KNOWLEDGE, ATTITUDES, AND PRACTICES TOWARDS HEPATITIS B INFECTION AMONG HEALTHCARE WORKERS AT AIC KIJABE HOSPITAL

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A Thesis Submitted to the Institute of Postgraduate Studies of Kabarak University in Partial Fulfilment of the Requirements for the Award of Master of Medicine in Family Medicine

KABARAK UNIVERSITY

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DECLARATION

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Fredrick Ochieng' Ogada

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The Thesis entitled "**Knowledge, Attitudes and Practices towards Hepatitis B Infection among Healthcare Workers at AIC Kijabe Hospital"** written by **Fredrick Ochieng' Ogada** is presented to the Institute of Postgraduate Studies of Kabarak University. We have reviewed the thesis and recommend it be accepted in partial fulfillment of the requirements for the award of degree of Master of Medicine in Family Medicine

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DEDICATION

This thesis work is dedicated to four important categories of persons in my life. First and foremost, to my parents, to start with, my late father, Vincent, even though you are no longer of this world your words of encouragement and push for academic excellence still ring in my ears to date. Equally, I dedicate it to my mother, Felgona, you have always been on my side encouraging me and praying with me since my childhood. Second, I dedicate this work to my elder sister Seraphine together with your husband, thank you for your generosity and inspiration. You forever remain special in my heart. Third, I dedicate this thesis to my other siblings, Ben, David, Geoffrey, Charles, Joseph, Teresa, and Francis, you have been my greatest cheerleaders. Finally, this work is dedicated to all the patients across the country living with chronic hepatitis B infection and others living with all sorts of chronic liver diseases. God is faithful and he will see you through your illnesses!

ABSTRACT

Hepatitis B (HBV) infection is a public health burden worldwide. In its chronicity, the infection causes chronic liver diseases that can be fatal. In Kenya, the prevalence of HBV infection has been increasing despite the availability of the HBV vaccine. However, there is a paucity of data regarding HCWs' knowledge, attitudes, and practices on HBV infection. This study aimed to investigate healthcare workers' knowledge, attitudes, and practices in managing chronic hepatitis B infection. This was a descriptive cross-sectional survey at Kijabe Hospital. It included 254 out of the 350 frontline healthcare workers thus a 73% response rate. Informed consent was obtained from all the participants. Ethical approval from KUREC (KUREC- 090323), KHERC (KH/ISERC/02718/0054/2023), and a research license from NACOSTI (NACOSTI/P/23/24856). Data were collected using self-administered questionnaires and analysed using STATA v18. Variable associations were determined using a chi-squared test, with statistical significance set at $p<0.05$. The correlation between the dependent variables is determined by Spearman's correlation coefficient. About 80.3% were aged between 25 and 35 years, 65.4% of all the respondents being females. Most of the respondents were diploma holders with most serving in OPD and critical care areas. Only 39.37% had high-level knowledge, while 81.89% had a good attitude, and only 3.54%, had good practices. Knowledge was found to have a significant association with age (p=0.047), level of education (p=0.001), cadre (p=0.001), and service department (p=0.001). Spearman's rank correlations showed a weak positive correlation between knowledge and attitudes (r=0.0939, p=0.1354) and a weak negative correlation between Knowledge-Practices (r=-0.1553, p=0.0132) and Attitudes- Practices (r=-0.0235, p=0.7089). Most participants had a moderate level of knowledge, good attitudes, and poor practices towards HBV infection. We recommend regular training to help improve HCWs' KAP at Kijabe Hospital.

keywords: *Hepatitis B, Health Knowledge, Attitude, Practice, Prevalence*

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ABBREVIATIONS AND ACRONYMS

AIC:	African Inland Church
ALT:	Alanine Aminotransferase
APRI:	AST to Platelet Ratio Index Score
AST:	: Aspartate Aminotransferase
CHBI:	Chronic Hepatitis B Infection
CME:	Continuing Medical Education
DRC:	Democratic Republic of Congo
ECO:	Emergency and Critical Care Clinical Officer
HBeAg:	: Hepatitis B e-Antigen
HBV DNA:	Hepatitis B Virus Deoxyribonucleic Acid
HBV:	Hepatitis B Virus
HCC:	Hepatocellular Carcinoma
HCV:	Hepatitis C Virus
HCWs:	Healthcare Workers
HDU:	High Dependency Unit
HIV:	Human Immunodeficiency Virus
ICU:	Intensive Care Unit
IgG:	: Immunoglobulin G
IgM:	Immunoglobulin M
IPGS:	Institute of Post-Graduate Studies
IVDU:	Intravenous Drug Users
KAP:	Knowledge, Attitudes and Practices
KEPI:	Kenya Expanded Program on Immunization
KHERC:	Kijabe Hospital Ethics and Research Committee
KUREC:	Kabarak University Research Ethics Committee
MSM:	Men Who Have Sex with Men
MTCT:	Mother to Child Transmission
NACOSTI:	National Commission of Science, Technology and Innovation
NSI:	Needlestick Injury
OBGY:	Obstetrics and Gynaecology
OPD:	Outpatient Department
PCR:	Polymerase Chain Reaction

PECO:	Paediatrics Emergency and Critical Care Clinical Officer
PEP:	Postexposure Prophylaxis
Ph.D.:	Doctor of Philosophy
SDC:	Socio-Demographic Characteristics
SDGs:	Sustainable Development Goals
ULN:	Upper Limit Normal
WHO:	World Health Organisation

OPERATIONAL DEFINITION OF TERMS

Attitudes: This study defines attitudes as healthcare workers' way of thinking about HBV. It is classified as good, moderate and poor concerning the score of HCWs' responses i.e., 62% and below, 63%-75% and 76% and above respectively.

Chronic Hepatitis B infection: A form of hepatitis B virus infection that persists in the blood of the infected individual for six months or more. The risk of developing this form of infection is directly related to the age of the individual at the time of exposure i.e., the younger the person, the greater the risk.

Healthcare Worker: This term is used in this study to refer to the frontline clinical staff who regularly diagnose and administer treatment for infectious diseases. They are clinical officers, emergency and critical care clinical officers, medical officers, residents (registrars), consultants, as well as nurses.

Knowledge: Awareness or familiarity with something gained by experience or education. Its levels are classified in this study as high, moderate and low, based on scores from respondents i.e., 55% and below, 56%-76% and 77% and above respectively.

Practices: Used in this sense to mean how care is given to patients and also to imply the self-care skills of HCWs. This study classifies HCWs' practices as good, moderate and poor based on the scores of the HCWs' responses, namely: 62% and below, 63%-75% and 76% and above respectively.

CHAPTER ONE

INTRODUCTION

1.1 Overview

According to the World Health Organization (2017), Hepatitis B infection has for a long time remained a public health concern globally. In Kenya, the prevalence of HBV infection increased four-fold between 2016 and 2021. It is thus necessary to establish whether this situation lies in the healthcare workers' capacity or not. This study was therefore aimed at establishing the healthcare workers' knowledge, attitudes, and practices on HBV infection at AIC Kijabe Hospital. This chapter focuses on the background of the study and the problem statement. Besides, it illustrates the study's justification and explains the purpose of the study. Not least of all, it enumerates the study objectives and research questions. Finally, the chapter demonstrates the significance of the study and identifies the foreseen study limitations and delimitations.

1.2 Background to the Study

The Hepatitis B virus is a member of the *Hepadnaviridae* family. It infects the liver, causing a large scope of liver diseases ranging from acute hepatitis infection (including fulminant liver failure), chronic hepatitis infection, and liver cirrhosis, to liver cancer chiefly hepatocellular carcinoma (HCC) (Liang, 2009). Two-thirds of people with acute hepatitis infection, usually have a mild, asymptomatic, and subclinical illness that often resolves spontaneously and unnoticed; whereas, one-third have clinical signs and symptoms of hepatitis ranging from mild (fatigue and nausea) to marked symptoms, jaundice, and rarely to acute liver failure (Guvenir & Arikan, 2020). On the other hand, chronic hepatitis B infection (CHBI) can progress to liver cirrhosis and liver cancer (Liaw & Chu, 2009). Developing CHBI however, depends on the age of an individual at

the acquisition of the infection. For instance, neonates and infants below 5 years have a 90-95% chance of developing CHBI whereas adults and adolescents only have a low chance of up to 5% (Tang et al., 2018).

Hepatitis B virus is transmitted through exposure to infected blood and body secretions. In Sub-Saharan Africa, horizontal transmission among children aged between six months and five years is observed commonly due to their close contact with infected households and playmates (Spearman et al., 2017). Vertical (mother-to-child) transmission is common in areas of high endemicity for HBV infection (WHO, 2015) and HBV-HIV coinfection increases the risk of mother-to-child transmission (Spearman et al., 2017. In addition, a study by Karoney et al. (2020) in the western part of Kenya revealed that sexual activities present the highest risk for HBV infection followed by traditional practices such as tattooing, traditional marking, and traditional circumcision.

According to the global report by the World Health Organisation [WHO] (2017), viral hepatitis caused 1.34 million mortalities globally. Out of these, 96% were due to hepatitis B and C viruses. Moreover, in the same report, 257 million people are estimated to live with chronic hepatitis B infection (CHBI) globally. The prevalence of chronic Hepatitis B infection has since increased to 296 million with an estimated annual new infection of 1.5 million and another estimated 820,000 deaths in 2019 alone, largely from cirrhosis and hepatocellular carcinoma (WHO, 2022). In most sub-Saharan countries, HBV infection is hyperendemic in the immunocompetent population (Zampino et al., 2015). In consonance with this, Kenya for instance had an HBV infection prevalence of 8.54% by 2021 (Kafeero et al., 2021). In addition, more than 33% of patients presenting with jaundice in Nairobi have HBV infection (Ochwoto et al., 2016).

Identification and appropriate treatment of CHBI reduce the risk of liver cirrhosis and HCC. Hence appropriate clinician management can have a significant impact on

patients' outcomes. Nonetheless, the literature suggests health care workers have an average or little knowledge about the treatment and prevention of hepatitis B infection (Mursy & Mohamed, 2019; Hang-Pham et al., 2019). In Asia, a study conducted in Vietnam reported significant knowledge gaps in all aspects of HBV infection including transmission, risk of developing CHBI, and treatment as well as a significant level of unsafe practices towards prevention of HBV transmission among HCWs (Hang-Pham et al., 2019). In the Middle East, a Saudi Arabian study by Elbur et al. (2017) showed multiple knowledge gaps and several misconceptions in attitudes and practices among HCWs, however, the level of knowledge of the disease was classified as satisfactory. Whereas in Sudan, there was a low level of knowledge and poor practices towards HBV prevention and treatment (Bakry et al., 2012), in Rwanda there was adequate knowledge and good practices towards HBV but inappropriate attitudes among nursing students (Umuhoza., et al 2021). The available Kenyan literature, however, reports HCWs' vaccination uptake (Kisangau et al., 2018) and KAP and vaccination uptake among students of medical training college and not qualified HCWs (Maina & Bii, 2020). Concerning this, this study proposed to establish the level of knowledge, attitudes, and practices towards HBV infection among various cadres of qualified frontline HCWs at AIC Kijabe Hospital, Kenya.

1.3 Statement of the Problem

Hepatitis B Virus infection has been and remains a major public health challenge worldwide (WHO, 2017). In Kenya, the prevalence increased from 2.1% in 2007 (Ly et al., 2016) to 8.54% in 2021 (Kafeero et al., 2021). Additionally, in some rural areas, especially among the nomadic pastoral communities, HBV infection is considered hyperendemic with children aged between five and ten years being most affected (Mutuma et al., 2011). In Nairobi, over 30% of patients presenting with jaundice have

HBV infection (Ochwoto et al., 2016). Moreover, there is a strong association between HBV and HCC which happens to be a major driver of mortality. For instance, Mutuma et al. (2011) reported that at least 70% of all HCC cases in Kenya had CHBI.

Studies agree that desirable levels of knowledge, attitudes and practices among HCWs reduce the prevalence of HBV infection among the general population. For instance, in Jordan the prevalence of HBV reduced from 9.9% to 2.4% with strict adherence to HBV vaccination (Nusair et al., 2023). In contrast, the prevalence and prognosis of HBV infection have remained relatively high and poor respectively despite the available set of interventions in Kenya. These interventions include affordable, reliable, and timely laboratory diagnosis, adequate vaccine uptake, and effective clinical management (Su et al., 2022). The role of Healthcare Workers (HCWs) in the effective implementation of the interventions as well as the availability of adequate infrastructure cannot be overemphasized. The available literature is silent on whether the problem lies with the capacity of HCWs or with the infrastructural insufficiency of the healthcare system in Kenya. Moreover, the few available studies report the rate of vaccination uptake among HCWs (Kisangau et al., 2018) and medical training college students (Maina & Bii, 2020) but do not assess the HCWs' KAP towards HBV infection fully. In this connection, this study aimed at establishing the level of knowledge, attitudes, and practices towards HBV infection among different cadres of the frontline HCWs at AIC Kijabe Hospital and not just vaccination.

1.4 Justification of the Study

The Hepatitis B Virus causes a serious infection which in its chronic form transforms into advanced liver diseases, mainly liver cirrhosis and liver cancer which are fatal (Mutuma et al., 2011). Furthermore, the risk of developing CHBI is dependent on the

individual's age at acquisition therefore children between zero and five years are at a higher risk compared to older children, adolescents and adults. (Jonas et al., 2016). Literature reports higher seroprevalence of chronic hepatitis B among HCWs in Africa, especially sub-Saharan Africa, than in Asia (Maamor et 2022). This could be due to poor knowledge among the HCWs. This is justified by a study done among HCWs in Nigeria by Qin et al (2018) and another one among HCWs in Sierra Leone by Dayyab et al (2020), both of which showed that there exists poor knowledge of HBV infection among the mentioned study subjects.

Besides, among the general population in Kenya, the prevalence of chronic hepatitis B infection has continued to rise since 2016 (Kafeero et al., 2021). Healthcare workers are expected to ensure healthy lives and promote well-being for all persons at all ages according to the sustainable development goals (SDGs) set to be achieved by 2030. This can be aided by reducing the rate of new HBV infections and ultimately eradicating it by 2030 according to WHO (2022). In its effort to eradicate viral hepatitis WHO aims to reduce viral hepatitis related mortality by 65% and new infections by 90%. One of the pragmatic approaches to this is to assess the level of knowledge, attitudes and practices of the HCWs to know the current situation. However, little is known about HCWs' level of knowledge, attitudes, and practices towards HBV infection in Kenya.

Making early diagnoses and initiating timely treatment for all diseases including CHBI among the HCWs in Kenya as well as their counterparts across the world will be proof of efforts to achieve goal 3 of the SDGs. This is achievable by encouraging proper knowledge, attitudes, and practices among HCWs towards any disease management. In this regard, there is a great need to understand the level of knowledge, attitudes, and practices of the Kenyan HCWs towards HBV infection to help establish their baseline.

This study employed a cross-sectional design owing to the design's nature of capturing information as is at a point in time. Thus, it aided in establishing HCWs' knowledge, attitudes, and practices at the time of study. Additionally, AIC Kijabe Hospital, the study site is a teaching and referral facility which helped establish the level of knowledge, attitudes, and practices on HBV infection imparted to learners as well as that which is employed in treating patients from various parts of the country.

1.5 Purpose of the Study

To establish the level of knowledge, attitudes, and practices among HCWs towards HBV infection at AIC Kijabe Hospital.

1.5.1 Specific Objectives of the Study

The following were the specific objectives of the study;

i. To assess the level of knowledge on transmission, diagnosis, treatment, and prevention of HBV infection among HCWs at AIC Kijabe Hospital
ii. To determine the attitudes of HCWs towards HBV infection at AIC Kijabe Hospital
iii. To establish the practices employed by HCWs in the management of HBV infection at AIC Kijabe Hospital

1.6 Research Questions

The following are the research questions guiding this study;

i. What is the level of knowledge on transmission, diagnosis, treatment, and prevention of HBV infection among HCWs at AIC Kijabe Hospital?
ii. What are the attitudes of HCWs towards HBV infection at AIC Kijabe Hospital?

iii. What are the various practices employed by HCWs towards the management of HBV infection at AIC Kijabe Hospital?

1.7 Significance of the Study

This study identified the current situation at AIC Kijabe Hospital in terms of knowledge, attitude, and practices. The data obtained is expected to provide insights into areas that need addressing to improve HCWs' approach to CHB infection. For instance, improving their knowledge and practices as well as maintaining their good attitudes.

1.8 Limitations and Delimitations of the Study

This study was limited and delimited by the factors as illustrated.

Table 1

Limitations and Delimitations of the Study

Limitations	Delimitations
The study's findings may be limited by a relatively small sample size from a single hospital which may impact the generalisability of the results to a broader HCW population.	The study exclusively examined KAP related to HBV infection. it does not include other bloodborne infections or broader infection control practices that healthcare workers often encounter.
The design was cross-sectional which only allows for assessment of associations but not causal relationships.	The findings of this study are from the context of a single hospital. Therefore, the differences in healthcare policies, resources and practices in different hospitals across the country may impact its generalisability.
The study relied on the self-reported data from HCWs which may have introduced response bias and underreporting of sensitive or socially desirable behaviours, affecting the accuracy of the gathered information.	The study particularly focused on the level of KAP among HCWs towards HBV infection at AIC Kijabe Hospital. this could restrict its applicability to HCWs in other hospitals with varied healthcare settings and resources.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter gives an overview of hepatitis and briefly describes its causes. Subsequently, it elaborately highlights HBV infection; its lifecycle, types, various modes of transmission, ways of diagnosis, treatment, and prevention. Moreover, it compares the situation of the level of HCWs' knowledge, attitudes, and practices towards HBV infection around the world. Lastly, the chapter outlines the theoretical framework employed and its application to this study as well as the conceptual framework where the interaction of variables used in the study is explained.

