepatitis B vaccination impact on acute disease, chronic carriers and hepatocarcinoma incidence. Rev Gastroenterol Peru PMID:12140576, *20*, 414–421.

Vipul, K., Rubee, T., Deepak, P., & Chirag, P. (2012). Prevalence of Hepatitis B Virus Infection in Health Care Workers of a Tertairy Care Hospital, *2*(2), 176–178.

World Health Organization. (2017a). *Global hepatitis report*. Geneva, Switzerland. Retrieved from http://www.who.int/hepatitis

World Health Organization. (2017b). WHO | Hepatitis B. Retrieved July 2, 2017, from http://www.who.int/mediacentre/factsheets/fs204/en/

World Health Organization. (2017c). WHO | What is hepatitis? Retrieved July 2, 2017, from http://www.who.int/features/qa/76/en/

Yogarajah, H., Lestari, A. A. W., & Yasa, I. W. P. S. (2011). Laboratory diagnosis of hepatitis b, 1–14.

Zafar, M. (2014). Original Article Some studies on prevalence of hepatitis B surface antigen amongst healthcare workers of tertiary care hospitals of Multan city. *Punjab Univ. J. Zool.*, *29*(1), 11–15.

Ziraba, A. K., Bwogi, J., Namale, A., Wainaina, C. W., & Mayanja-kizza, H. (2010). Sero-prevalence and risk factors for hepatitis B virus infection among health care workers in a tertiary hospital in Uganda. *BMC Infectious Diseases*, *10*(191), 1–12.

APPENDICES

Appendix A : Informed Consent Form

INFORMED CONSENT FORM

Research Title

Prevalence and Risk Factors of Hepatitis B virus infection among medical laboratory science students in the University of Health and Allied Sciences, Ho.

Name and Address of Principal Investigator

Philip Apraku Tawiah, Department of Biological, Environmental and Occupational Health Sciences, School of Public Health, University of Ghana, Legon or School of Pharmacy, University of Health and Allied Sciences, Ho. Mobile: 0242164519. Email address: phyllipoo27@gmail.com

Introduction

I am a master's student of the School of Public Health, University of Ghana conducting a research on hepatitis B virus infection among medical laboratory science students. Please you would be required to kindly fill the questionnaire and test for hepatitis B virus infection. All information provided would be treated as very confidential.

General Information about Study

Medical laboratory technicians are known to be among the high threatened group of hepatitis B infection. This places medical laboratory science students even at a higher risk. In essence, this research seeks to determine the prevalence of hepatitis B among medical laboratory science students in the University of Health and Allied Sciences.

Risks and Benefits

This study would not pose any risks to respondents as sterile materials would be used to test for Hepatitis B infection. The only potential uneasiness that may arise would involve a needle prick on the thumb in the process of testing Hepatitis B infection. Participants would spend approximately 30 minutes in answering and testing Hepatitis B infection status. There would be a direct benefit as the research would give study participants the opportunity to check and update their Hepatitis B infection status. Further, it would also provide a platform to refer students who test positive for further investigation and treatment. Indirectly, the study may be used to formulate policy programmes and measures required to limit the risk of infection and transmission of the disease among health care workers and medical laboratory science students.

Privacy and Confidentiality

Study materials such as questionnaires, consent forms and referral forms will not bear the names of participants. Instead, they will be labelled and given unique numbers just for identification purposes. The data will be entered into stataSE version 15 with identification numbers and electronic formats would only be made available to research team. The study materials (questionnaires and informed consent forms) and data would be stored under key by the principal investigator.

Compensation

Qualified candidates who give informed consent to participate in the survey will not be given any monetary compensation before, during or after the research work.

Voluntary participation and withdrawal

Participating in the research is entirely out of free will and one can opt out at any time of the study. Eligible participants declining to be involved in the study would bear no negative consequences.

Research participant right

This research has been reviewed and approved by the Ghana Health Service Ethical Review Committee (GHS-ERC). If you have any questions about your right as a research participant you can contact GHS-ERC Administrator, Hannah Frimpong on this number **0507041223** or through the email address **hannah.frimpong@ghsmail.org**, or principal investigator of the study.

Clarifications before consent

Do you have any questions you wish to ask about the research? (If yes, please indicate the questions below)

……

……

Statement of Consent

I…….. declare that the purpose, procedures and all other information of the study have been read by me and all question (s) and clarifications have been sought and answered. I therefore give my consent to participate in the study.

Signature of participant…….. Date ……../……./……

Statement of Researcher

I have provided all information, explanations and clarifications about the study to participant as well as answering any questions concerning the study. I agree to answer all questions that may arise in the course of the study and stick to approved study protocols.

Signature of researcher……..... Date……/……/……

Appendix B : Medical Referral Form

MEDICAL REFERRAL FORM

Date:……/……../……

RE: (Patient Name)
Patient Date of Birth

Dear Dr…….

The above named patient was recently involved in a research work where a sample of his/her blood was taken for analysis of Hepatitis B virus infection. The following abnormality was noted in his/her laboratory results.

Parameter and abnormality identified

As a result we are referring him/her to your health care facility for appropriate and complete medical care. We are most indebted for your assistance.

