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UPTAKE OF HEPATITIS B VACCINE AMONG HEALTH CARE WORKERS IN MUTARE CITY CLINICS, MANICALAND PROVINCE, ZIMBABWE, JANUARY TO DECEMBER 2020.

BY

JOSEPH KUDZANAI NYAMAREBVU

A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF PUBLIC HEALTH IN THE COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES

2021

Abstract

HBV infection has long been recognised as an occupational risk for health care personnel and the risk of infection after exposure to highly infectious fluids such as blood from a patient who is actively transmitting the disease is up to 30%. WHO in 2017, recommended Hepatitis B vaccination for all healthcare workers. The vaccine provides more than 90% effective protection after all doses. WHO estimate showed that HBV vaccination coverage among HCWs is only 18–39% in low- and middle-income countries compared to 67–79% in developed countries. Zimbabwean Ministry of Health and Child Care currently has no documented policy regarding HBV vaccination for HCW and there is no data in Zimbabwe on HBV vaccine coverage in healthcare workers. This study determined the proportion of HBV uptake and the associated factors in Healthcare workers at Mutare city clinics, Manicaland province, Zimbabwe. This analytical cross sectional study reviewed data of 111 purposively selected healthcare workers from the 9 Mutare city health centers. Two key informant healthcare workers, Director City Health and Senior Nursing Officer, were also interviewed. Univariate and multivariate logistic regression analyses in Epi Info 7 were performed to determine the factors associated with HBV uptake. The study results revealed that the prevalence of HBV vaccination uptake stand at 21% among health professionals in Mutare district. The association between HBV uptake and demographic variables was assessed using the Chi-square test. Only age (p=0,001); education level (p=0.045); profession (p=0.05); household expenditure (p= 0.032) and religion (p= 0.048) were significantly associated with HBV uptake by health professionals in Mutare. Only 11 (10%) of the participants had correct knowledge of the definition of HBV and only 40% of the participants had the correct knowledge on the number of times one should be inoculated. Only 30% of the participants had the correct knowledge as to the intervals of HBV boosters. With regards to availability of the vaccine, only 24 (22%) of the participants confirmed regular availability of HBV, 83 (75%) claimed that there are no awareness campaigns that are being conducted to raise aware on the vaccine among health professionals and stating its essence in protecting them in the clinical area and 62 (56%) said that the HBV vaccine is free and affordable. The study conducted a step-wise multivariate binary regression analysis to determine the predictors of uptake of HBV by health service providers in Mutare. Only age [AOR = 2.1, 95% CI (1 – 3.3)], household expenditure per month [AOR = 18.8, 95% CI (3.1 – 11.2)], knowledge on HBV [AOR =2.6, 95% CI 0.5 – 15.3], scheduling for HBV [AOR = 3.9, 95% CI (1 – 14.9)], and health service related factors [AOR = 10, 95% CI (2.3 – 43.3)] were statistically significant predictors of HBV uptake. These findings indicate that the health management team for Mutare City council need to invest more in social behaviour change communication, raising awareness on the essence and importance of the HBV vaccine; and most importantly to make the vaccine available, to increase uptake by health care workers.

Key Words: Hepatitis B Vaccine, Hepatitis Infection, Mutare City Clinic, Mutare, Manicaland province, Zimbabwe

Declaration Page

I declare that this dissertation is my original work except where sources have been cited and acknowledged. The work has never been submitted, nor will it ever be submitted to another university for the award of a degree.

Nyamarebvu Joseph Kudzanai  05/01/2022

Student`s Full Name Student`s Signature (Date)

Mr.Elliot Chikaka  12/01/2022

Main Supervisor`s Full Name Main Supervisor`s Signature (Date)

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Acknowledgements

I would like to acknowledge the support and technical guidance I got from my academic and field supervisor; Mr. E. Chikaka and Dr A. Mutara respectively in making this research a success. I would also like acknowledge the support from Emilia Mutya for her assistance in making this project fruitful.

List of Acronyms and Abbreviations

AIDS	Acquired Immune-deficiency Virus
CDC	Centers for Disease Control
DNA	Deoxyribonucleic acid
ELISA	Enzyme-linked immunosorbent assay
HBIG	Hepatitis B Immune Globulin
HBsAg	Hepatitis B surface antigen
HBV	Hepatitis B vaccine
HCC	Hepatocellular carcinoma
HCP	Healthcare professionals
HCW	Health care worker
HIV	Human Immune-deficiency Virus
VPD	Vaccine-preventable diseases
WHO	World Health Organization.

Definition of key terms

HBV vaccination schedule- HBV vaccination is provided in the form of an intramuscular injection in three doses. The first dose is the baseline dose, and the second and third doses are provided one and 6 months after the first dose, respectively.