2.2 Overview of Hepatitis

According to Devarbhavi et al (2023), liver diseases are a public health threat globally and account for an estimated over 2 million deaths annually. In their paper, Devarbhavi et al (2023) argued that liver diseases are the tenth-leading cause of death in Africa, and two-thirds of liver-related mortalities usually occur in men. Liver diseases include cirrhosis, viral hepatitis and HCC.

Hepatitis is a general term for an inflammation of the liver tissue and is commonly caused by viral infection globally (Razavi, 2020). Other causes of hepatitis include excessive alcohol consumption, certain pharmacological agents e.g., paracetamol, autoimmune disorder, and toxins (Junaidi & Di Bisceglie, 2007). Viral hepatitis can be caused by infection from five different types of viruses, namely: Hepatitis A Virus (HAV), Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Hepatitis D Virus (HDV) and Hepatitis E Virus (HEV). Both Hepatitis A and E are transmitted through ingesting

contaminated foods or water while Hepatitis B, C, and D are transmitted through exposure to contaminated body fluids and blood. (Shapiro, 1994).

2.2.1 Alcoholic Hepatitis

This type of hepatitis is caused by continuous and heavy consumption of alcoholic drinks. In the order of events in the pathogenesis, hepatitis (inflammation) comes after fatty changes in the liver and is usually succeeded by fibrosis and ultimately cirrhosis (Hosseini et al., 2019). Alcoholic liver disease, which encompasses alcoholic hepatitis is mostly associated with high morbidity and mortality both in the short and long term (Sehrawat et al., 2020). Discontinuation of alcoholic drink consumption is paramount in treating this disease.

2.2.2 Drug-Induced Hepatitis

The liver sometimes reacts with certain pharmacological agents, and herbal and nutritional supplements in certain susceptible individuals. Susceptibility of these persons is often due to the environmental and genetic risk factors which are unique to them and usually modify the metabolism and excretion of the causal agent leading to injury and inflammation of the liver (Katarey & Verma, 2016). This form of liver injury is uncommon but often severe and can be fatal, being the leading cause of acute liver failure, avoiding the causative agent usually supports healing and is thus vital (Andrade et al., 2019).

2.2.3 Autoimmune Hepatitis

This is an immune-mediated chronic liver inflammation which affects genetically predisposed persons including children globally (Komori, 2020). It usually responds to corticosteroids and immunosuppressants such as Azathioprine or Mycophenolate Mofetil. The latter is of use if there is treatment failure with the former (Sucher et al.,

2019). In children, it should be suspected among those with acute or severe liver disease since the presentation usually varies (Pathak & Kamat 2018).

2.2.4 Viral Hepatitis

This is the commonest cause of hepatitis and the viruses responsible for this are classified into five groups namely: A, B, C, D and E. Viral hepatitis is considered a public health burden worldwide with varying endemicity across the globe. For instance, in India, only hepatitis A is hyperendemic, especially among children, whereas hepatitis B and E have intermediate endemicity of 2-4% with hepatitis C being only 1% prevalent (Satsangi &Chwala 2016). The situation in the United States is different since it registered an increased death toll from hepatitis C (HCV) which was considered beyond the deaths caused by HIV (Ly et al., 2012). These mortalities commonly arise from HCC, a majority of whose cases are found in sub-Saharan Africa as well as Northern Asia and often 80-90% of cases are attributable to HBV and HCV (El-Serag, 2012).

Since the number of deaths due to HCV increased in America, the country still accounts for fewer deaths (less than 10%) compared to Asia which accounts for 74% of mortalities from HCC worldwide emanating from HBV and HCV (Cooke et al., 2019). In their study, Cooke et al (2019) disclosed that sub-Saharan Africa had a CHBI prevalence of between 6.1% and 8.8% with an estimated 80 million persons having CHBI.

In the sub–Saharan Africa, different variants of viral hepatitis exist at various prevalences. For instance, in general, HEV has been reported to emerge with a mortality rate that has risen to between 1 and 2 per cent as well as accounting for 50% of all outbreaks in refugee and Internally Displaced Persons (IDP) camps (Bagulo et al., 2020).

Additionally, in Uganda, the prevalence of HCV stands at 7.8% (Nankya-Mutyoba et al., 2021).

In their Kenyan study conducted at the national and referral hospital, Muchiri et al (2012) agreed that viral hepatitis is the most common cause of hepatitis. In this study, most persons who had hepatitis when tested turned positive for either of the variants of hepatitis viruses. Furthermore, HBV alone carries a significant burden in Kenya (Makokha et al., 2023) and remains the main variant of viral hepatitis infecting most individuals in the Kenyan coastal town of Mombasa (Ochieng'Kasera et al., 2021).

2.3 Hepatitis B Virus Infection

Hepatitis B virus infection is caused by HBV, a life-threatening liver infection. Upon entry into the body, HBV infects the liver cells (also known as the hepatocytes) of humans and some other non-human primates (Herrscher et al., 2020). In their paper, Herrscher et al (2020) stated that in the blood, HBV has an infectious form called the Dane particle which contains a partially double-stranded circular DNA. The Dane particle is what was later named the Hepatitis B surface Antigen (HBsAg) (Tang 2019).

The infection is transmitted through percutaneous or mucosal exposure to infected blood or other infected body fluids such as semen, ascitic fluid, etc. Individuals infected with the Hepatitis B virus can develop either acute hepatitis B infection (including fulminant liver failure) or chronic hepatitis B infection. Of note, chronic hepatitis B infection often leads to cirrhosis, and liver cancer, mainly, hepatocellular carcinoma (HCC) (Liang, 2009).

2.3.1 Lifecycle of Hepatitis B

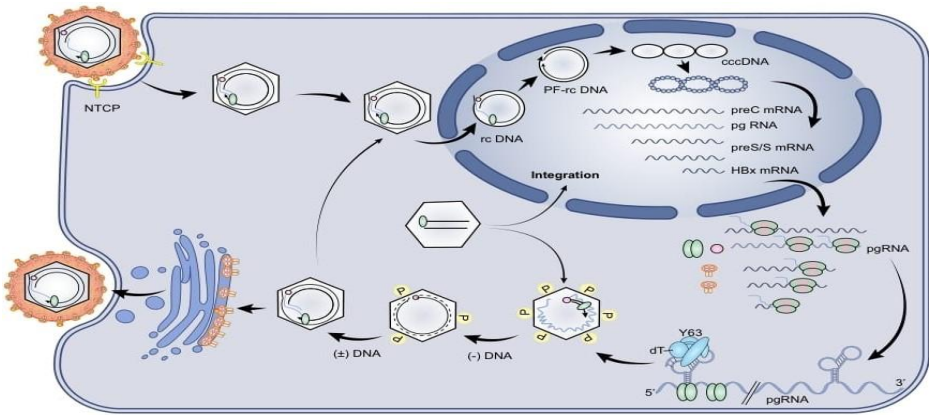
According to Tang (2019), HBV is a hepatotropic virus and its entry into the hepatocytes is mediated by the surface proteins. In their paper, Tang (2019) reports that the preS1

domain of the surface proteins plays a crucial role in the binding and entry process. The virus then enters the hepatocyte through the sodium tourocholate cotransporting polypeptide (NTCP also known as SLC10A1) (Tong & Revill, 2016). After that, the virus attacks the core of the cell converting viral DNA (vDNA) to covalently closed circular DNA (cccDNA) which usually contains the instructions for viral replication as depicted in Figure 2.0. (Chuang et al., 2022). At this stage, the newly enhanced cell structure is then prepared to replicate and infect more cells. Additionally, cccDNA, known for its role in viral replication, remains after an individual recovers from an acute HBV infection and thus the infection can reactivate under conducive situations (Herrscher et al., 2020).

This stage is also signified by the fact that if an individual has a strong immunity at the time of the infection, their body produces antibodies to bring viral load under control and clear an acute HBV infection. (Tong &Revill, 2016). This explains why some individuals infected by hepatitis B recover spontaneously and unnoticed (Tang, 2019). On the other hand, individuals with compromised immunity do not easily clear the infection in this manner. They therefore develop CHBI which attacks the liver causing cirrhosis, cancer and ultimately death (Wilkins et al., 2019).

Figure 1

HBV Lifecycle



Note. This figure demonstrates the lifecycle of the hepatitis B virus. Adapted from "Overview of Hepatitis B Viral Replication and Genetic Variability," by S. Tong and P. Revill, 2016, Journal of Hepatology, 64(1), p.S4-S16. https://doi.org /10.1016/j.jhe p.2016.01.027. Copyright 2016, European Association for the Study of the Liver.

According to Tong and Revill (2016), the Hepatitis B virus enters hepatocytes through binding of L-HBsAg to sodium taurocholate cotransporting polypeptide (NTCP) and binding of S-HBsAg to heparan sulphate proteoglycans (HSPG) on the hepatocyte cell membrane. Subsequently, the nucleocapsid is released and transported into the nucleus where uncoating takes place. Relaxed circular DNA (rcDNA), sometimes referred to as viral DNA, is then released from the nucleocapsid into the nucleus of the hepatocyte. The released rcDNA is then converted to cccDNA which serves as the template for viral transcription. The cccDNA is subsequently transcripted to HBVRNAs whose translation results in the production of HBeAg, core protein, a P protein, L-HBsAg, M-HBsAg, S-HBsAg and HBx protein. P protein-mediated reverse transcription and synthesis of HBV minus (-) strand DNA then follows, here, the template is pgRNA. HBV plus (+) strand DNA is synthesised to give rise to rcDNA after the degradation of pgRNA. The mature core particles are then enveloped to be either released as virions or transported to the nucleus to generate more cccDNA. This is shown in Figure 1.

2.4 Acute and Chronic Hepatitis B Infections

Acute hepatitis B infection occurs ninety days after exposure (Bartholomew & Lee, 2018). Since acute viral hepatitis B infection is asymptomatic a majority of the time, sometimes it presents with symptoms which usually appear about 1 to 4 months after infection. These symptoms include nausea, abdominal pain, emesis, loss of appetite, yellowing of eyes and skin (called jaundice), fever, diarrhoea, and malaise (Liang, 2009). Moreover, 30% of adults with acute infection will have jaundice and hepatitis whereas 0.1-0.5% will develop fulminant liver failure (Kao, 2008).

Chronic hepatitis is defined as the persistent positive serum HBsAg test in an individual for more than six months from its first detection (Wilkins et al., 2019). Most primary liver cancers and cirrhosis according to Perz (2006), are attributable to HBV and HCV infections. However, HBV leads to more cases of HCC and liver cirrhosis. For instance, in his study, Perz (2006) reported that a majority of individuals with cirrhosis and HCC were HBsAg positive. The progression of HBV infection to its chronic form depends on the age of an individual when they acquire the infection (Aspinall et al., 2011). Often, if acquired in adulthood, there is a lower risk of progression (approximated to be usually less than 5%) than if acquired in the neonatal period (approximately 90%) by neonates born of mothers who are HBeAg positive and by children below the age of five years. (Tang et al., 2018). The stages of CHBI are listed below: first is the immune tolerance stage which is usually highly contagious and the liver markers AST and ALT are often elevated (Vyas et al., 2017). Second is the immune or active clearance stage which, according to Vyas et al (2017) is characterised by an increase in liver enzymes (AST and ALT) as the body forms antibodies to destroy infected cells. The third stage is the inactive stage where HBV is reduced to very low or undetectable levels. Here the virus remains inactive as long as the immune system stays robust (Shi & Shi, 2009). Finally,

the reactivation stage. This comes as a result of a compromised immune system. The immune system may get compromised under the following circumstances according to Loomba and Liang (2017): to begin with are cancer patients receiving immunosuppressive therapy to treat cancer, secondly are patients or individuals with an underlying autoimmune disorder and lastly are those who have undergone organ transplant. The signs and symptoms are related to acute infection but with the progression of the disease, new symptoms develop such as abdominal distention, early satiety (comes with a swollen liver, especially with HCC), loss of weight, dark urine, itchiness of the body as well as engorged abdominal vessels beneath the skin and an extent of manifestations away from the liver (Mazzaro et al., 2022).

2.5 Transmission of Hepatitis B Infection

Hepatitis B virus is highly infectious. Compared to HIV, it is 100 times more infectious and 30 times more infectious than HCV (Lule & Nyawira, 2012). Multiple risk factors are implicated in the transmission of HBV infection. In Kenya, sexual intercourse remains the leading route of transmission of HBV (Karoney, 2020).

Sexual intercourse here is used to mean unprotected heterosexual and homosexual intercourse including men who have sex with men (MSM). In their study, Aspinall et al. (2011), argued that vertical transmission from mother to child is common in HBV endemic areas, especially among mothers who are HBeAg positive (i.e., in the immune reactive phase). Coincidentally, all hyperendemic areas in Kenya have mother-to-child transmission as the leading route. In their study, Mutuma et al (2011) found that most children aged between five and ten years were positive for HBsAg and this prevalence was noted to decrease with advanced age. This evidence suggests that mother-to-child transmission and (or) early childhood transmission is the most common in these areas.

Sharing of injection or cutting equipment such as needles, syringes, and blades (McMahon, 2009) is a mode seen commonly among individuals injecting intravenous drugs (IVDU) along the Kenyan coast (Webale et al., 2015). Further, certain cultural practices often predispose to the transmission of HBV infection such as tattooing of gums and body, common among Ethiopian nationals. (Belay et al., 2020) along with traditional marks and traditional circumcision found among some Kenyan communities (Karoney, 2020). Needlestick injuries (NSI) encountered during treatment procedures such as suturing, injection, and other surgeries are not uncommon among healthcare workers and also contribute to the transmission of this viral infection (Mbaisi et al., 2013).

2.6 Diagnosis, Treatment, and Prevention of Hepatitis B Infection

The diagnosis of HBV is normally based on an array of clinical, biochemical, histological, and serological findings (Allain & Opare-Sem 2016). Several antigens and their corresponding antibodies can be detected in serum after infection with HBV. The World Health Organisation Guidelines for Prevention, care, and Treatment of persons with CHBI (2015) recommends treatment for individuals with CHBI and clinical proof of compensated or decompensated cirrhosis (or cirrhosis based on Aspartate aminotransferase [AST]-to-platelet ration index [APRI] score of more than 2 in adults) regardless of alanine aminotransferase (ALT) levels, HBeAg status or HBV DNA levels. In addition, adults aged above 30 years with no cirrhosis and have APRI scores less than (or equal to) two (2), with persistently elevated levels of ALT and HBV DNA levels more than 20,000 IU/ml regardless of HBeAg status should also be treated. If an HBV DNA test is unavailable, these individuals should be treated based on abnormal ALT levels alone (WHO Guidelines, 2015). Further, for pregnant women who are HBsAg positive, Aspinall et al. (2011) recommend that it is necessary to check HBeAg and HBV

DNA viral load to differentiate between high and low risk of mother-to-child transmission of HBV and CHBI. Table 2.1 shows the serological and virological markers of HBV infection.

Acute HBV infection has no specific treatment. Fortunately, more than 95% of adult cases with acute Hepatitis B infection normally recover spontaneously and seroconvert to anti-HBs (complete remission of HBV infection) without the need for antiviral therapy (Vlachogiannakos & Papatheodoridis, 2018). The goal of care here often revolves around comfort and nutritional balance including hydration to replenish the water lost from diarrhoea and vomiting. In efforts to slow the disease progression, Aspinall et al. (2011) recommend that it is essential for infected patients to cease cigarette smoking and avoid excessive alcohol intake as well as liver toxic medications such as acetaminophen or paracetamol as these are associated with poor prognosis.