Sincerely,

Philip Apraku Tawiah
Principal Investigator
School of Public Health
University of Ghana

Appendix C : Questionnaire for Project Work

QUESTIONNAIRE

A CROSS SECTIONAL STUDY ON PREVALENCE AND RISK FACTORS OF HEPATITIS B VIRUS INFECTION AMONG MEDICAL LABORATORY SCIENCE STUDENTS IN THE UNIVERSITY OF HEALTH AND ALLIED SCIENCES, HO.

Please kindly complete the questionnaire by circling the appropriate number that corresponds to the answer and/or writing in the space provided.

DATE: ...../……/…..... **FORM NO. :**…./…./….

SECTION I – DEMOGRAPHIC DATA		
NO.	**QUESTIONS**	**RESPONSES**
1	Sex of respondent	1. Male 2. Female
2	Age of respondent (years)	1. 15 – 19 2. 20 – 24 3. 25 – 29 4. > 29
3	Religious affiliation	1. Christianity 2. Islamic 3. Traditional 4. Other (specify) …….....
4	Marital status	1. Single 2. Married 3. Other (specify) ……
5	Residential status	1. On campus 2. Off campus 3. Other (specify) ……
6	Year group	1. Year 2 2. Year 3 3. Year 4
7	Have you ever been employed as a laboratory technician or a laboratory assistant before?	1. Yes 2. No
8	If **No in 7**, skip to **9** If **Yes in 7**, how many years of	1. < 1 2. 1 – 3

	working experience do you have?	3. 4 – 6 4. > 6
9	How many times have you embarked on a vocational attachment programme since the beginning of your programme?	1. Once 2. Twice 3. Thrice 4. More than thrice
10	What is the total duration of the entire vocational attachment programme you have done so far?	1. 2 months 2. 4 months 3. 6 months 4. more than 6 months
SECTION II – PREVALENCE OF HEPATITIS B INFECTION		
11	Hepatitis B infection is a disease with the following characteristics labelled 'a' to 'f'. Tick as many answers as applicable.	a. Yellowish skin b. Tiredness c. Abdominal pains d. Dark urine e. Loss of appetite f. Nausea
12	Hepatitis B infection is a critical occupational hazard for health care workers.	1. True 2. False
13	Hepatitis B infection is caused by?	1. Bacteria 2. Fungi 3. Virus 4. Other (specify) ……
14	What is the medium of transmission of hepatitis B infection?	1. Blood and body fluids 2. Food 3. Fecal route 4. Other (specify) ……..
15	Do you know any means by which one can get to know his/her hepatitis B infection status?	1. Yes 2. No
16	If **No in 15**, skip to **17** If **Yes in 15**, by what means?	1. Laboratory test 2. Clinical signs and symptoms 3. Other (specify) ……..
17	Do you know your hepatitis B infection status?	1. Yes 2. No
18	If **No in 17**, skip to **19** If **Yes in 17**, state the date year ……...	
19	Would you like to check or confirm your status?	1. Yes 2. No
20	If **No in 19**, skip to **21**	1. Reactive

	If **Yes in 19**, check or confirm your hepatitis B status by testing.	2. Non-reactive
SECTION III – RISK FACTORS FOR HEPATITIS B INFECTION		
21	Did you ever have any needle-prick during any of your vocational attachment?	1. Yes 2. No 3. Don't know
22	If **No in 21**, skip to **26** If **Yes in 21**, was the needle a used one?	1. Yes 2. No 3. Don't know
23	Did you report the needle prick injury to any authority?	1. Yes 2. No
24	If **Yes in 22**, what solution was prescribed?	1. Post exposure testing 2. Post exposure treatment 3. Nothing 4. Other (specify) ……
25	If **No in 22**, why?	1. No treatment will be given 2. Patient was not infected 3. Will be ridiculed by peers 4. No action will be taken 5. Other (specify) ……
26	Did you ever have any sharp-related injury during any of your vocational attachment?	1. Yes 2. No 3. Don't know
27	If **No in 26**, skip to **31** If **Yes in 25**, was the sharp object a used one?	1. Yes 2. No 3. Don't know
28	Did you report the sharp-related injury to any authority?	1. Yes 2. No
29	If **Yes in 28**, what solution was prescribed?	1. Post exposure testing 2. Post exposure treatment 3. Nothing 4. Other (specify) ……
30	If **No in 28**, why?	1. No treatment will be given 2. Patient was not infected 3. Will be ridiculed by peers 4. No action will be taken 5. Other (specify) ……
31	Did you ever have splash of blood or body fluid into your	1. Yes 2. No 3. Don't know