Complete HBV vaccination- Healthcare workers who had received three HBV vaccine doses according to the HBV schedule were considered to have complete HBV vaccination.

Incomplete but on schedule HBV vaccination- Healthcare workers who had received one or two HBV vaccine doses according to the schedule but were not due for their next dose were considered to have a vaccination level that was incomplete but on schedule.

Incomplete HBV vaccination- Healthcare workers who had not received a full vaccination course but who were otherwise 1 month or more post-appointment for their scheduled dose were considered to have incomplete vaccination.

Ineligible for HBV vaccination- Healthcare workers with HBV infection or immunity to HBV upon their vaccination screening visit were considered ineligible for HBV vaccination.

Table of Contents

List of Tables

List of Figures

List of Appendices

CHAPTER 1 INTRODUCTION

1.1 Introduction

According to the World Health Organisation (WHO) in its 2017 global hepatis report, significant morbidity and mortality across the globe is being caused by chronic hepatitis B virus (HBV) infection, therefore it remains a considerable public health threat needing considerable interventions to eliminate it by 2030. In 2015, 257 million people lived with chronic HBV infection worldwide, and the highest burden of chronic HBV is in Africa, where 5–8% of the population is living with chronic HBV (WHO, 2017).

The prevalence of HBsAg carriage in Zimbabwe is estimated to be 15.4% which is almost double the threshold of being highly endemic of 8% (Tswana, Chetsanga, Nystrom, Moyo, Nzara, & Chieza, 1996). The prevalence is even higher among pregnant women with a prevalence of 25% reported at Harare Maternity Hospital between 1996 and 1997 (Madzime, Adem, Mahomed, Woelk, Mudzamiri, & Williams, 1999). There are no recent studies of the prevalence of HBV in Zimbabwe.

While many of the Sub-Saharian countries have implemented universal HBV vaccination for infants, there is limited visibility on what is happening related to protecting health workers from an infection that can be easily prevented with a three-dose regimen of the HBV vaccine (WHO, 2012). It is estimated that 5.9% of health care workers (HCWs) worldwide are exposed to hepatitis B infection annually (Prüss, Üstün, Rapiti, & Hutin, 2005).

Hepatitis B vaccine is one of the first anticancer vaccine that was found to be 95% effective in preventing both children and adults from developing chronic infection (Abiola, Omoyeni and Akodu, 2013). One of the key components of the WHO Hepatitis B Elimination Strategy 2016–2021 is Hepatitis B vaccination for healthcare workers (Aaron, Nagu, Rwegasha & Komba, 2017).

HBV is the most common blood-borne virus that poses a particularly high risk of cross-infection between patients and health care workers (HCWs) (Elduma & Saeed, 2011) and this virus is very infectious, being 50–100 times more infectious than the dreaded human immunodeficiency virus (WHO, 2000). In health care settings, needle stick injuries are common and present one pathway of HBV transmission, putting HCWs at particularly high occupational risk (Auta, Adewuyi, Tor-Anyiin, Aziz, Ogbole, Ogbonna & Adeloye, 2017). According to Elduma and Saeed (2011), HCWs have 4–5 times the risk for acquiring chronic HBV than other populations.

Hepatitis B virus (HBV) is one of the five viruses which affect primarily the liver. We have Hepatitis A, B, C, D and E. Hepatitis B and C cause chronic disease and complications whilst the rest are self-limiting. The virus is most commonly transmitted from mother to child during delivery, as well as through contact with blood or other body fluids, including sex with an infected partner, injection-drug use that involves sharing needles, syringes, or drug-preparation equipment and needle sticks or exposures to sharp instruments in healthcare workers (WHO, 2015).

A study by Ziraba, Bwogi, Namale, Wainaina and Mayanja-Kizza (2010) in Uganda showed that 40% and up to 67% of HCWs reported exposure to patients' body fluids and needle stick injuries, respectively. Given this increased occupational risk, it is

recommended that medical professionals receive HBV screening, vaccination and counselling before starting their clinical practice. Eliminating chronic HBV by 2030 requires increased testing for chronic HBV, including targeting high-risk groups such as HCWs. In recognition of the immense occupational hazard posed by HBV infection to HCWs, at the World Hepatitis Summit held in Sao-Paulo, Brazil, the WHO called on governments to include vaccination of HCWs against HBV in national immunisation programmes, since it has been documented that hepatitis B vaccines could reduce the risk of infection to almost zero (Bonani and Bonnacorssi, 2001).