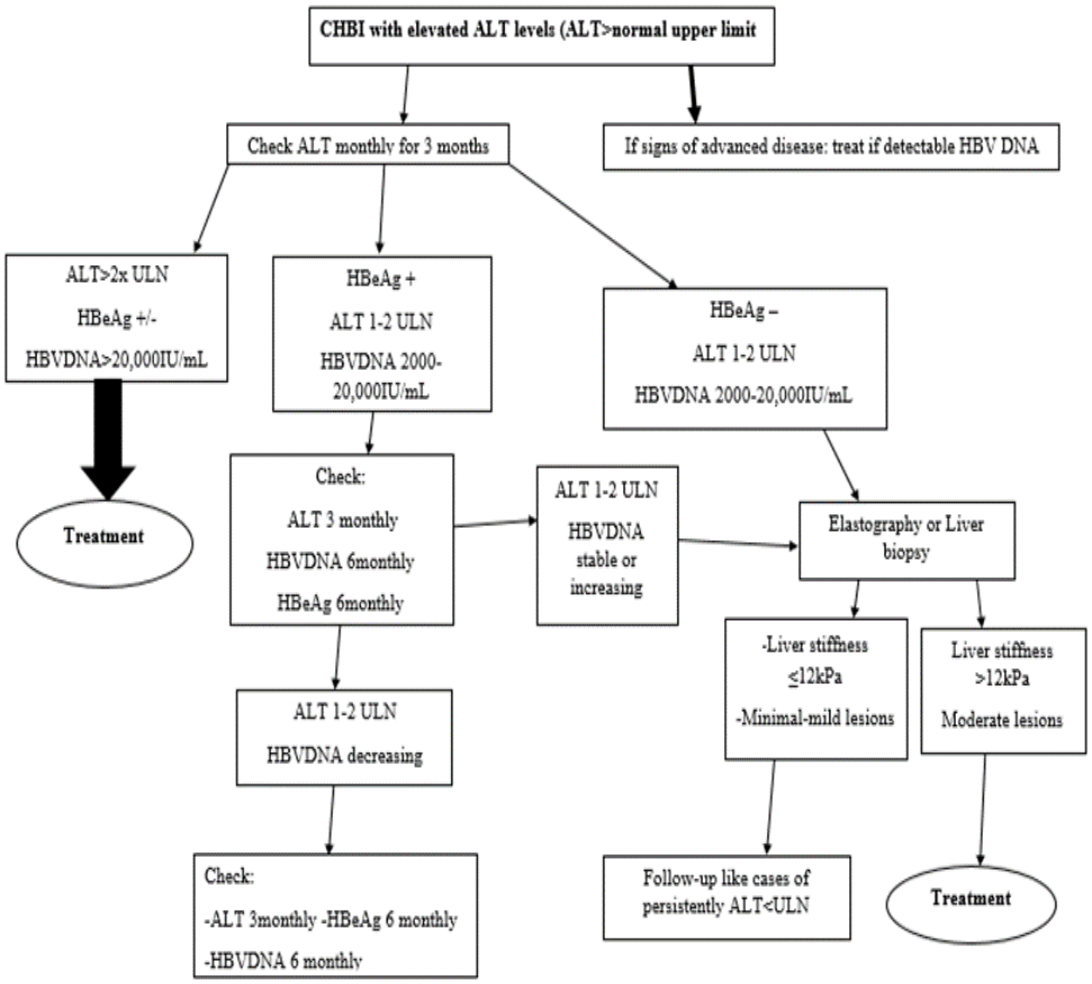
According to WHO guidelines (2015), the treatment of eligible individuals, as mentioned earlier in this section, is usually by antivirals. The commonly used antivirals especially for the treatment of naïve patients are Nucleos(t)ide analogues e.g., Tenofovir and entecavir. Additionally, in most cases, Tenofovir Disoproxil Fumarate (TDF) is used but there also exists tenofovir alafenamide whose potency is equivalent to TDF and is associated with less renal and bone toxicity (Yapali et al., 2014). Guidelines recommend tenofovir for adults and adolescents (aged 12 years and above) and Entecavir for children between 2 and 11 years (Stinco et al., 2021). However, these antivirals do not eradicate the HBV infection, they slow the progression of cirrhosis, reduce the chances of HCC and prolong life (WHO, 2022). Individuals with confirmed cirrhosis continue with treatment for life whereas those with no cirrhosis can stop treatment in HBeAg loss and seroconversion to antiHBe as well as after completion of at least one additional year of

treatment and persistently normal ALT levels as well as persistent undetectable HBV DNA levels (WHO, 2015).

Aspinall et al. (2011) furthermore, recommend that it is necessary for pregnant mothers who are HBsAg positive to check HBeAg and HBV DNA viral load to differentiate between high and low risk of mother-to-child transmission of HBV and CHBI. See Figure 2 and Figure 3 below for approaches of patients with persistently high levels of ALT and those with normal levels of ALT respectively.

Figure 2

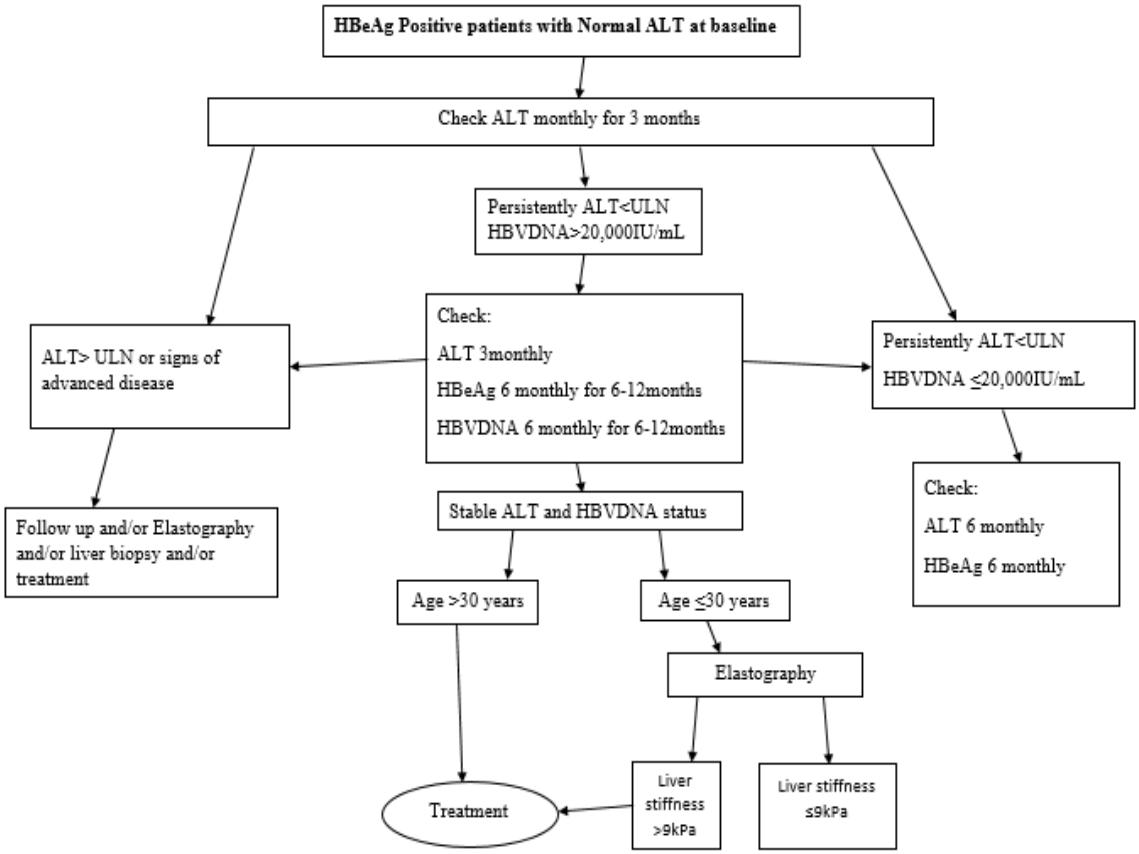
Management of Chronic Hepatitis B with Elevated Baseline ALT Levels



Note. Figure 2 demonstrates the management of patients with chronic HBV infection presenting with elevated baseline ALT levels. Adapted from "Hepatitis B: Who and When to Treat?" by J. Vlachogiannakos and G. Papatheodoridis, 2018, Liver International, 38(S1), p 71-78. Https://doi.org/10.1111/liv.13631. Copyright 2018, John Wiley & Sons A/S.

Figure 3

Management of HBeAg-positive chronic HBV patients with normal baseline ALT levels



Note. Figure 3 demonstrates the management of patients with chronic HBV infection presenting with normal baseline ALT levels. Adapted from "Hepatitis B: Who and When to Treat?" by J. Vlachogiannakos and G. Papatheodoridis, 2018, Liver International, 38(S1), p 71-78. Https://doi.org/10.1111/liv.13631. Copyright 2018, John Wiley & Sons A/S.

Prevention of HBV infection entails pre-exposure vaccination, post-exposure prophylaxis and managing special populations. Pre-exposure vaccination is the best prevention strategy and in Kenya, the hepatitis B vaccine was first introduced as a 3-dose vaccine in 1982 and got assimilated into the Kenya Expanded Program on Immunisation (KEPI) in 2002 (Lule & Nyawira 2012). In addition, the vaccine protects to a rate of between 90% and 95%. It is given in a schedule of 6th week, 10th week, and 14th week of life to children and at 0, 1, and 6 months in older persons (WHO, 2017). However, as

stated in their paper, Lule and Nyawira (2012) recommend that individuals in need of quicker protection (e.g., in the next 48 hours) can get it at 0,7, and 21 days with a booster dose 1 year after the third dose.

Persons who are already in contact with exposures that could transmit HBV such as bite or NSI, mucosal exposure to blood or infectious secretions such as semen and body fluids that contain blood from an infected individual (HBsAg positive) or status unknown should be administered PEP (Schillie et al., 2018). In their paper, Schillie et al (2018) agree that PEP can reduce HBV transmission by 70 to 90 per cent and is usually effective if administered within 12 to 24 hours of exposure. However, persons who recovered from a past infection (anti-HBs and antiHBc positive) do not require PEP. Similarly, the individuals previously vaccinated and are known to have responded to the vaccine (i.e., post-vaccination antiHBs above or equal to 10 million international units/mL as well as those who have an active chronic hepatitis B infection (HBsAg positive) do not require PEP (Chilaka et al., 2020). Hepatitis B virus infection can also be prevented by managing special populations, namely, pregnant mothers to avoid MTCT, prevent sexual exposure by use of condoms and (or) minimising the number of sexual partners, avoiding IVDU and use of sterile instruments for cutting and injections and lastly, healthcare workers to use protective equipment to prevent exposure to splashing blood and body fluids (Trepo et al., 2014).

Table 2

Hepatitis B Virus Serological and Virological Markers and their Respective Meanings

Marker	Meaning
HBsAg	HBV infection; is seen in both acute and chronic infections.
HBeAg	High-level HBV replication and infectivity; a marker for treatment response.
HBV DNA	Level of HBV replication; a primary virologic marker for treatment response.
Anti HBc (IgM)	Acute HBV infection; could be seen in a flare of CHBI.
Anti-HBc (IgG)	Recovered or CHBI
Anti HBs	Recovered HBV infection; a marker of HBV vaccine (shows one is immune to HBV).
Anti-HBe	Low-level HBV replication and infectivity; a marker for treatment response.
Anti-HBc (IgG) and anti-HBs	Past HBV infection.
Anti HBc (IgG) and HBsAg	CHBI.
Anti-HBc and (or) anti-HBs and HBV DNA(PCR)	Latent/occult HBV infection

Note. This table demonstrates Hepatitis B Virus serological and virological markers and their respective meanings. Adapted from "Hepatitis B: The virus and disease," by J. Liang, 2009, Hepatology, 49, P S13-S21. Https://doi.org/10.1002/hep.22881. Copyright 2009, John Wiley & Sons.

2.7 Knowledge of Hepatitis B Virus Infection among Healthcare Workers

The rate at which HCWs' knowledge of HBV infection is overlooked remains alarming worldwide. For instance, in China, some HCWs do not know such important information as HBV infection can lead to liver cirrhosis, liver cancer (Hepatocellular carcinoma), and premature death (Chao, 2010). If HCWs fail to understand the effects of HBV infection, they are likely not to treat HBV infection with the care that it deserves, and they will not take heed of the recommended preventive precautions (Gomes et al., 2019). A study conducted among Saudi Arabian dental students and interns by Al-Shamiri et al. (2018)

argued that there is a dire need for continuous training on HBV infection management to curb the growing lack of adequate knowledge of the infection.

Some parts of the world are doing well in terms of knowledge of HBV infection among HCWs. An example is Italy where a larger proportion of HCWs are aware of the HBV vaccine (La Torre et al., 2017). This is almost a similar case in Turkey, where most HCWs have moderate knowledge of HBV infection (Cekin et al., 2013). Conversely, in India a significant portion of the HCWs were reported to be unaware of their vaccine statuses and thus unaware of the importance of taking the HBV vaccine (Sukriti et al., 2008). However, the HCWs' knowledge regarding the disease and its transmission was indicated as moderate by Siraj and Mahajan (2016) in their study. The situation is different among the Iranian nurses according to Joukar et al. (2017) as most of them were shown to have unsatisfactory knowledge about HBV infection.

The situation, in Africa is worrisome as in most cases HCWs lack adequate knowledge about HBV infection. For instance, in West Africa, HCWs in Cameroon have suboptimal knowledge about HBV infection (Tatsilong et al., 2016). Similarly, only a handful of Senegalese medical practitioners understand that the hepatitis B vaccine can safely be administered to pregnant women additionally, medical practitioners older than 40 years and general practitioners were shown to contribute to a large number of HCWs with poor knowledge about HBV infection (Jaquet et al., 2017). Comparably, Sierra Leone suffers a similar setback as most HCWs have insufficient knowledge about HBV infection thus registering a poor hepatitis B vaccine uptake (Qin et al., 2018). Finally, despite having better knowledge about HBV infection, Kesieme et al (2011) revealed that some of the Nigerian HCWs were unaware that the HBV vaccine exists.

Likewise, in Eastern Africa, HCWs' knowledge about HBV infection is still considered scanty. This is exemplified in the study by Bakry (2012) which noted that the Sudanese HCWs tend not to recognise their occupational risk following HBV infection. The Ethiopian HCWs exhibiting similar characteristics as their Sudanese counterparts were shown to have low knowledge about HBV infection with some not aware of the existence of the infection and the vaccine against it (Abeje & Azage, 2015).

In the East African Community, the level of HCWs' knowledge regarding HBV infection is equally low and needs improvement. For instance, in Rwanda, Kateera et al (2015) noticed that regardless of the HCWs' HBV seroprevalence of 2.9%, there was inadequate knowledge of HBV preventive measures, for example, 4.5% of the HCWs ever got HBV vaccination with only 0.8% completing the recommended 3 doses. In Tanzania, on the other hand, Shao et al (2015) established an inadequate knowledge of HBV infection among HCWs. A study conducted by Shah et al (2020) among HCWs across Africa (Kenya included) revealed that the West African HCWs were more aware of their HBV serostatus compared to their East African counterparts.

While studies give concrete evidence that all HCWs across the globe are highly susceptible to HBV infection (Suckling et al., 2006), little is known about the level of knowledge of HBV infection in Kenya. For this reason, this study is aimed at assessing the level of knowledge of HBV infection among HCWs at AIC Kijabe Hospital, Kenya.

2.8 Attitudes of Healthcare Workers towards Hepatitis B Virus Infection

Attitudes can have a great influence on behaviour and often can change depending on the factors surrounding an individual (Cherry, 2018). In this regard, HCWs need to have a positive attitude as this heightens their good relationships with patients and by so doing, enhances patient care (Malinowska-Lipień et al., 2021). However, in most cases, people

have had misconceptions about certain disease entities including HBV infection. To illustrate this, Jin et al (2020) in their study demonstrated that participants had wrong beliefs such as having a healthy diet and lifestyle as well as maintaining a positive mood can protect people from HBV infection.

In reviewing stigma, according to their study, Jin et al (2020) observed that a great majority of their respondents believed that people living with HBV infection must never be employed in eateries like restaurants or even be allowed to work in childcare centres since they thought this was a way to prevent the spread. In addition, the Australian study also showed that participants believed that screening for HBV should be a prerequisite to job recruitment so that those found infected do not get employed to curb transmission of the said viral infection. Similarly, Van Der Scheun et al (2019) unveiled that some Indian HCWs feared treating HBV patients and thought that such patients "had what they deserved". In this qualitative study, HCWs felt that HBV was acquired from immoral behaviour which was defined as having multiple sexual partners and self-injection of intravenous illicit drugs. These are beliefs that can negatively influence healthcare workers' attitudes.

The general global picture of HCWs' attitudes towards HBV infection is positive. For instance, Liu et al (2018) described the Chinese HCWs' attitudes as positive. The same case was seen in a Saudi Arabia study by Al-Hazmi (2015) and Kuwait (Habiba et al., 2012).

In Africa, the situation is the same as most countries record positive attitudes among HCWs towards HBV infection. In West Africa, for example, Botchway et al (2020) reported positive attitudes towards HBV infection among Ghanaian HCWs. Similarly, Samuel et al (2009) noted a positive attitude among Nigerian HCWs towards HBV

infection. However, there have been a few reported cases of negative attitudes and stigma among West African HCWs which can influence the management of HBV infection. In Cameroon for instance, generally, there is a poor attitude towards HBV infection, but nurses were noted to have greater levels of stigma compared to the doctors (Akazong et al., 2020).

The East African situation is largely similar since most HCWs exhibit positive attitudes towards HBV infection. For example, in a study done among Ugandan HCWs by Ojara et al (2021), most of the HCWs were shown to have positive attitudes towards HBV infection. Aaron et al (2017) agree with their Ugandan counterpart by also reporting positive attitudes towards HBV infection among Tanzanian HCWs. On the contrary, a handful of studies from the East African region have reported negative attitudes among HCWs. For instance, in line with Umuhoza et al (2021), 96% of nursing students were shown to have poor attitudes towards HBV infection.

In their study, Setia et al (2013) observed that most HCWs' attitude correlates with their knowledge. Thus, HCWs who have good knowledge of HBV infection are most likely to also have positive attitudes toward the same and vice versa. In agreement with this, Jaquet et al (2017) in their study among HCWs found that those who had negative HBV screening attitudes also had a correlating poor knowledge.

In Kenya, the information about the HCWs' attitudes towards HBV infection is scanty. There are a few studies reporting attitudes towards certain elements in managing HBV infection rather than giving the attitudes towards the infection itself. For instance, A study done by Maina and Bii (2020) among the Kenya Medical Training College (KMTC) students only showed that they had positive attitudes towards HBV vaccination. Moreover, this study was on students and not on qualified HCWs. This particular study

is, therefore, set to determine the attitudes of the HCWs towards HBV infection at AIC Kijabe Hospital, Kenya.