	eyes or on your body during any of your vocational attachment? If **No in 31** skip to **35**	
32	Did you report the splash of blood or body fluid to any authority?	1. Yes 2. No
33	If **Yes in 32**, what solution was prescribed?	1. Post exposure testing 2. Post exposure treatment 3. Nothing 4. Other (specify) ……
34	If **No in 32**, why?	1. No treatment will be given 2. Patient was not infected 3. Will be ridiculed by peers 4. No action will be taken 5. Other (specify) ……
35	Did you use gloves during any of your vocational attachment programme?	1. Yes 2. No
36	If **Yes in 35**, how frequently did you use it?	1. Always 2. Once a while 3. Not often
37	If **No in 35**, what was your reason?	1. Non-availability of gloves 2. Felt uncomfortable in it 3. Not usually used by mentors 4. Other (specify) ……
38	Did you have your gloves torn in any of your laboratory procedures? If **No in 38** skip to **42**	1. Yes 2. No 3. Don't know
39	If **Yes in 38**, did you report to any authority?	1. Yes 2. No
40	If **Yes in 39**, what solution was prescribed?	1. Post exposure testing 2. Washing of hands 3. Nothing 4. Other (specify) ……
41	If **No in 39**, why?	1. Nothing 2. No action will be taken 3. Non-infectious patient 4. Other (specify) ……

42	Did you ever disinfect your working area during your vocational attachment?	1. Yes 2. No
43	If **Yes in 42**, how frequently did you use disinfect?	1. Always 2. Once a while 3. Not often
44	If **No in 42**, what was your reason?	1. Non-availability of disinfection 2. Not usually used by mentors 3. Other (specify) ……
45	Did you ever engage in multiple sexual affairs in the last six months?	1. Yes 2. No 3. Don't know
46	If **Yes in 45**, did you use any sexually transmitted diseases preventive method?	1. Yes 2. No 3. Don't know
47	If **Yes in 46**, which type	1. Condom 2. Other (specify) ……
SECTION IV – MEASURES AGAINST HEPATITIS B INFECTION		
48	Have you ever been vaccinated against hepatitis B infection before getting admission into the University?	1. Yes 2. No 3. Don't know
49	If **Yes in 48**, did you take the complete vaccination of three doses?	1. Yes 2. No 3. Don't know
50	If **No in 48**, did you get vaccinated before your first vocational attachment programme?	1. Yes 2. No
51	If **No in 50**, what was your reason?	1. Not required 2. No need 3. No money 4. Other (specify) ……
52	Did you receive any training on infectious diseases or hepatitis B infection before or during any of your vocational attachment?	1. Yes 2. No
53	If **Yes in 52**, on how many occasions?	1. Once 2. Twice 3. Thrice 4. More than thrice

54	Were there sufficient protective items in the last laboratory you had your vocational attachment?	1. Yes 2. No 3. Don't know
55	If **No in 54**, which item(s) was/were not adequate?	1. Protective gloves 2. Methylated spirit 3. Nose marks 4. Other (specify) ……..
56	Using the range of lowest value of 1 to highest value of 10, how would you rate infection preventive measures in the last laboratory you had your vocational attachment?	1. Good (8, 9, 10) 2. Moderately good (5, 6, 7) 3. Poor (l, 2 , 3, 4)
57	If **Poor in 56**, which one was not well observed?	1. Use of gloves 2. Disinfection of working area 3. Other (specify) ……

Appendix D: GHS-ERC Study Approval Letter

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

In case of reply the number and date of this Letter should be quoted.

Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
Tel: +233-302-681109
Fax + 233-302-685424
Email: ghserc@gmail.com

MyRef. GHS/RDD/ERC/Admin/App 18/023
Your Ref. No.

17th March, 2018

Philip Apraku Tawiah
University of Ghana
School of Public Health
Legon, Accra

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	**GHS-ERC: 166/12/17**
Project Title	Prevalence and Risk Factors of Hepatitis B Virus Infection among Medical Laboratory Science Students in the University of Health and Allied Sciences, Ho, Volta Region
Approval Date	17th March, 2018
Expiry Date	16th March, 2019
GHS-ERC Decision	**Approved**

This approval requires the following from the Principal Investigator

- Submission of yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months,
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.
- Submission of a final report **after completion** of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.

Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....
DR. CYNTHIA BANNERMAN
(GHS-ERC CHAIRPERSON)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra

Appendix E: FDA Letter of Confirmation of HBsAg Test kits

Food and Drugs Authority

Head Office
P. O. Box CT 2783,
Cantonments, Accra-Ghana
Tel: (+233-302)233200, 235100
Fax: (+233-302)229794, 225502
Email: fda@fdaghana.govgh

FDA/MCH/MDD/DU2/18/0470

21st May 2018

Mr. Phillip Apraku Tawiah
School of Public Health
University of Ghana
Legon

Tel: 0242164519
Email: phyllipoo27@gmail.com

Dear Phillip,

RE: APPLICATION FOR A LETTER OF CONFIRMATION OF SD BIOLINE HBsAg RAPID DIAGNOSTIC TEST KITS

This is to acknowledge receipt of your letter submitted to the Food and Drugs Authority (FDA) on April 18, 2018 requesting for a confirmation letter on SD Bioline HBsAg test kits to be used in your research.

The content of your letter has been noted.

The SD Bioline HBsAg test kit is duly registered with the Authority and can be used for your project.

Yours Sincerely,

DELESE A. A. DARKO (MRS)
CHIEF EXECUTIVE OFFICER

Page 1 of 1