Hepatitis B virus infection may cause acute and/or chronic infection-which is associated with severe complications (liver cirrhosis and portal hypertension). Individuals with chronic HBV infection have a 100-fold risk of hepatocellular carcinoma (HCC) compared to non-carriers (Ganem & Prince, 2004). According to the Global Burden of disease estimates, hepatitis B and C together accounted for 1.4 million deaths in 2010 including deaths from acute infection, liver cirrhosis and hepatocellular carcinoma. In Zimbabwe HBsAg was detected in 48.3% in patients with HCC compared to a 13.3% seroprevalence in healthy blood donors. HCC is amongst the 5 most common cancers and causes of cancer death in Zimbabwe (Chokunonga, Levy, Bassett, Mauchaza, Thomas, & Parkin, 2000)

Vaccination is recommended for healthcare professionals (HCPs) to protect them against vaccine-preventable diseases (VPDs); however, uptake rates are low. It is estimated that 5.9% of health care workers (HCWs) worldwide are exposed to hepatitis B infection annually (Rapiti, Prüss-Üstün & Hutin, 2005).

Health care providers had a prevalence of HBV infection approximately 10 times greater than the general population (Schillie, Murphy, Sawyer, Hughes, Jiles & Ward, 2013). The WHO report of 2000 showed that about 6% of HCWs are each year exposed to blood-borne HBV infections corresponding to about 66,000 HBV infections in health care workers worldwide (Hutin, 2005). Auta, A., Adewuyi, E. O., Kureh, G. T., Onoviran, N., & Adeloye, D. (2018) indicated in their metaanalysis study that many HCWs in Africa are at risk of Hepatitis B infection as only a quarter of them were fully vaccinated against Hepatitis B virus.

Over the past two decades much of the thrust from governments and health funding partners in developing countries has been rightly targeted at HIV/AIDS, Tuberculosis and Malaria. This approach has been largely effective with notable decreases in disease incidence and mortality (Ortblad, Lozano, & Murray, 2013). Viral hepatitis has not received as much attention despite reaching endemic proportions globally. WHO recommends the hepatitis B vaccination for adults at the highest risk of acquiring HBV infection, which include patients who frequently require blood or blood products, persons who use injecting drugs, household and sexual contacts with persons with a chronic HBV infection, persons with multiple sexual partners and healthcare workers (WHO 2017).

In South Africa, a neighbouring country with similar disease patterns only 33.6% of HCW exhibited immunity to HBV infection. Guidelines developed in 2017 from the Centres for Disease Control (CDC), state that where pre-vaccination testing is not available it should not be a barrier or obstacle to vaccination for potentially susceptible individuals.

1.2 Background of the study

Due to the absence of medical treatment that can cure hepatitis B virus (HBV) infection, hepatitis B vaccine is the single most effective and safe strategy for the prevention of the disease if appropriate doses are given during a period of 6 months (at 0, 1 and 6 month). The vaccine provides more than 90% effective protection after all doses (Shepard, Simard, Finelli, Fiore, & Bell, 2006).

Dr Gasasira, Zimbabwe WHO Country Director, said while mortality from HIV, tuberculosis, and malaria was on the decline, mortality caused by viral hepatitis was on the rise which necessitated an urgent need to reverse the alarming trend, through high-impact cost-effective interventions such as Hepatitis B vaccination which can score an early win for prevention (WHO, 2019).

1.3 Problem statement

HBV infection has long been recognised as an occupational risk for health care personnel and the risk of infection after exposure to highly infectious fluids such as blood from a patient who is actively transmitting the disease is up to 30%. WHO in 2017, recommended Hep B vaccination for all healthcare workers.

In spite of higher vulnerability among health professionals, the WHO estimate showed that HBV vaccination coverage among HCWs is only 18–39% in low- and middle-income countries compared to 67–79% in developed countries (Schillie, Murphy, Sawyer, Hughes, Jiles, & Ward, 2013). The biggest challenge is that Zimbabwean Ministry of Health and Child Care currently has no documented policy regarding HBV vaccination for HCW and there is no data in Zimbabwe on HBV

vaccine coverage in healthcare workers. This poses a great risk to healthcare workers considering the exposure status and the seropositive prevalence rate of Hepatitis B in the country.

The researcher seeks to investigate the uptake of Hep B vaccine in Mutare city council clinics. This research was done elsewhere in the world but to the best of my knowledge it was never done in Mutare clinics and there is no data on Hepatitis B virus infection and vaccination in Mutare. This information is important for planning strategies to facilitate uptake of the vaccine in this vulnerable population.

1.4 Broad Research Objectives

The purpose of this study is to investigate the factors influencing the uptake of Hepatitis B vaccine among healthcare workers in Mutare city council clinics, Manicaland province of Zimbabwe for the period January 2010- December 2020.

1.4.1 Specific Objectives

The study will specifically seek to:

1. Determine the prevalence of Hepatitis B vaccine uptake among healthcare workers in Mutare city council clinics, Manicaland province of Zimbabwe for the period January - December 2020.
2. Determine the socio demographic characteristics that influence the uptake of Hepatitis B vaccine among healthcare workers of Mutare city council clinics, Manicaland province of Zimbabwe for the period January - December 2020.