2.9 Practices of Healthcare Workers towards Hepatitis B Virus Infection

Healthcare practices are an important part of patient care and are often designed to fit the broader system of their application (Jacobs & Mynatt, 2017). Largely, screening, treatment, and preventive practices are handy in managing HBV infection. Time and again, post-exposure prophylaxis (PEP), hepatitis B vaccination principally for at-risk individuals including HCWs (Akibu et al., 2018 and Malewezi et al., 2016), as well as safe patient handling practices and waste management, create a safe and healthy working environment for both HCWs and patients (Demsiss et al 2018).

Conversely, in various Asian countries, clinical practices among HCWs toward HBV infection are not the best. For instance, only a few HCWs are fully vaccinated against HBV in Saudi Arabia (Alrowaily et al., 2016). In addition, Hang-Pham et al (2019) outline that only 61.3% of HCWs consistently wear gloves when injecting patients and a significant number still recap needles with two hands after administering an injection, a highly risky practice. Furthermore, congruent with the study by Ko et al (2017), some HCWs have poor vaccine uptake giving an excuse for being "too busy".

The African situation is similar to Asia in that most African countries have poor practices despite the high prevalence of HBV infection in most parts. In West Africa, most HCWs have poor practices regarding HBV prevention (Abiola et al., 2016). In the same vein, less than half of HCWs are likely to get vaccinated and of those only 18% complete the recommended full dose (Dayyab et al 2020). In Khartoum Sudan, despite a needlestick injury prevalence of 52%, there still exists 27% of HCWs who have not received hepatitis B vaccination at all and a low hepatitis B vaccine uptake of only 41%

(Mursy & Mohamed, 2019). Additionally, Bakry et al (2012) observed that HCWs in Sudan do not fully acknowledge their occupational risk of HBV infection and that more laboratory technologists and nurses than doctors did not change gloves between patients. Lastly, in Tanzania and the Democratic Republic of Congo (DRC), there is low hepatitis B vaccine uptake respectively (Debes et al., 2016). For instance, in DRC, only 3.8 per cent of HCWs complete the required vaccine dose and 24 per cent get at least one dose (Shindano et al., 2017).

In so much as the prevalence of percutaneous injuries in Kenya is 19 per cent, many HCWs still embrace poor practices towards HBV infection. According to a study done by Burmen et al (2018) in the western part of Kenya, all HCWs exposed to HBV infection get PEP initiated in good time but only half of them complete the recommended period of PEP medication. Besides, there is poor HBV testing and vaccine uptake among these HCWs. On the other hand, In Makueni County, Kenya, as reported by Kisangau et al (2019), despite a vast majority of the HCWs being vaccinated during their medical training, less than half completed the three recommended hepatitis vaccine doses whereas only 4.8 per cent check antiHBs antibody after vaccination. Over and about that, the author argues that the low hepatitis B vaccine uptake could be due to the unavailability of the vaccine, too long duration between vaccine doses, and HCWs forgetting to have their final dose.

In general, studies have shown that improving knowledge plays a major role in the betterment of attitudes and practices. For instance, in a study by Rentala et al (2021), education helps improve knowledge which in turn, improves attitudes and practices at workplaces. Halasz et al (2021) on the other hand, prove that knowledge influences

attitudes and practices. In their study, Halesz et al (2021) report that a low level of knowledge is commonly accompanied by poor attitudes and vice versa.

In conclusion, Nepal has a low HBV infection prevalence of 0.9 per cent This is due to low rates of mother-to-child transmission of HBV infection owing to the low prevalence of active HBV infection in pregnant women (Shrestha & Shrestha, 2012). On top of that, there is a good culture of vaccinating HCWs early in their training and as a result, 74 per cent of HCWs in training get hepatitis B vaccination in college before joining their clinical years (Shah et al., 2016). This would be a good practice if embraced by the whole world. Kenya's situation regarding all practices towards HBV is not known. What is known is only the HCWs' HBV vaccination uptake practices done in a single county in Kenya. This study, therefore sets out to determine HCWs' practices towards HBV infection and help improve the knowledge of HCWs' practices towards HBV infection.

2.10 Theoretical Framework

This study adopted the 'KAP Theory'. This Theory is a health behaviour change theory founded in 1963 by Korean scholars (Kim et al., 1969). The KAP theory believes that human behaviour changes are divided into three consecutive processes. These processes are the acquisition of knowledge followed by the creation of attitudes and finally the institution of behaviour (also referred to as practice).

Knowledge is defined as the act of understanding information (Bolisani et al., 2018). While attitude refers to a negative or positive assessment of an objective (Ajzen & Fishbein, 2000). Practice on the other hand refers to the constant activities influenced by shared social norms and beliefs (Bourdieu, 1990). This theory proposes that there exists a growing connection among knowledge, attitudes, and behaviour (practices). The relationships of the variables are elaborated below.

2.10.1 Knowledge and Practices

According to the KAP theory, educating the public enhances their knowledge and this becomes a strategy to assist them in adopting preventive and protective health behaviours (practices). Siddiquea et al (2021) summarised the relationship between knowledge and practice as the more the health knowledge, the better the behaviour (practice). However, knowledge does not always elicit behavioural responses since in certain circumstances people do not fail to take disease preventive measures due to inadequate knowledge but because of other factors that may underly (Allegrante et al., 2020).

2.10.2 Knowledge and Attitudes

Liu et al (2020) argue that knowledge is not the sole factor that induces behaviour since numerous other factors moderate the influence of knowledge on behaviour and that attitude is among them. Attitude is categorised into two namely: 1. cognitive attitude which are the values and beliefs attached to objects (Van den Berg et al., 2006). 2. Affective attitude refers to the emotional experience related to objects; emotions include moods and feelings, translating to either positive or negative emotions (Phipps et al., 2021).

2.10.3 Application of the Theories to the Study

The knowledge, attitudes, and practices of HCWs towards HBV infection ought to be acceptable to help in the apt management of the infection. It is suitable if HCWs drop their apprenticed behaviour which could translate to a poor level of knowledge, bad attitudes, and unacceptable practices towards HBV infection, and adopt a knowledge-seeking behaviour that undoubtedly transforms their attitudes and practices.

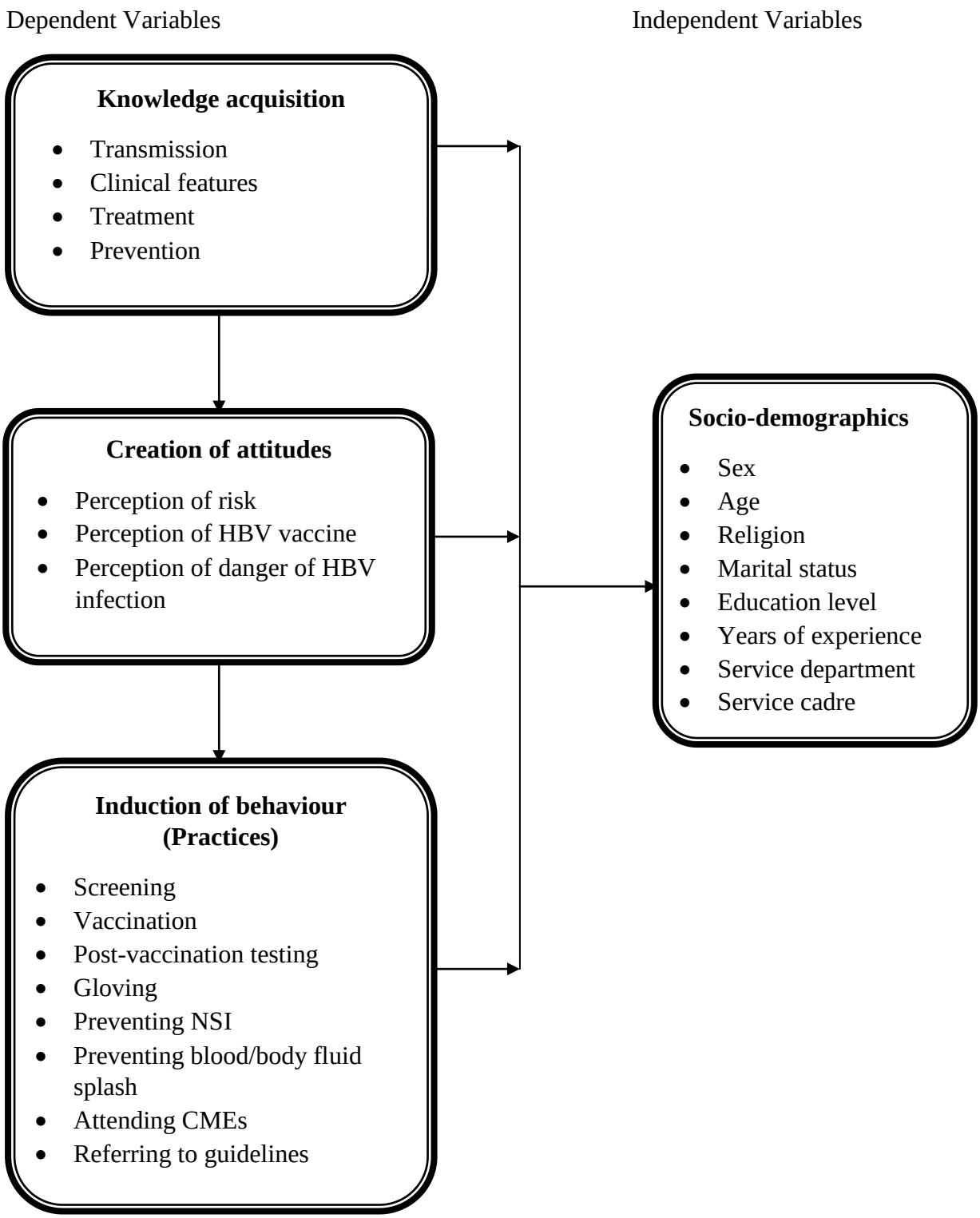
2.11 Conceptual Framework

This study had the following categories of variables. 1. The independent variables which consisted of participants' socio-demographic characteristics such as sex, age, religion, marital status, level of education, years of experience, department of service, and service cadre; and 2. the dependent variables which were the HCWs' knowledge, attitudes, and practices.

Acquisition of knowledge of transmission, clinical features, treatment and prevention of HBV infection by the HCWs influences the formation of their attitudes on the perception of their nature of work as a risk of acquiring HBV, vaccination and danger of HBV infection. Both knowledge and attitudes then influence the induction of HCWs' practices (behaviour) about screening, vaccination, post-vaccination testing, gloving during procedures, and preventing both NSI and blood/ body fluids splash. Healthcare workers' KAP is dependent on their socio-demographic characteristics. Figure 4 illustrates this.

Figure 4

Conceptual Framework



Source: Author (2023).

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter presents the methodology that will be used to conduct the research. It describes the design, and the location of the study. Further, it delineates the population, and details the sample population that will be involved in the study. Moreover, the chapter outlines how the sample size will be determined and the sampling technique that will be employed. In addition, the chapter describes the data collection tool that will be used and highlights the data collection procedures, as well as management and analysis methods to be utilised. Finally, the chapter explains the ethical considerations and reports the budgetary allocation of the study.

3.2 Study Design

The study employed a descriptive cross-sectional design according to Wang and Chen (2020). In line with Akhtar (2016), descriptive study designs report phenomena as they are and usually characterise the prevalence of one or multiple health outcomes in a specified population. In analytical cross-sectional studies, investigators collect data for both exposures and outcomes at one specific point in time for the purpose of comparing outcome differences between exposed and unexposed subjects (Kothari, 2013). It was conducted between 29th May and 27th June 2023 among HCWs working at AIC Kijabe Hospital and the findings inferred across all HCWs working under similar situations as those at AIC Kijabe Hospital. Data collected from the participants were processed and reported without alteration.

3.3 Study Location

The study was conducted at AIC Kijabe Hospital. Which is a referral and a teaching, faith-based, level 5, tertiary hospital in Lari sub-county, Kiambu County, Kenya. The hospital is situated approximately 66 kilometres (approximately 1 hour's drive), North-West of Nairobi town and serves both rural and urban populations. In its capacity as a teaching hospital, the hospital has: 1. a medical training college (training diploma in nursing and medicine as well as higher diploma in various fields), 2. doctor residency programs from various universities and on various fields (post-graduate studies programs for doctors), as well as 3. An internship centre for both intern doctors and clinical officers. This made it an ideal site for this study since it aimed at assessing the level of knowledge, attitudes, and practices imparted to these trainees by their mentors and teachers.

3.4 Study Population

Asiamah et al. (2017) describes a study population as a larger collection of all subjects from where a sample is drawn. The study population comprised clinical staff clerking, treating and counselling patients especially with infectious diseases at AIC Kijabe Hospital. This consisted of: 1. Doctors [medical officers (15), residents (36), and consultants (32)], 2. Clinical officers, [registered clinical officers (RCOs) (51), emergencies and critical care clinical officers, and paediatric emergencies and critical care clinical officers {ECCCOs and PECCCOs} (30) as well as 3. Nurses (186) working at AIC Kijabe main hospital, in both inpatient and outpatient areas. The target population was a total of 350 HCWs (a total number of frontline healthcare workers as per the AIC Kijabe Hospital human resource records by June 2021).

3.4.1 Sample Population

The sample population comprised clinicians and nurses working at AIC Kijabe Hospital. Members of the target population sampled were defined based on the criteria below:

3.4.1.a Inclusion Criteria

The following is the inclusion criteria;

i. Clinicians and nurses working in both inpatient and outpatient departments and regularly interacted with patients suffering from infectious diseases.

3.4.1.b Exclusion Criteria

The following is the exclusion criteria;

i. Clinicians and nurses who were away during the study.
ii. Clinicians and nurses who declined consent.
iii. Clinicians on internship training such as clinical officer interns as well as medical officer interns.

3.5 Sample Size Determination

Fei (2015) states that the sampling size determination describes the list of all population units from which a sample is selected. This study was a census survey. Therefore, all the nurses and clinicians who regularly diagnose and treat infectious diseases were to participate. In line with Triola et al (2006), a census is a collection of data from each component of a population. In this regard, self-administered questionnaires (which was the preferred data collection tool) were prepared for all 350 frontline healthcare workers (as per the human resource records of 2021) with the expectation of having everyone participate in the study.

3.6 Sampling Technique

Purposive sampling according to Etikan, Musa, and Alkassim (2016) was used to recruit the participants. This was due to the fact that all the respondents were to be HCWs diagnosing and treating infectious diseases regularly. Therefore, being a hospital-based study conducted in single centre, the goal was to include as many HCWs as possible to reduce the margin error. The study participants were grouped into subgroups according to their various departments of service namely: 1. Outpatient department (OPD), 2. Critical care, 3. Surgery/ Internal medicine, 4. Obstetrics and Gynaecology (OBGY), 5. Casualty and, 6. Paediatrics for ease of data management and analysis. A survey response rate of 60 percent was considered adequate according to Fincham (2008) and Sammut et al. (2021). Considering this fact, the researcher intended to include all HCWs at AIC Kijabe Hospital (as defined in this study) and get as many responses as possible within the four weeks of data collection to ensure adequate representation.

3.7 Data Collection Tools

A self-administered questionnaire adapted from a study conducted in Ghana by Balegha et al (2021) was administered to the participants who met the inclusion criteria. This was made possible with the help of a trained research assistant. According to Balegha et al (2021), the questionnaire has been validated, tested and used in three other studies in parts of African (the study questionnaire is attached as Appendix I). Prior to adopting the questionnaire for use in this study, permission was sought from the principal investigator of the aforementioned donor study. A copy of the email request and permission to use the tool is attached as Appendix II. The questionnaire had 4 sections. Section A assessed the socio-demographic characteristics which included sex, age, marital status, religion, level of education, service cadre, department of service, and years of experience. Section

B assessed knowledge and had 18 questions with 'Yes', 'No', and 'Not Sure' options as answers. Each correctly answered questions earned the respondent one mark whereas each of those wrongly answered was scored as zero. Sections C and D contained the questions that assessed attitudes and practices respectively. Both sections C and D contained 8 questions and those correctly answered also got awarded one mark whereas those wrongly answered were each awarded zero. On assessing level of knowledge, the minimum attainable total score was 0 while the maximum was 18 points. Similarly, the minimum and maximum obtainable total score on the assessment of both attitudes and practices were 0 and 8 respectively.

Besides, it was written in English and without a slot for participants' names to ensure anonymity.

3.7.1 Validity and Reliability of the Data Collection Tool

The questionnaire adopted from a study done in Ghana had already been validated and used in multiple African studies before this one. Its suitability test among Kenyan HCWs was assessed by having the research assistant (who was a nurse from a different Hospital) fill at a specific duration of time. This was done after the study was explained to him but he had not seen the questionnaire. The result was that the questions were understandable, it could easily be filled and only took 7 minutes to complete. This therefore, made the contemplated pretest of the questionnaire among different HCWs unnecessary.

3.8 Data Collection Procedures

Data collection is a process whose aim is to either agree or disagree with some facts (Kombo & Tromp, 2013) and is normally a step-by-step process (Kothari, 2011). Therefore, before data collection from the field, certain procedures were met. Ahead of

data collection process, the study was approved by the IPGS, which introduced it to KUREC and KHERC for ethical approval. After approval from the ethical bodies both at Kabarak and Kijabe respectively, research permit was sought from NACOSTI.

Subsequently, a research assistant was hired to help with data collection. The research assistant was to be well conversant with the hospital, have a personal identifying name tag and be proficient in the English language. Following a comprehensive explanation of the study to him, the research assistant was assessed to ensure he had good communication skills and confidence in obtaining informed consent from participants. In addition, safe data handling and ethical principles of research were emphasized to him in order to avoid missing data which could compromise the validity of the study and to enable acceptable moral standards during the study respectively.

Thereafter, both the researcher and the research assistant explained the study to the participants on their separate departments of data collection. Informed consent was then obtained from each participant. Consequently, data was collected by the use of the structured self-administered questionnaires which were handed to the study participants by either the researcher or the research assistant.

In ensuring that the data were accurate and complete, face-to-face questionnaire administration was preferred over e-mail dissemination of questionnaires. This enabled the researcher to ensure that all the questionnaires were correctly and completely filled as the participants return them. It was also a quicker way of data collection since the researcher did not have to send e-mails reminding the respondents to fill out the questionnaires. Working alongside the trained research assistant was advantageous since it enabled the researcher to have an extra hand in administration and collection as well as verifying the completeness of questionnaires. In addition, questionnaires were

administered to a specific subgroup of participants each day to avoid mix up. Finally, the filled questionnaires were placed immediately into specific envelopes according to the department of service to avoid identifying the information filled in them with the participants. This helped maintain trust between the researcher and the participants.

3.9 Data Management

Each questionnaire was scrutinised for completeness daily before temporarily storing in the envelopes pre-labelled according to the respective participants' service departments. Subsequently, the data were entered into Microsoft Excel and stored in a password-protected computer device, whose access is only allowed to the lead researcher, for management. Finally, after entry, the filled-up questionnaires were then stored in a lockable cupboard. The hard data (questionnaires) will be discarded by shredding and burning while soft data will safely be discarded through deletion. The data will permanently be gotten rid of seven years after the completion of the study in both cases.

3.10 Data Analysis

According to Peersman (2014) data analysis procedures includes the act of packaging the collected data into information, putting it in order and structuring its main components in a way that the findings can easily and effectively be communicated. Data were imported to the Statistics and Data (STATA) version 18 from MS Excel for analysis. Descriptive statistics according to Puspitawati (2016) were used to analyse data and the results obtained were presented in the form of tables, and graphs. Categorical variables were summarized as absolute counts and relative frequencies. Subsequently, inferential statistics were used to draw conclusions about the data. In agreement with Habib et al (2021), each participant's level of knowledge was classified as low, moderate, and high correlating with their scores ≤55%, 56-76%, and ≥77% respectively. Whereas the scores

for attitudes and practices were each ranked as poor, moderate, and good to keep in line with ≤62%, 63-75%, and ≥76% respectively. This scoring system has been used in a number of studies in the past (Mallhi et al., 2018). Associations between demographic variables, knowledge, attitudes, and practices were analysed using Pearson's chi-square test (χ^2). A *p*-value of $\alpha < 0.05$ and a confidence interval of 95% was set to determine the statistically significant difference of the reported results from the expectations. Further, the correlation between KAP was determined using Spearman's rank correlation coefficient.

3.11 Ethical Considerations

Ethical clearance was sought from the Kabarak University Research Ethics Committee (approval number KUREC- 090323), Kijabe Hospital Ethics and Research Committee (approval number KH/ISERC/02718/0054/2023), and finally the Research license obtained from the National Commission of Science, Technology, and Innovation (research license number NACOSTI/P/23/24856). The ethical clearance from KUREC and Kijabe Hospital as well as the Research license are attached as appendices IV, V, and VI respectively.

Informed consent was sought from each participant before recruitment into the study (the informed consent form is hereby attached as appendix III) Confidentiality and anonymity were observed by asking participants not to indicate their names on the questionnaires. Although a confidential list of participants' names was made to help prevent duplication during data collection, it was not used to identify the questionnaires. The study was classified as a low-risk study during the ethical approval.

3.12 Dissemination of Findings

Subsequent to data analysis, the thesis report was bound in the Kabarak University library and the soft copy in the Kabarak University repository. The study findings were also presented at the local and international scientific conferences to add onto the already existing knowledge. Most importantly, plans to share the findings with AIC Kijabe Hospital are underway. This will be done through the hospital's research department by use of poster presentation on the research day. As a result, the healthcare workers will benefit by getting to know their baseline characteristics in terms of the level of knowledge, attitudes, and practices towards HBV infection. The disseminated findings are expected to inspire the healthcare workers improve their capacity on the approach of HBV infection.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND DISCUSSION

4.1 Introduction

This chapter presents the results of this study. These results are on the participants' socio-demographic characteristics, their knowledge, attitudes, and practices towards HBV infection. Three hundred and fifty self-administered questionnaires were sent out and 254 were filled and returned. This resulted in a 73 percent response rate. Out of the 96 healthcare workers who failed to participate, 30 HCWs were away from work during the data collection period and 66 HCWs declined consent. The results on healthcare workers' socio-demographic characteristics, level of knowledge, and attitudes, are summarised in tables 3, 4, and 5, respectively while their practices are shown in tables 6, 7 and figure 6. Additionally, Figure 5 shows the general outcome variables of the study while the variable associations and correlations between respondents' knowledge, attitude, and practices are illustrated in Tables 8 and 9 respectively.

4.2 Socio-Demographic Characteristics of the HCWs

In view of the HCWs' SDC, out of 254 respondents, 166 (65.4 percent) were females, and 88 (34.6 percent) males. 204 (80.3 percent) participants were aged between 25 and 35 years, followed by 32 (12.6 percent) who were aged between 36 and 45 years. Those who were aged below 25 years and above 45 years formed the minority with each entity consisting of 8 (3.1 percent) and 10 (3.9 percent) respectively.

Half (129, 50.8 percent) of the participants were married, 107 (42.1 percent), were single, and those in the consensual union and divorced formed the least number at 17

(6.7 percent) and 1 (0.4 percent) respectively. A vast majority were Christians (253, 99.6%), and only 1 (0.4%) were from the Islamic faith.

The lowest level of education among the respondents was diploma with 113 (44.5 percent) of them being holders, followed by undergraduate, held by 62 (24.4 percent) participants and higher diploma, held by 48 (18.9 percent) of the respondents. Master, postgraduate diploma, and Ph. D holders formed the minority with each represented by 24 (9.4 percent), 6 (2.4 percent) and 1(0.4 percent) respectively. Most participants were nurses 116 (45.7 percent), followed by clinical officers 51 (20.1 percent). Residents followed closely at 30 (11.8 percent), whereas consultants, emergency and critical care clinical officers as well as the medical officers were the minority at 26 (10.2 percent), 22 (8.7 percent) and 9 (3.5 percent) respectively.

The outpatient department contributed 63 (24.8 percent) of the participants followed by critical care areas [High Dependency Units (HDUs) and Intensive care units (ICUs)] at 49 (19.3 percent), surgery and paediatrics at 45 (17.7 percent) and 41 (16.1 percent) respectively. Obstetrics and gynaecology (OBGY), internal medicine and casualty had the least number of participants.

Finally, most of the participants 119 (46.9 percent) had served for 2 to 5 years whereas 43 (16.9 percent) had served for less than 2 years. The numbers declined with increasing number of experience years where 20 (7.9 percent) had worked for between 11 and 15 years, 10 (3.9 percent) between 16 and 20 years and only 4 (1.6 percent) participants above 20 years. The social-demographic characteristics of the HCWs are presented in table 3.

Table 3

Socio-demographic Characteristics of HCWs at AIC Kijabe Hospital

Variable	Total (N=254)	
Sex	Frequency	Percent (%)
Male	88	34.6
Female	166	65.4
Age		
Below 25 years	8	3.1
25-35 years	204	80.3
36-45 years	32	12.6
Above 45 years	10	3.9
Marital status		
Married	129	50.8
Consensual union	17	6.7
Divorced	1	0.4
Single	107	42.1
Religion		
Christian	253	99.6
Islam	1	0.4
Level of education		
Diploma	113	44.5
Higher Diploma	48	18.9
Undergraduate	62	24.4
Master (Graduate)	24	9.4
Postgraduate Diploma	6	2.4
Ph. D	1	0.4
Service cadre		
Medical Officer	9	3.5
Nurse	116	45.7
Clinical officer	51	20.1
ECCCO/PECCCO	22	8.7
Resident	30	11.8
Consultant/ specialist	26	10.2
Department of service		
General OPD	63	24.8
Surgery	45	17.7
OBGY	22	8.7
Critical care (ICU/HDU)	49	19.3
Casualty	14	5.5
Internal medicine	20	7.9
Paediatrics	41	16.1
Years of experience		
Below 2 years	43	16.9
2-5 years	119	46.9
6-10 years	58	22.8
11-15 years	20	7.9
16-20 years	10	2.8
Above 20 years	4	1.6

4.2.1 Discussion on the Socio-Demographic Characteristics of the HCWs

In this study, female participants were more than males with the nursing cadre forming the majority just like in a study by Hussein et al (2022). This was contrary to a study done among Sri Lankan HCWs which reported more male HCWs than females (Chathuranga et al., 2013). This could be due the different geographical locations of these studies which could be informing the cultural and (or) religious beliefs among the study populations. The presence of more nurses than other cadres at the hospital justifies the argument of Oetelaar et al (2016) that nurses address more patients' needs compared to the other cadres. This could be a better strategy to improve the nurses' quality of life, by reducing burnouts due to spread workloads, and enhancing patient care (Diehl et al., 2021).

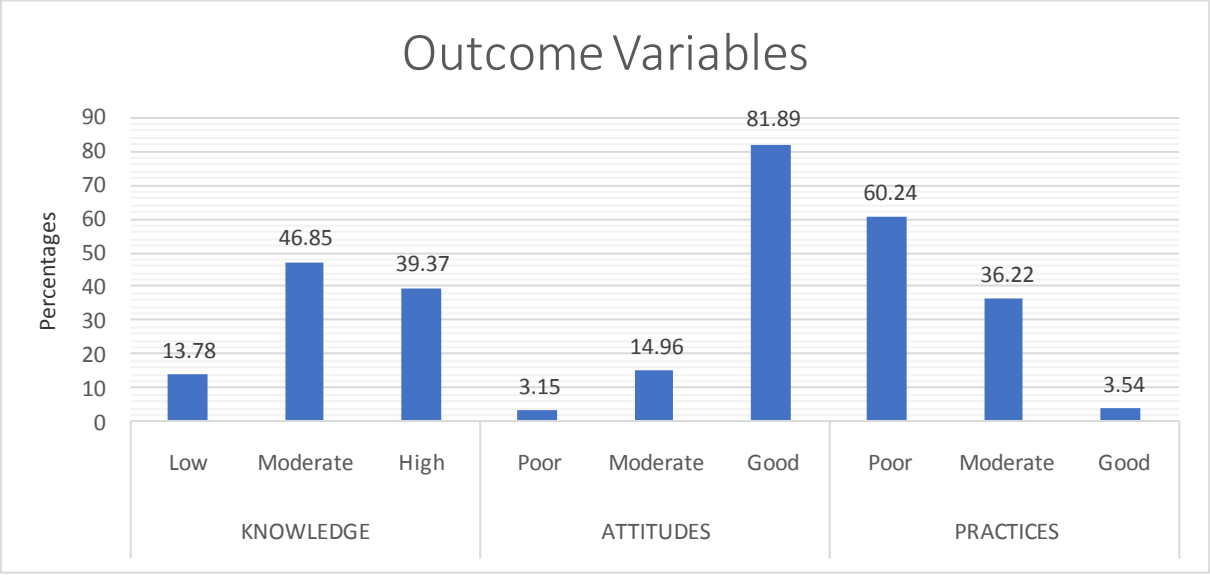
Additionally, this study showed that a large number of the respondents were between the ages of 25 and 35 years, a finding that was similar to a Kenyan study done by Kisangau et al (2018), similar observations were also made by Olum et al (2020) in Uganda and Bhagavathula et al (2020) in the Middle East. This can be explained by the fact that the HCWs of this age bracket are young and energetic thus, possessing a higher level of efficiency and effectiveness than their older counterparts. Further, in this study, most participants had between 2 to 5 years of work experience whereas very few had work experience above 10 years. This finding was similar to that of Kamil et al (2022) where most respondents also had less than 10 years of work experience. Conversely, Mursy and Mohamed (2019) found that most of the Sudanese HCWs responding to their study had below 2 years of experience. This could be informed by various beliefs and preferences of the employing authority at the hospitals.

4.3 General Outcome of the Study

In general, regarding HCWs knowledge, 35 (13.78%) had low level knowledge, 119 (46.85%) had moderate level knowledge while 100 (39.37%) had high level of knowledge. Concerning attitudes, 8 (3.15%) had poor attitudes, 38 (14.96%) having moderate attitudes with a majority (81.89%) having good attitudes. Finally, the general practices score among HCWs at Kijabe Hospital was as follows, 153 (60.24%) had poor practices, whereas 92 (36.22%) and 9 (3.54%) had moderate and good practices respectively. This is summarised on Figure 5.

Figure 5

General Outcome of the Study



4.4 Level of Knowledge on Transmission, Diagnosis, Treatment, and Prevention of HBV Infection Among HCWs

Results in table 4 indicate that 35 (13.78 percent) scored 55 percent and below, thus a low level of knowledge, 119 (46.85 percent) scored between 56 percent and 76 percent which translated to a moderate level of knowledge while 100 (39.37 percent) scored 77

percent and above, showing a high level of knowledge. This means that many still have a moderate (average) level of knowledge.

The poorly scored questions were mainly on diagnosis, treatment and prevention. For instance, a majority of the participants, 204 (80.4 percent) did not know that some of the HBV infected persons do not present with symptoms. Further, more than half of them did not know that HBV infection can be diagnosed by molecular tests and that the infection has no specific cure currently 133 (52.4 percent) and 131 (51.6 percent) respectively. Regarding the prevention of Hepatitis B, 190 (74.6 percent) did not know that the Hepatitis B vaccine is not made from human blood while 165 (65 percent) of the respondents were ignorant of the fact that a post-exposure prophylaxis (PEP) is available for HBV infection.

On the other hand, there were also questions that were well responded to. To begin with, a majority knew that jaundice is a sign of HBV infection 233 (91.7 percent). Following transmission, a large number knew that the infection can be passed to others 219 (86.2 percent), through exposure to contaminated blood and blood products 249 (98 percent), unsterilised equipment 240 (94 percent), through unprotected sexual intercourse 226 (89 percent) or from mother to child at birth 228 (89.8 percent). Finally, 205 (80.7 percent) participants knew that HBV infection can cause liver cancer and that the Hepatitis B vaccine prevents HBV infection 222 (87.4 percent).

Table 4

Level of Knowledge on Transmission, Diagnosis, Treatment, and Prevention of HBV Infection Among HCWs at AIC Kijabe Hospital

Knowledge n (%)	Expected response	Yes	No	Not sure
HBV infection caused by a partial ds DNA virus	Yes	146 (57.5)	23 (9.1)	85 (33.5)
Is Jaundice a sign of hepatitis B infection	Yes	233 (91.7)	11 (4.3)	10 (3.9)
All HBV infected persons present with symptoms	No	50 (19.7)	181 (71.3)	23 (9.1)
HBV can be transmitted by carriers	Yes	219 (86.2)	16 (6.3)	19 (7.5)
HBV infection transmitted via the faeco-oral route	No	49 (19.3)	188 (74.0)	17 (6.7)
HBV infection transmitted through holding of hands	No	45 (17.7)	193 (76.0)	16 (6.3)
HBV infection transmitted by contaminated blood	Yes	249 (98.0)	3 (1.2)	2 (0.8)
HBV infection transmitted by unsterilized instruments	Yes	240 (94.5)	7 (2.8)	7 (2.8)
HBV infection transmitted via unprotected sex	Yes	226 (89.0)	19 (7.5)	9 (3.5)
HBV infection passed from a mother to her baby at birth	Yes	228 (89.8)	13 (5.1)	13 (5.1)
HBV infection diagnosed by serological Rapid Diagnostic Test	Yes	161 (63.4)	44 (17.3)	49 (19.3)
HBV infection diagnosed by a molecular test	Yes	121 (47.6)	21 (8.3)	112 (44.1)
Is hepatitis B infection curable?	No	131 (51.6)	99 (39.0)	24 (9.4)
Can the hepatitis B virus cause liver cancer?	Yes	205 (80.7)	22 (8.7)	27 (10.6)
Is the hepatitis B vaccine made from human blood?	No	64 (25.2)	64 (25.2)	126 (49.6)
HBV vaccination prevents hepatitis B infection	Yes	222 (87.4)	26 (10.2)	6 (2.4)
HBV vaccine protects against liver cancer	Yes	85 (33.5)	115 (45.3)	54 (21.3)
HBV infection has a post-exposure prophylaxis	Yes	89 (35.0)	101 (39.8)	64 (25.2)

4.4.1 Discussion on the Healthcare Workers' Knowledge on Transmission, Diagnosis, Treatment and Prevention of HBV Infection at AIC Kijabe Hospital

Proper knowledge of HBV infection is essential now that the infection is life-threatening and has been declared of public health concern (WHO, 2017). In this study, it was expected that the HCWs at AIC Kijabe Hospital would exhibit a good level of knowledge of HBV infection as the world gears towards the elimination of the infection by 2030. According to the WHO Hepatitis B news release (2022), new hepatitis B chronic infections should be reduced by 90 percent, and mortality from the infection be reduced by 65 percent compared to the 2015 baseline. This is achievable by putting correct measures such as executing proper prevention, diagnosis, and treatment strategies in place, and not leaving HCWs' education unattended.

Generally, this study found that the HCWs' level of knowledge of transmission, diagnosis, treatment, and prevention of HBV infection at AIC Kijabe Hospital was moderate. This is in concurrence with the study done in Ghana by Balegha et al (2021) as well as the one done in Cameroon by Akazong et al (2020). However, a study done in South Kivu, Democratic Republic of Congo, showed that a large number of HCWs had poor knowledge (Shindano et al., 2017). According to the terms used in this study, the findings in the above study are equivalent to a low level of knowledge. In a Sierra Leonean study, half of the HCWs were also shown to have poor (low level of) knowledge of transmission and prevention of HBV infection (Qin et al., 2018).

The reason behind the moderate level of knowledge could be because the HCWs have lacked continuing medical education (CME) on hepatitis B virus infection. Thus, education on the infection's transmission, diagnosis, treatment, and prevention is crucial and should be regularised at the hospital to ease the global efforts of its elimination.

Celebrating the world hepatitis day annually may increase HCWs enthusiasm about the disease.

On examining the specific responses, a good number of the respondents (65%) were unaware that there exists post-exposure prophylaxis for HBV infection, a finding similar to that of the studies done in Ghana by Senoo-Dogbys (2022) which showed that 73% were unaware of post-Exposure prophylaxis for HBV as well as that of Isunju et al (2022) which showed that only 10.8% of the Ugandan HCWs were aware of PEP for HBV infection. Owolabi et al (2011) differs with this study when they reported that 97% of Nigerian HCWs were aware of the existence of PEP against HBV infection. This could be explained by the difference in geographical locations and hospital policies in these countries. Most importantly the difference here, could also have been impacted by the varying efforts to emphasize the role of PEP in preventing HBV infection across the world.

In addition, only a handful were aware that there is no specific cure eradicating CHBI. This confirms the findings of a Vietnamese study by Hang-Pham et al (2019). Nevertheless, the percentage of the Vietnamese HCWs who responded correctly to this question was higher (61.5%) compared to those of this study (39%). Regardless of the difference in the percentages, this is still considered a misconception and can lead to an increase in transmission of HBV infection in case people become careless knowing that the infection is completely treatable. These findings suggest that there is a great need for strengthening and regularizing health education on transmission, diagnosis, treatment and prevention of HBV infection among HCWs of AIC Kijabe Hospital.

4.5 Attitudes of HCWs towards HBV Infection

Table 5 presents the HCWs' attitudes towards HBV infection. In the table Likert scale responses are coded as: 'Strongly agree=5', 'Agree=4' be 'Neutral=3', 'Disagree=2' and 'Strongly disagree=1'.

Generally, out of the 254 participants, 208 (81.89 percent) had good attitude while 38 (14.96 percent) and only 8 (3.15 percent) had moderate and poor attitudes respectively. Largely, a majority of the participants answered the questions right. For instance, 170 (66.9 percent) participants strongly agreed and another 69 (27.2 percent) agreed that they were at risk of HBV infection. Many either strongly disagreed 125 (49.2 percent) or disagreed 85 (34.6 percent) that occasion contact with blood will not necessarily increase their risk of getting infected with hepatitis B virus. Cumulatively the participants who answered this question right were 213 (83.9 percent).

One hundred and ninety-eight (78 percent) strongly disagreed that wearing personal protective equipment during surgery is unnecessary while 20 (7.9 percent) others disagreed to the statement. In addition, A majority 213 (83.9 percent) strongly disagreed that hepatitis B vaccine was unnecessary and 31 (12.2 percent) disagreed to the same statement. At the same time, 244 (96.1 percent) respondents disagreed (with some strongly disagreeing) that HBV infection is not potentially serious. Further, 162 (63.8 percent) strongly disagreed and another 67 (26.3 percent) disagreed with the statement that stated that 'HBV infection is not potentially serious because it is treatable'.

Table 5

Attitudes of HCWs Towards HBV Infection at AIC Kijabe Hospital

Variable, n (%)	Expected response	5	4	3	2	1
You are at risk of getting HBV infection	5/4	170(66.9)	69(27.2)	11 4.3)	4 (1.6)	0 (0.0)
Occasional contact with blood will not necessarily increase my risk of getting hepatitis B infection	2/1	13 (5.1)	23 (9.1)	5 (2.0)	88(34.6)	125(49.2)
Wearing personal protective equipment during surgery is unnecessary	2/1	29 (11.4)	4 (1.6)	3 (1.2)	20 (7.9)	198 78.0)
Hepatitis B vaccination is unnecessary because acquiring hepatitis B infection is not as serious as HIV infection	2/1	7 (2.8)	1 (0.4)	2 (0.8)	31(12.2)	213 83.9)
Hepatitis B infection is not potentially serious because people who acquire it live normal lives	2/1	5 (2.0)	10 (3.9)	7 (2.8)	77 30.3)	155(61.0)
Hepatitis B infection is not potentially serious because it is treatable	2/1	7 (2.8)	11 (4.3)	7 (2.8)	67(26.3)	162 63.8)
Occasional needle pricks don't require reporting to the healthcare authorities	2/1	3 (1.2)	3 (1.2)	6 (2.4)	29 (11.4)	213 (83.9)
Occasional blood or body fluid splashes on the face don't require any reporting.	2/1	3 (1.2)	5 (2.0)	8 (3.1)	51(20.1)	187 (73.6)

4.5.1 Discussion on the Attitudes of the HCWs towards HBV Infection

Like other diseases and infections, managing HBV infection requires good (positive) attitudes from the healthcare workers. Positive attitude towards any disease helps HCWs

to improve their self-care skills and enhance the approach to screening, prevention and management of the said disease. Further, having a positive attitude will enable the HCWs to be keen in providing psychosocial support to the patients as well as refine their education skills to the community to alleviate the spread of infections and by so doing reduce new infections (Glover et al., 2020). In addition, Ssekamate et al (2021) also agrees that there are numerous advantages to healthcare workers in having positive attitudes towards a disease including an improvement in its management and prevention.

In a general sense, this study discovered that a great number of the respondents had good attitudes towards HBV infection. This is in line with a study done in Khartoum, Sudan (Mursy & Mohamed, 2019) and one done among HCWs in Malawi (Mtengezo et al., 2016). Conversely, a study done in Cameroon (Akazong et al., 2020) reported poor attitudes among HCWs. Another study done in Kabul Afghanistan also discovered that HCWs had unacceptable attitudes toward HBV infection (Roien et al., 2021). The difference in findings could be due to the Kijabe hospital HCWs' proper perception of the risk put to them by the nature of their work as well as the fact that HBV infection is life-threatening (Balegha et al., 2021).

Going by the specific questions asked, most respondents responded correctly to the questions. This is exemplified by most participants agreeing or strongly agreeing that their job puts them at risk of acquiring HBV infection. This confirms the findings of Ayalew et al (2016) in their Ethiopian study. In both studies a vast majority of participants recognised the risk of acquiring HBV infection given their nature of work. On the contrary, Dev et al (2018) showed that most HCWs were unaware that their jobs put them at a risk of acquiring HBV infection. In their study, Dev et al (2018) reported that only 35% of their respondents knew that NSI could predispose them to HBV infection. The difference in findings could be due to the influence of the varying

characteristics of the study subjects involved. Particularly, the respondents of the study by Dev et al., worked in a medical college while our respondents worked exclusively at the Hospital.

Secondly, a majority of the participants admitted that occasional exposure to blood and body fluid splashes was dangerous and required reporting. This is a similar finding to that of the study done among the Chinese anaesthesiologists by Tian et al (2019). However, there is still underreporting of blood /body fluid splash accidents among some cadres of HCWs in some parts of China. For instance, Yi et al (2018) in their study among Chinese registered nurses, argued that only 14.6% reported blood/body fluid exposure to the hospital authority. The discrepancy could be due to the difference in the cadres involved in the studies.

Similarly, most participants in this study recognised that needle stick injury (NSI) also required reporting to healthcare authorities. This is in accord with the study done in Ghana by Afihene et al (2015). Conversely, Joukar et al (2017) in their study among Iranian nurses revealed that only 10% reported NSI accidents to authority in the hospital. This discrepancy could be explained by the involvement of all cadres of HCWs in our study whereas the Iranian study only involved the nurses. The reason for underreporting in the Iranian study was that the nurses were busy and could get the time to report these accidents to hospital authorities. Nonetheless, hospitals need to come up with mechanisms that will ease reporting of such instances to enable timely address.

4.6 Practices of HCWs towards HBV Infection

Most of the respondents, 153 (60.24 percent), were found to have poor practices with scores of 62 percent and below, 93 (36.22 percent) had moderate practices with scores of between 63 percent and 75 percent while only 9 (3.54 percent) had exhibited good

practices with scores of 76 percent and above. Slightly more than half, 133 (52.4 percent) of the participants had screened for HBV infection with 244 (96.1 percent) having been vaccinated. However, out of the 244 respondents who had been vaccinated, only 132 (53 percent) had received the recommended 3 doses of HBV vaccine with another 25 (9.8 percent) having received more than the 3 recommended doses. The remaining participants had received 2 doses and below with 79 (31.1 percent) receiving 2 doses and the other18 (7.1 percent) having received only one dose. This is presented in Table 6.

Table 6

Practices Employed by HCWs in Managing HBV Infection at AIC Kijabe Hospital

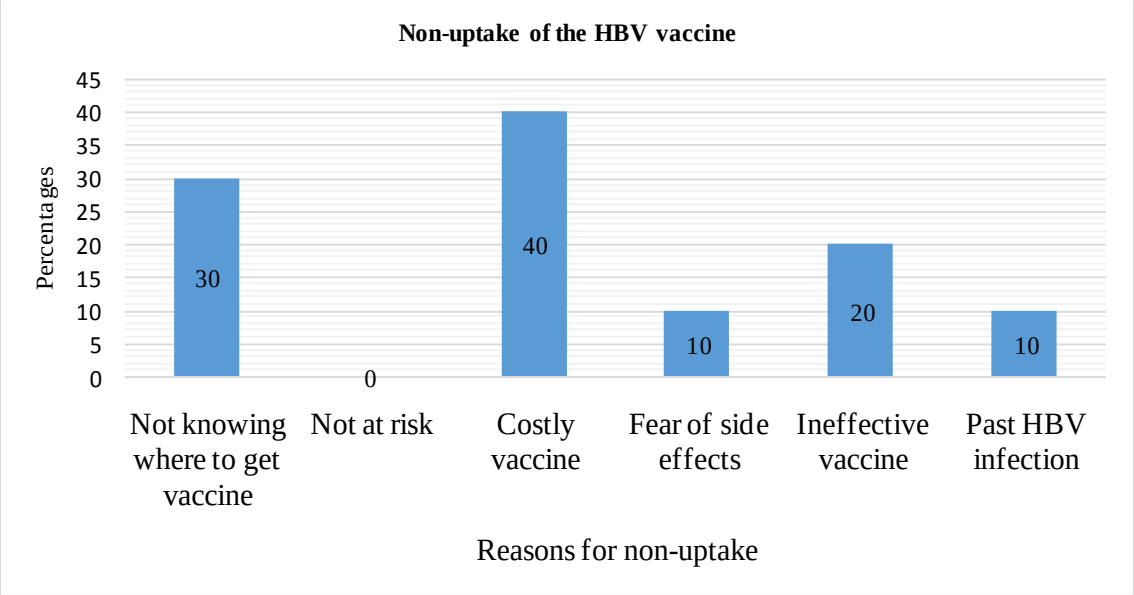
Practice (n =254)	Frequency	Percentage (%)
Have you screened for Hepatitis B infection?		
Yes	133	52.4
No	121	47.6
Have you ever taken the hepatitis B vaccine?		
Yes	244	96.1
No	10	3.9
How many doses of hepatitis B vaccine did you receive?		
1 dose	18	7.1
2 doses	79	31.1
3 doses	132	52.0
> 3 doses	25	9.8
Have you done a post-hepatitis B vaccination antibody test?		
Yes	33	13
No	222	87

However, the participants who reported not having been vaccinated against HBV, by answering ‘No’ to the question about the vaccine uptake, were required to choose the reason(s) as to why they failed to do so in the subsequent set of questions. Most of them

(40 percent) noted that the vaccine is costly with the other 30 percent not aware of places where to get vaccinated. Twenty percent thought that the vaccine is ineffective while only 10 percent feared the side effects of the vaccine with another 10 percent having had a past HBV infection. None of the respondents reported 'not being at risk' as a reason for non-vaccination uptake. This is shown in Figure 6.

Figure 6

Reasons for Non-Uptake of HBV Vaccine Among HCWs at AIC Kijabe Hospital



Furthermore, the other set of 4 questions had 3 options, 'Always', 'Sometimes', and 'Never' thus, the participants were expected to choose one that they thought was correct to the best of their knowledge. Only 5 participants (2 percent) reported to always change gloves between patients while 213 (83.9 percent) sometimes changed gloves between patients and the other 36 (14.1 percent) reported to never change gloves between patients. In regards to the practice of recapping needles after use, only 92 (36.2 percent) reported to have never done the practice whereas 155 (61 percent) and another 7 (2.8 percent) indicated to sometimes and always recap needles after use respectively. Close to

half of the respondents [122 (48 percent)] have never had a needle-stick injury in the past while 33 (15 percent) and 94 (37 percent) indicated to always and sometimes have this accident respectively. Finally, following blood and body fluid exposure, a majority 228 (89.8 percent) always had these splashes and another 25 (9.8%) sometimes splashing the fluids on them with only 1 (0.4%) having never experienced this accident in their practice. This is summarised in Table 7.

Table 7

Practices Employed by the HCWs in Managing HBV Infection at AIC Kijabe Hospital

Practice (n= 254)	Always		Sometimes		Never	
	Frequency	*(%)*	*Frequency*	*(%)*	*Frequency*	*(%)*
Change of gloves between patients	5	2.0	213	83.9	36	14.1
Recapping of used needles	7	2.8	155	61.0	92	36.2
Past NSI history	38	15.0	94	37.0	122	48.0
Body fluid/ blood splash	228	89.8	25	9.8	1	0.4

Some of the questions that were answered wrongly contributing to poor overall practice scores were as follows. Firstly, it is expected that HCWs change gloves between patients always but a majority, 213 (83.9 percent) only did this sometimes with only 5 (2 percent) reporting to always change gloves between patients. Secondly, a majority of the participants, 222 (87 percent) did not do a post-hepatitis B vaccination antibody test, while this is the acceptable practice to help confirm the achievement of adequate immune response. Thirdly, most of the respondents 155 (61 percent) reported to sometimes recap used needles with the other 7 (2.8 percent) reporting to always recap the used needles. This practice exposes the HCWs to the risk of needlestick injury and if contaminated, possible blood-borne infections thereafter. Finally, ideally, it is expected that HCWs protect themselves when handling blood and body fluids from patients by donning

personal protective equipment such as gloves, aprons, goggles, etc, and be careful not to splash the fluids on their faces since the fluids may be contaminated. In responding to the question that asked this, a majority, 228 (89.8 percent) reported always splashing these fluids on their faces. This again is a risky practice. On the other hand, slightly more than half of the participants, 133 (52.4 percent) had screened for HBV, with a greater proportion, 244 (96.1 percent) having been vaccinated. Of the vaccinated, only slightly more than half 132 (52 percent) had received 3 doses of the vaccine, 25 (9.8 percent) received more than 3 doses whereas 79 (31.1 percent) and 18 (7.1 percent) received two and one doses respectively. In view of this, 38.2 percent of the participants did not complete the vaccination as per the WHO hepatitis B vaccination schedule something that still leaves them at risk of acquiring HBV infection. The Ten participants who reported to have never been vaccinated against hepatitis B were aware that they were at risk of HBV infection. Thirty percent did not know where to get the vaccine, 10 percent were afraid of the side effects while 20 percent thought that the vaccine was not effective.

4.6.1 Discussion on the Practices of the HCWs towards HBV Infection

The overall practice of HCWs towards HBV infection was determined to be poor in this study. This data confirms those of Abiola et al (2016), Afihene et al (2015), and Shindano et al (2017) whose studies were conducted in Nigeria, Ghana, and the Democratic Republic of Congo respectively. Conversely, the findings of studies done in India (Garg et al., 2023) and Somalia (Moussa et al 2020) reported a good practice among HCWs. The discrepancy demonstrated here could be an affirmation that practice is greatly influenced by the individual, cultural, societal or even religious beliefs (Hayre et al., 2018). Indians and Somalis have varying beliefs from Kenyans.

Looking at the individual items, the first item was on screening and only half of the HCWs had screened for HBV infection. This finding agrees with that of Sikakulya et al (2022) where only 47.7% of Congolese HCWs had screened for HBV infection. However, Bangura et al., (2021) reported 80% of HCWs screening for HBV in their study in Sierra Leone. This could be due to difference in locations that impact the aggressiveness of HCWs screening practices. For instance, the prevalence of HBV infection in Kenya is 8.54% (Kafeero et al., 2021) whereas Sierra Leone has been reported to have a higher prevalence of 13% (Yendewa et al., 2023). This could be the motivating factor for screening among HCWs in Sierra Leone.

Overlooking HBV screening among HCWs can be detrimental to patients and HCWs' families since the infection can be transmitted to them unknowingly. Additionally, it is important to note that there are a number of HCWs who are infected with HBV. This is exemplified in a Nigerian study done in the south-south part by Ndako et al (2014) which emphasized the need for screening HCWs' HBV statuses after establishing that 17% of HCWs screened randomly were seropositive for HBV infection. In another study done in Ekiti State, South-West Nigeria, HCWs' HBV seroprevalence was indicated as 1.1% (Alese et al.,2016), a percentage that was lower than that in the latter study but still shows that HBV could be prevalent among HCWs and thus, screening is key.

Secondly, this study revealed that slightly above 50% of the HCWs had completed all the three recommended HBV vaccination doses with another 9.8% having exceeded the 3 doses. According to Mwangi et al (2022), completion of 3 vaccine doses is important in aiding individuals vaccinated to have higher anti HBs titres which is protective rather than lower titres. This low rate of vaccination has also been seen in other studies across the world. For instance, the study conducted in Kenya by Kisangau et al (2018) had a vaccination rate of 48% among the HCWs as well the Tanzanian study by Ndunguru et al

(2022) which reported a suboptimal HBV vaccine uptake rate of 18%. Moreover, Hussein et al (2022), in their study also found only 16.4% of HCWs fully vaccinated in Somalia. The fact that this study may appear to have higher vaccination uptake rate compared to the other African studies mentioned, does not mean that we are at par with the rest of the world. For example, the contrary findings of an Indian study by Garg et al (2023) that more than 76% of HCWs at risk of HBV had received three doses of HBV vaccine. Moreover, Soomar et al (2021) also disagree with this study by reporting two-thirds of HCWs at risk having been vaccinated in their study in Pakistan. Compared to the estimated HBV vaccination uptake rate between 2020 and 2030 of 90%, the developing world is still lagging behind (WHO, 2017). The reasons for poor HBV vaccine uptake in the developing world could be due to its unavailability in some areas, fear of injection by the certain HCWs and cost of the vaccine (Abebaw et al., 2017) or maybe failure of HCWs to adjust to change by heeding HBV vaccination protocols (Burnes, 2015). Finally, a reason that can be borrowed from Pakistan, which led to an increased HBV vaccine uptake, was that the HCWs in most hospitals were required to have completed HBV vaccination before they could be offered jobs (Soomar et al., 2021).

Thirdly, this study disclosed that a majority of the participants had not done a post-hepatitis B vaccine antibody (anti HBs) test. A test which confirms if the level of immunity acquired after vaccination is adequate. This test should always be carried out in a duration of 1-2 months after vaccination (Garzillo et al., 2020). Following vaccination against HBV, persons vaccinated are expected to acquire a strong immunogenicity against HBV for up to 30 years even without a booster vaccine after the recommended 3 doses (Cocchio et al., 2021). However, some people usually poorly respond or do not respond at all to vaccination, showing low or no titres of HBV surface

antibody (anti HBs) in blood. Therefore, the those who get vaccinated should always be tested after every 5 years to check if anti-HBs levels fall and if they fall below 10mlU/mL, then the person should receive a booster dose (Batra et al., 2015).

The finding of low anti HBs test post vaccination in this study confirms the one done in a number of East and West African countries, including Kenya (Shah et al.,2020) and a Ghanaian study by Efua et al (2023) where post vaccination testing rate was only 21.3%. This may be a practice that has not been fully embraced in the sub-Saharan Africa and therefore should be emphasized among HCWs in the region.

Fourth, regarding the change of gloves, this study found out that only a few HCWs consistently changed gloves between patients. A risky practice that exposes patients to bloodborne infections including HBV. This finding is similar to that of a study done in Egypt by Refeai et al (2020) which also showed that a few HCWs changed gloves between patients. On the contrary, a study among Nigerian HCWs reported 72.4% of HCWs who always changed gloves between patients (Amoran & Onwube, 2013). This could be due to the nature of patients treated in the hospitals. For instance, in the Nigerian study above, the study site was described to have a HIV prevalence of 10%, a reason that could have motivated cautious practices among the HCWs. However, it is a good practice to always change gloves between patients and all HCWs should be encouraged to do so.

Last but not least, more than half of the respondents reported to sometimes recap needles after use. A risky practice that predisposes to needlestick (percutaneous) injuries and thus transmission of HBV infection (Kaweti & Abegaz, 2015). This finding agrees with that of Bakry (2012) who reported a bigger percentage (93%) of HCWs having the norm of recapping used needles. Ganczak et al (2019) differed with this study by reporting that only 35.9% of HCWs recap needles after use in Poland. This is a lower needle recapping

rate compared with the one of this study. The different could be due to the fact that Kenya and Poland are two different worlds with Poland being a developed economy while Kenya is still developing. However, there should be no recapping of needles among HCWs across the globe.

Lastly a majority (89.8%) of the respondents reported to always splash blood and body fluids on their bodies, a finding that confirms that of Hebo et al (2019) as well as Yasin et al (2019). Contrary to this, Sabermoghaddam et al (2015) and Nouetchognou et al (2016) in their studies done in Iran and Cameroon respectively reported lower percentages of blood and body fluids splash accidents among their respective HCWs. The discrepancy could be due to difference in study subjects and their beliefs. The percentages may be smaller than the one of this study but there is still need for improvement to help eradicate this harmful practice. Hospitals should be encouraged to supply HCWs with enough protective gears such as goggles, aprons, masks and gloves, just to mention a few.

4.7 The Association of HCWs' SDC and their Knowledge, Attitudes and Practices (KAP)

The assessment of the association of HCWs' SDC, level of Knowledge, was categorized as low=1, moderate=2 and high=3. On the other hand, the level of the attitudes and practice was categorized as poor=1 moderate=2 and good =3. Assessment of the association between the dependent and independent variables was done using Pearson's chi squared (χ^2) test. Knowledge was shown to have a statistically significant association with the HCWs' Age (p=0.047), level of education (p=0.001), cadre (p=0.001), and Department of Service (p=0.001). However, HCWs' sex, age, level of education, cadre, department of service, and year of experience were neither shown to have significant association with their attitudes nor their practices towards HBV infection. The

association between HCWs' socio-demographic characteristics and knowledge, attitudes and practices towards HBV infection is shown on Table 8.

Table 8

The Association Between HCWs' socio- demographic Characteristics and HBV Knowledge, Attitudes, and Practices

Variable	Level of Knowledge				Level of Attitude				Level of Practice			
	1	2	3	*p*-value	1	2	3	*p*-value	1	2	3	*p*-value
Sex				0.570				0.242				0.594
Male	10	40	38		5	13	70		56	30	2	
Female	25	79	62		3	25	138		97	62	7	
Age				0.047				0.896				0.686
Below 25 years	1	5	2		0	1	7		7	1	0	
25-35 years	30	102	72		8	30	166		123	73	8	
36-45 years	2	9	21		0	5	27		18	13	1	
Above 45 years	2	3	5		0	2	8		5	5	0	
Level of education				0.001				0.555				0.492
Diploma	27	62	24		7	16	90		61	46	6	
Higher Diploma	5	28	15		0	9	39		32	14	2	
Undergraduate	2	23	37		0	10	52		43	18	1	
Master (Graduate)	1	3	20		1	2	21		13	11	0	
Postgraduate Diploma	0	2	4		0	1	5		4	2	0	
Ph. D	0	1	0		0	0	1		0	1	0	
Service cadre				0.001				0.334				0.066
Medical Officer	1	1	9		0	1	10		8	3	0	
Nurse	26	60	28		4	21	89		58	51	5	
Clinical officer	5	28	20		3	10	40		35	16	2	
ECCCO/PECCCO	1	15	8		0	3	21		18	5	1	
Resident	2	9	17		0	2	26		23	4	1	
Consultant/ specialist	0	6	17		1	0	22		11	12	0	
Department of service				0.001				0.33				0.538
General OPD	4	26	33		4	9	50		35	27	1	
Surgery	2	21	22		1	4	40		29	16	0	
OBGY	0	10	12		0	2	20		12	9	1	
Critical care (ICU/HDU)	10	25	14		2	10	37		30	17	2	
Casualty	2	8	4		0	3	11		9	5	0	
Internal medicine	3	10	7		1	6	13		11	8	1	
Paediatrics	14	19	8		0	4	37		27	10	4	
Years of experience				0.062				0.335				0.555
Below 2 years	9	18	16		3	2	38		27	14	2	
2-5 years	17	63	39		4	20	95		70	45	4	
6-10 years	6	29	23		1	9	48		38	17	3	
11-15 years	1	5	14		0	3	17		9	11	0	
16-20 years	2	2	3		0	3	4		6	1	0	
Above 20 years	0	2	5		0	1	6		3	4	0	

4.7.1 Discussion on the Association of HCWs' Socio-Demographic Characteristics and HBV Knowledge, Attitudes, and Practices (KAP)

A statistically significant association was shown between HCWs' Age, cadre, department of service and level of education and their knowledge. This is similar to the findings of a study done in Ghana by Afihene et al (2015). This finding also confirms those of Kamil et al (2022) in their study conducted in Khartoum Sudan. In their study, they argued that better knowledge of HBV infection comes with higher level of education and thus more misconceptions regarding HBV infection are seen in lower cadres. On the contrary, Shindano et al (2017) in their study in South Kivu, Congo, found no statistically significant difference in knowledge towards HBV infection in regards to age. Similarly, Mursy and Mohamed (2019) also had different opinion on this. This discrepancy could be due to the study sites and the population involved which could be having different organisations. The Congolese and Sudanese studies (aforementioned) were both conducted in public hospitals while ours was in a private hospital and this could inform the difference in the results. For instance, Opollo et al (2021) established that HCWs in public hospitals exhibit suboptimal compliance to infection prevention and control. This could be due to the difference in structuring of the public hospitals.

In this study however, gender, age, level of education, cadre, department of service, and year of experience were shown not to have any association with attitude or HBV practices. This confirms the findings of Afihene et al (2015). Conversely, Balegha et al (2021) in their study argued differently. This can be explained by the difference in study participants between the Ghanaian study and this one.

4.8 Correlation between Knowledge, Attitude and Practice Scores

Spearman rank correlations revealed a weak negative linear correlation between Knowledge and practice (r=-0.1553, p=0.0132) together with Attitude and Practice (r=-0.0235, p=0.7089). on the other hand, it showed a weak positive linear correlation between knowledge and attitude (r=0.0939, p=0.1354).

Only the correlation between Knowledge and practice was found to be statistically significant (p=0.0132) as illustrated in Table 9.

Table 9

Correlations between knowledge, attitudes and practice scores

Variable	Correlation Coefficient	*p*-Value
Knowledge – Attitude	0.0939	0.1354
Knowledge – Practice	-0.1553	0.0132
Attitude – Practice	-0.0235	0.7089

4.8.1 Discussion on the Correlation Between Knowledge, Attitudes and Practices Scores

The weak positive correlation between knowledge and attitudes noted in this study is in agreement with many studies done in the past including Moussa et al (2020) and Afihene et al (2015). This indicates that an increase in knowledge spurs an improvement in HCWs' attitudes. Despite the similarity, the mentioned studies report a stronger correlation compared to this study. Contrary to many studies, this study found that the correlation between attitude and practice together with that of knowledge and practice was weak negative. The weak negative correlation was also a finding in the study done in Saudi Arabia by Alhowaymel et al (2023). The difference noted could be due to the difference in the target populations of the various studies.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

This chapter summarises the findings of the study, by indicating the major findings under each objective. In addition, the chapter concludes on the major findings of the study and finally outlines the recommendations which are classified as either policy recommendations or as recommendations for further research.

5.2 Summary

This section summarises the major findings of the study

5.2.1 Level of Knowledge on Transmission, Diagnosis, Treatment, and Prevention of HBV Infection Among HCWs

This study demonstrates that a larger proportion of the HCWs at AIC Kijabe Hospital have a moderate level of knowledge towards HBV infection. This could be due to the fact that over 80% are unaware of some HBV infected patients presenting asymptomatically, another 52% unaware of the absence of a specific cure for HBV infection currently and about 75% having no knowledge of the existence of a post exposure prophylaxis (PEP) against HBV infection.

5.2.2 Attitudes of HCWs towards HBV Infection

About 82% of the participants were shown to have good attitudes towards HBV infection. This is evident by a vast majority (95%) demonstrating that the nature of their work as HCWs puts them at risk of HBV. Another 98% of the respondents recognised that wearing personal protective equipment (PPE) during risky procedures such as surgeries is important. Finally, another 95% of the participants acknowledged that HBV vaccination is an important protecting factor.

5.2.3 Practices of HCWs towards HBV Infection

About 60% of the respondents were shown to have poor practices. During this assessment, 52% reported to have screened for HBV infection, 62% having completed the three recommended doses of HBV vaccine. The HCWs' reasons for incomplete vaccination were: 1. The vaccine is costly (40%), 2. Not knowing where to get vaccinated (30%), 3. Ineffective vaccine (20%) and 4. Fear of the side effects (10%).

Following the assessment on the protective practices, 14% of the respondents reported to never change gloves between patients, 3% reported to recap needles always after use and about 90% always having blood and body fluids splash accidents.

5.3 Conclusion

This study shows that the HCWs at AIC Kijabe Hospital have moderate (average) knowledge of HBV infection. Efforts to increase this level of knowledge to the desired levels should be established. Additionally, the study found significant associations between participants' age, level of education, cadre, and departments of service with knowledge. Furthermore, the HCWs exhibited good (positive) attitudes and poor practices. The spearman's correlation coefficient revealed a weak positive correlation between knowledge and attitude and weak negative correlations between knowledge and practice together with attitude and practice.

5.4 Recommendations

The following are the recommendations of this study:

5.4.1 Policy Recommendations

i. Training on HBV infection should be regularised and incorporated into the hospital's CMEs. This would help sensitize the HCWs on better approach to HBV infection.
ii. All frontline HCWs should be mandated to don PPEs when handling patients especially those with (or suspected to have) infectious diseases and when splash of body fluids and blood is expected.
iii. There is also a need for continuous infection prevention trainings for staff to avoid risky practices such as recapping needles after use, and using one glove on many patients as noted by this study.
iv. It is recommended that the hospital makes HBV vaccination mandatory for its clinical staff. This can be made possible by making the vaccination a job entry requirement during recruitment.

5.4.2 Recommendations for Further Research

i. In the future, it would be good to have this research in multiple areas of the country for better generalisability. This was not possible with this study due to financial and time constraints.
ii. A mixed-method version of this study is highly recommended to help elicit more reasons for the finding of the study. Owing to some respondents writing on the questionnaires that they 'knew little' about HBV infection, it is suggested that future studies be interventional.

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APPENDICES

Appendix I: The Study Questionnaire

Section A: Socio-demographic characteristics (please tick ONE option)

1. Sex	[ ] Male
	[ ] Female
2. Age	[ ] Below 25 years
	[ ] 25-35 years
	[ ] 36-45 years
	[ ] Above 45 years
3. Marital status	[ ] Married
	[ ] Consensual union Separated
	[ ] Divorced
	[ ] Widowed
	[ ] Never married
4. Religion	[ ] No religion
	[ ] Christian
	[ ] Hindu
	[ ] Islam
	[ ] Others: Specify_____
5. Level of education	[ ] Certificate
	[ ] Diploma
	[ ] Higher diploma
	[ ] Undergraduate
	[ ] Masters (Graduate)
	[ ] Postgraduate diploma
	[ ] Ph.D
6. Service cadre	[ ] M.O
	[ ] Nurse
	[ ] Clinical officer
	[ ] ECCCO
	[ ] Resident

	[ ] Consultant/ specialist
	[ ] Other, specify
7. Department of service	[ ] General OPD
	[ ] Surgery
	[ ] OBGY
	[ ] Critical care (ICU/HDU)
	[ ] Casualty
	[ ] Internal medicine
	[ ] Paediatrics
8. Years of experience	[ ] Below 2 years
	[ ] 2-5 years
	[ ] 6-10 years
	[ ] 11-15 years
	[ ] 16-20 years
	[ ] Above 20 years

Section B: Knowledge Item questions (Please tick only ONE option)

9. Is Hepatitis B infection caused by a partial double-stranded DNA virus?	[ ] Yes [ ] No [ ] Not sure
10. Is Jaundice a symptom of hepatitis B infection?	[ ] Yes [ ] No [ ] Not sure
11. Do all hepatitis B infected persons present with symptoms?	[ ] Yes [ ] No [ ] Not sure
12. Can carriers of hepatitis B who are not sick pass the infection to others?	[ ] Yes [ ] No [ ] Not sure
13. Is hepatitis B virus transmitted via the faeco-oral route?	[ ] Yes [ ] No [ ] Not sure
14. Is hepatitis B infection transmitted through casual contact such as holding of hands?	[ ] Yes [ ] No

	[ ] Not sure
	[ ] Yes
15. Can hepatitis B infection be transmitted by contaminated blood and blood products?	[ ] No
	[ ] Not sure
16. Can hepatitis B infection be transmitted by un-sterilized syringes, needles, and surgical instruments?	[ ] Yes
	[ ] No
	[ ] Not sure
17. Can hepatitis B infection be transmitted via unprotected sex?	[ ] Yes
	[ ] No
	[ ] Not sure
18. Can hepatitis B infection be passed from a mother to her baby at birth?	[ ] Yes
	[ ] No
	[ ] Not sure
19. Is hepatitis B infection diagnosed by serological Rapid Diagnostic Test?	[ ] Yes
	[ ] No
	[ ] Not sure
20. Can a diagnosis of hepatitis B infection be done by a molecular test?	[ ] Yes
	[ ] No
	[ ] Not sure
21. Is hepatitis B infection curable?	[ ] Yes
	[ ] No
	[ ] Not sure
22. Can the hepatitis B virus cause liver cancer?	[ ] Yes
	[ ] No
	[ ] Not sure
23. Is the hepatitis B vaccine made from human blood?	[ ] Yes
	[ ] No
	[ ] Not sure
24. Does hepatitis B vaccination prevent hepatitis B infection?	[ ] Yes
	[ ] No
	[ ] Not sure
25. Does the hepatitis B vaccine protect against liver cancer?	[ ] Yes
	[ ] No

[ ] Not sure

26. Does hepatitis B infection have post-exposure prophylaxis?
[ ] Yes
[ ] No
[ ] Not sure

Section C: Attitude Item Questions (Please tick only ONE option)

27. You are at risk of getting hepatitis B infection
[ ] Strongly agree
[ ] Agree
[ ] Uncertain
[ ] Disagree
[ ] Strongly disagree

28. Occasional contact with blood will not necessarily increase my risk of getting hepatitis B infection
[ ] Strongly agree
[ ] Agree
[ ] Uncertain
[ ] Disagree
[ ] Strongly disagree

29. Wearing personal protective equipment during surgery is unnecessary
[ ] Strongly agree
[ ] Agree
[ ] Uncertain
[ ] Disagree
[ ] Strongly disagree

30. Hepatitis B vaccination is unnecessary because acquiring hepatitis B infection is not as serious as HIV infection
[ ] Strongly agree
[ ] Agree
[ ] Uncertain
[ ] Disagree
[ ] Strongly disagree

31. Hepatitis B infection is not potentially serious because people who acquire it live normal lives
[ ] Strongly agree
[ ] Agree
[ ] Uncertain
[ ] Disagree
[ ] Strongly disagree

32. Hepatitis B infection is not potentially serious because it is treatable
[ ] Strongly agree
[ ] Agree
[ ] Uncertain

	[ ] Disagree
	[ ] Strongly disagree
33. Occasional needle pricks don't require reporting to the healthcare authorities	[ ] Strongly agree
	[ ] Agree
	[ ] Uncertain
	[ ] Disagree
	[ ] Strongly disagree
34. Occasional blood or body fluid splashes on the face don't require any reporting.	[ ] Strongly agree
	[ ] Agree
	[ ] Uncertain
	[ ] Disagree
	[ ] Strongly disagree

Section D: Practice Item Questions (Please tick only ONE option)

35. Have you screened for Hepatitis B infection?	[ ] Yes
	[ ] No
36. Have you ever taken the hepatitis B vaccine?	[ ] Yes
	[ ] No
37. If yes to Q 36, how many doses of hepatitis B vaccine did you receive?	[ ] 1 dose
	[ ] 2 doses
	[ ] 3 doses
	[ ] > 3 doses
38. Have you done a post hepatitis B vaccination antibody test?	[ ] Yes
	[ ] No
39. Do you change gloves for each patient during blood collection?	[ ] Always
	[ ] Sometimes
	[ ] Never
40. Do you recap needles after use?	[ ] Always
	[ ] Sometimes
	[ ] Never
41. To the best of your knowledge have you acquired needlestick injuries in the past?	[ ] Always
	[ ] Sometimes
	[ ] Never
42. To the best of your knowledge have you	[ ] Always

splashed blood/body fluids on your body? [ ] Sometimes

[ ] Never

Section E: Reasons for non-uptake of Hepatitis B vaccine

If your answer is NO to question 36, why have you not received the hepatitis B vaccine? Please for each question, tick one option only. If YES to question 36, please do not answer questions 43-48

43. I do not know where to go and receive it [ ] Yes

[ ] No

44. I am not at risk of infection [ ] Yes

[ ] No

45. I think the vaccine is expensive [ ] Yes

[ ] No

46. I am afraid of the side effects of the vaccine [ ] Yes

[ ] No

47. The vaccine is not effective [ ] Yes

[ ] No

48. I had hepatitis B infection in the past [ ] Yes

[ ] No

Appendix II: Permission to adopt the validated Questionnaire

The following is the researcher's e-mail conversation with the questionnaire author.

RE: Request for permission to use your data collection tool

External

Fred Ogada <fogada@kabarak.ac.ke> to bnaugustine

Dear Augustine,
I am a Kenya doctor pursuing masters in family medicine
I hereby request to use your questionnaire in your study:
Knowledge, attitude, and practice of hepatitis B infection prevention among nursing students in the Upper West Region of Ghana: A cross-sectional study

Published in October 2021

Your response will be greatly appreciated

Thank you

Augustine Ngmenemandel Balegha Mar 23, 2022, 11:23 PM

to me

Dear Fred,

Thank you for contacting me concerning my questionnaire. You may use the questionnaire as long as you acknowledge me by way of citations and references. All the best in your studies.

Regards!

Appendix III: Informed Consent Form

(Adopted from Kabarak University Institutional Scientific and Ethics Review Committee (KABU-ISERC)

Study title: Knowledge, attitudes, and practices towards hepatitis B infection among healthcare workers in AIC Kijabe hospital.

PI: Fredrick Ogada

Affiliated Institution: Kabarak University & AIC Kijabe Hospital

Co-investigators: Dr Peter D. Halestrap & Dr Michael N. Walekhwa

Affiliated Institutions: AIC Kijabe Hospital (AICKH) & Kabarak University (KABU)

Introduction

You are invited to participate in this research study being undertaken by the above-listed investigators. This form will help you gather information about the study so that you can voluntarily decide whether you want to participate or not. You are encouraged to ask any question regarding the research process as well as any benefit or risk that you may accrue by participating. After you have adequately been informed about the study, you will be requested to either agree or decline to participate. Upon agreeing to participate in the study, you will be further requested to affirm that by appending your signature/thumbprint on this form. Accepting or declining to participate in this study does not in any way waive the following rights which you're entitled to:

a) Voluntary participation in the study;

b) Withdrawing from the study at any time without the obligation of having to give an explanation and;

c) Access to services which you're entitled to

A copy of this form will be provided to you for your own records

Should I continue YES/NO (Please tick ONE option).

This study has been reviewed and approved by Kabarak University Institutional Scientific and Ethics Review Committee (KABU-ISERC)

What is the purpose of the study?

The main reason for conducting this study is to answer the following questions:

i. What is the level of knowledge on transmission, diagnosis, treatment, and prevention of HBV infection among HCWs at AIC Kijabe Hospital?
ii. What are the attitudes of HCWs towards HBV infection at AIC Kijabe Hospital?
iii. What are the various practices employed by HCWs towards the management of HBV infection at AIC Kijabe Hospital?

(In order to answer these research questions, you are requested to voluntarily answer questions)

Who can take part in the study?

All HCWs working at AIC Kijabe Hospital will be included in the study, while HCWs away from work during the study period as well as those who will decline the informed consent will be excluded.

In case you agree to participate in the study, what will happen?

This is what is going to happen once you have agreed to participate in the study:
First, the questionnaire is straightforward and will take around ten minutes to fill

Second, a qualified and well-trained research assistant will administer the questionnaire to you and you will not indicate your name on it. The questionnaire contains multiple-choice questions whereby you are required to select ONE best answer. In case there is any question you feel uncomfortable responding to, you will not be coerced to respond. The questions will be on the following areas:

a) Your socio-demographic features
b) Your knowledge about hepatitis B virus infection
c) Your Attitudes to hepatitis B virus infection
d) Your practices towards hepatitis B virus infection

What potential risks are associated with participation in this study?

This research puts you at risk of exposing your knowledge, attitudes, and practices towards HBV. This will be mitigated by asking you not to indicate your name on the questionnaire to ensure anonymity. The questionnaires containing your response will also be kept in a safe cupboard only accessible by the principal researcher to keep confidentiality.

What benefits are you going to accrue by participating in the study?

The data obtained will provide insights on areas, if any, that need addressing in order to improve Healthcare workers' approach to Chronic Hepatitis B infection.

What will it cost you to participate in the study?

You will not incur any cost to participate in this study whatsoever.

In case I have any further questions/ concerns in future whom should I contact?

In the event that you need further clarification or questions regarding your continued participation in the study feel free to contact the PI {*0728771024*}. In case of concerns regarding your rights and/or obligations as a research participant do not hesitate to contact the secretary, KABU-ISERC on {*0705290520*}

What alternative options are available to me?

The decision on whether to participate or not is voluntary. You will be free to withdraw from the study at any point during the study without providing any explanation.

How will the findings of this study be communicated or shared?

The findings of the study will be shared with the hospital research department, which in turn, will give feedback through hospital CMEs.

Statement of consent

I have comprehensively read the consent form or/the information has been comprehensively read to me by the researcher. I have understood what the study is about and all the questions and concerns that I had have been responded to in a clear and concise. The study benefits and foreseeable risks have been explained to me. I understand that my decision to participate in this study is voluntary and I have the right to withdraw at any point during the study.

I freely consent to participate in this study

Signing this form does not in any way imply that I have given up the rights am entitled to as a participant

I agree to participate in this research YES☐ NO ☐ (*Please tick ONE box)*

I agree to provide my contact details for follow-up YES☐ NO ☐ *(please tick ONE box)*

Participant's Signature_____ Date _____

Appendix IV: Approval from KUREC

KABARAK UNIVERSITY RESEARCH ETHICS COMMITTEE

Private Bag - 20157
KABARAK, KENYA
Email: kurec@kabarak.ac.ke

Tel: 254-51-343234/5
Fax: 254-051-343529
www.kabarak.ac.ke

OUR REF: KABU01/KUREC/001/09/03/23

Date: 22nd March, 2023

Fred Ogada,
Reg. No: GMMF/M/2698/09/18
Kabarak University,

Dear Fred,

RE: KNOWLEDGE, ATTITUDES, AND PRACTICES TOWARDS HEPATITIS B INFECTION AMONG HEALTHCARE WORKERS AT AIC KIJABE HOSPITAL.

This is to inform you that ***KUREC*** has reviewed and approved your above research proposal. Your application approval number is ***KUREC-090323.*** The approval period is ***22/03/2023 – 22/03/ 2024.***

This approval is subject to compliance with the following requirements:

i. All researchers shall obtain an introduction letter to NACOSTI from the relevant head of institutions (Institute of postgraduate, School dean or Directorate of research)
ii. The researcher shall further obtain a RESEARCH PERMIT from NACOSTI before commencement of data collection & submit a copy of the permit to **KUREC.**
iii. Only approved documents including (informed consents, study instruments, MTA Material Transfer Agreement) will be used
iv. All changes including (amendments, deviations, and violations) are submitted for review and approval by ***KUREC***:
v. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to ***KUREC*** within 72 hours of notification;
vi. Any changes, anticipated or otherwise that may increase the risk(s) or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to ***KUREC*** within 72 hours;
vii. Clearance for export of biological specimens must be obtained from relevant institutions and submit a copy of the permit to KUREC;
viii. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal and;
ix. Submission of an executive summary report within 90 days upon completion of the study to ***KUREC***

Sincerely,

KABARAK UNIVERSITY
INSTITUTIONAL RESEARCH ETHICS COMMITTEE
23 MAR 2023
APPROVED
P.O. PRIVATE BAG

Prof. Jackson Kitetu PhD.
KUREC-Chairman

Cc Vice Chancellor
DVC-Academic & Research
Registrar-Academic & Research
Director-Research Innovation & Outreach
Institute of Post Graduate Studies

As members of Kabarak University family, we purpose at all times and in all places, to set apart in one's heart, Jesus as Lord. (1 Peter 3:15)
Kabarak University is ISO 9001:2015 Certified

Appendix V: AIC Kijabe Hospital Ethical Approval Letter

KIJABE HOSPITAL INSTITUTIONAL SCIENTIFIC AND ETHICAL REVIEW COMMITTEE
PO Box 20 Kijabe 00220, Kenya
Tel: 0709728200/637
Fax: 020-3246335
E-mail:researchcoord@kijabehospital.org
Website: www.kijabehospital.org

REF: KH/ISERC/0014/2023
Approval No: KH/ISERC/02718/0054/2023

29th May 2023

Dear, Fredrick Ogada

RE: KNOWLEDGE, ATTITUDES AND PRACTICES TOWARDS HEPATITIS B VIRUS INFECTION AMONG HEALTHCARE WORKERS AT AIC KIJABE HOSPITAL, KENYA.

Many thanks for your submission to KH ISERC.

This is to inform you that KH ISERC has reviewed and **approved** your above research protocol. Your application approval number is **KH/ISERC/02718/0054/2023. The approval period is starting from 29th May 2023 to 29th May 2024.** This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consent, study instruments, MTA) will be used.
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by KH ISERC.
iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to KH ISERC within 72 hours of notification.
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to KH ISERC within 72 hours.
v. Clearance for export of biological specimens must be obtained from relevant institutions.

vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.

vii. Submission of an executive summary report within 90 days upon completion of the study to KH ISERC.

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://oris.nacosti.go.keand also obtain other clearances needed.

Please do not hesitate to contact the AIC Kijabe Hospital ISERC Coordinator (researchcoord@kijabehospital.org) for any clarification or query.
Thank you,

Yours sincerely,

Pete Halestrap.

BMBCh, MRCGP, DCH, DRCOG, MA (OXON)

Chair, AIC Kijabe Hospital ISERC

Appendix VI: Research License from NACOSTI

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **920303**

Date of Issue: **19/April/2023**

RESEARCH LICENSE

This is to Certify that Dr.. Fredrick Ochieng Ogada of Kabarak University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Kiambu on the topic: Knowledge, Attitudes and Practices towards Hepatitis B infection among healthcare workers at AIC Kijabe Hospital, Kenya. for the period ending : 19/April/2024.

License No: **NACOSTI/P/23/24856**

920303

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

Appendix VII: List of Publication

JOURNAL OF CLINICAL CARE AND MEDICAL ADVANCEMENT

https://doi.org/10.58460/jcma.v1i01.39

ORIGINAL ARTICLE

Open Access

MJM BIOLABS

Healthcare Workers' Hepatitis B Virus Preventive Practices at a Mission Hospital in Kenya

Fredrick OGADA [1], Peter HALESTRAP [1,2], and Michael WALEKHWA [3]

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[2] *Division of Medical Education, Kijabe Hospital.*

[3] *Department of Biomedical Sciences, School of Medicine & Health Sciences, Kabarak University.*

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Article History

Submitted: 8th September 2023

Accepted: 5th October 2023

Published Online: 31st October 2023

To read this paper online, please scan the QR code below:

ABSTRACT

Hepatitis B (HBV) infection constitutes a major public health concern worldwide. In its chronicity, the infection causes potentially fatal advanced liver diseases. In Kenya, the prevalence of HBV infection has been on an upward trajectory despite the availability of an effective vaccine. However, literature demonstrates a dearth of information regarding healthcare workers' (HCWs') practices towards the infection. This study assessed HCWs' preventive practices towards HBV infection at Kijabe Hospital. A cross-sectional descriptive survey involving 254 frontline HCWs at Kijabe Hospital was conducted. Ethical approval from Kabarak University Research & Ethics Committee (KUREC- 090323), Kijabe Hospital Ethical Review Committee (KH/ISERC/02718/0054/2023), and a research license from the National Commission for Science, Technology & Innovation (NACOSTI/P/23/24856) were obtained. Prior to data collection, informed consent was obtained from each participant. Data was collected using validated self-administered questionnaires and analysed on STATA v18. Chi-square test was used to determine the association between categorical variables. More females (65.4%) than males participated in the study. Most (80.3%) were aged between 25 and 35 years with half of the participants being married. Most respondents held diplomas (44.5%). Nurses formed the majority (45.7%) of the respondents. No significant association was shown between HCWs' sex (P =.594), age (P=.686), education level (P=.492), service department (P=.538), experience years (P=.555), and practices. Most (60.24%) HCWs demonstrated a lack of absolute adherence to the available safety practices. For instance, about 60% completed 3 doses of the HBV vaccine, 14% never changed gloves between patients, 52% had had a past needlestick injury and about 63% recapped needles after use. These findings underscore suboptimal infection control practices among the sampled HCWs. Therefore, regular training and sensitization on preventive practices towards HBV cannot be overemphasized. We further recommend a targeted intervention anchored on qualitative study findings.

Keywords: Hepatitis B, Practice, Prevalence

Appendix VIII: Evidence of Conference Participation

KABARAK UNIVERSITY

Certificate of Participation

Awarded to

Fredrick Ogada

for successfully participating in the 13th Annual Kabarak University International Research Conference held from 23rd – 24th June 2023 and presented a paper entitled ***"A study on: knowledge, attitudes, and practices towards Hepatitis B infection among healthcare workers at AIC Kijabe Hospital, Kenya."***

Conference Theme

Bridging the Gaps in Global Health

Dr. Pamela Kimeto
Dean, School of Medicine and Health Sciences

Dr. Moses Thiga
Director - Research, Innovation and Outreach

Kabarak University Moral Code

As members of Kabarak University family, we purpose at all times and in all places, to [illegible]t in one's heart, Jesus as Lord.

(1 Peter 3:15)

Kabarak University is ISO 9001:2015 Certified