3. Assess the knowledge levels about HBV among healthcare workers at Mutare city council clinics, Manicaland province of Zimbabwe for the period January - December 2020.
4. Identify the health service factors that influence the uptake of hepatitis B vaccine among health care workers at Mutare city council clinics, Manicaland province of Zimbabwe for the period January - December 2020.

1.5 Research questions

1. What is the proportion of healthcare workers vaccinated against Hepatitis B virus at Mutare city council clinics, Manicaland province of Zimbabwe for the period January - December 2020?
2. What are the socio-demographic factors that influenced uptake of hepatitis B vaccine among healthcare workers at Mutare city council clinics, Manicaland province of Zimbabwe for the period January - December 2020?
3. What are the knowledge levels about HBV among healthcare workers at Mutare city council clinics, Manicaland province of Zimbabwe for the period January –December 2020?
4. What are the health service factors that influence uptake of hepatitis B vaccine among healthcare workers at Mutare city council clinics, Manicaland province of Zimbabwe for the period January - December 2020?

1.6 Justification

Hepatitis B vaccination for healthcare workers (HCWs) is a key component of the WHO Hepatitis B Elimination Strategy 2016–2021. Data on current hepatitis B

vaccine coverage among health care workers in Sub-Saharan Africa including Zimbabwe are scarce, but these data are vital for effective programming.

According to sustainable development goal 3, target 3: By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, waterborne diseases and other communicable diseases. Government and partners have made significant strides with the rest of conditions except with hepatitis virus infections. Dr Gasasira, Zimbabwe WHO country director, said while mortality from HIV, tuberculosis, and malaria was on the decline, mortality caused by viral hepatitis was on the rise which necessitated an urgent need to reverse the alarming trend, through high-impact cost-effective interventions such as Hepatitis B vaccination which can score an early win for prevention (WHO 2019). No study on this research topic in Mutare Urban has been done or has been published.

Health care providers had a prevalence of HBV infection approximately 10 times greater than the general population (Schillie et al., 2013) and this makes them a vulnerable group. In combating this endemic and devastating condition it is important for the government to understand and tailor make strategies from this vulnerable group's perspective.

The Zimbabwean Ministry of Health and Child Care and Mutare City Health in particular currently has no documented policy regarding HBV vaccination for HCW. However, at certain institutions the vaccine is offered to trainees at the commencement of their clinical work. There is no data in Zimbabwe on HBV vaccine coverage in healthcare workers. This information is important for planning strategies to facilitate uptake of the vaccine in the vulnerable population. In addition,

it is not known what proportion of the healthcare work force is at risk for HBV infection and needs vaccine. Results from the research will provide data to cover these knowledge gaps which are important for strategy and policy formulation.

In Zimbabwe HBsAg was detected in 48.3% in patients with HCC compared to a 13.3% seroprevalence in healthy blood donors. HCC is amongst the 5 most common cancers and causes of cancer death in Zimbabwe (Chin'ombe, Chavhunduka & Matarira, 2009). These devastating and expensive complications make Hep B infection a public health problem yet we lack important statistics on the most vulnerable group. It is important to do this study in order to unearth the reasons why policy makers are taking their time to protect the healthcare workers and the nation in general.

Hepatitis B is significantly more infectious than HIV following occupational exposure (50-100 times higher) but there is no policy or programme for post exposure prophylaxis and follow up testing of exposed employees. Healthcare workers are generally more concerned about occupational acquisition of HIV (De Villiers & Prinsloo, 2007) despite the lesser risk. The provision of national guidelines for post exposure prophylaxis and follow up for healthcare workers following HIV exposure should be replicated with viral hepatitis but this is only practical if we gather enough data on the subject.

1.7 Delimitations of the study

The study may be affected by participants' non-response and recall bias that may result in bias of the measures of the outcome. However, the researcher used face to face interviewer administered questionnaires.

Using 10 years' mark for subsequent booster helped to reduce recall bias. People not recalling a vaccine in the past 10 years was considered to have incomplete vaccine status.

1.8 Limitations of the study

The study had the following limitations

1) The study will be conducted at a single urban site which may limit the external validity of the findings. These findings may not be applicable to the general population of Zimbabwean HCW.

2) Much of the demographic and exposure characteristics including previous HBV vaccination and number of doses require retrospective recall by the participants and may thus be subject to recall bias.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature on HBV vaccine uptake amongst health workers globally, regionally and locally. Special focus is given to what other studies have reported as potential barriers and enhancers for the low uptake of HBV vaccine among health workers.

2.2 Conceptual framework

The study will adopt the Social Determinants of Health conceptual framework that was developed by the World Health Organization as shown in the figure below.

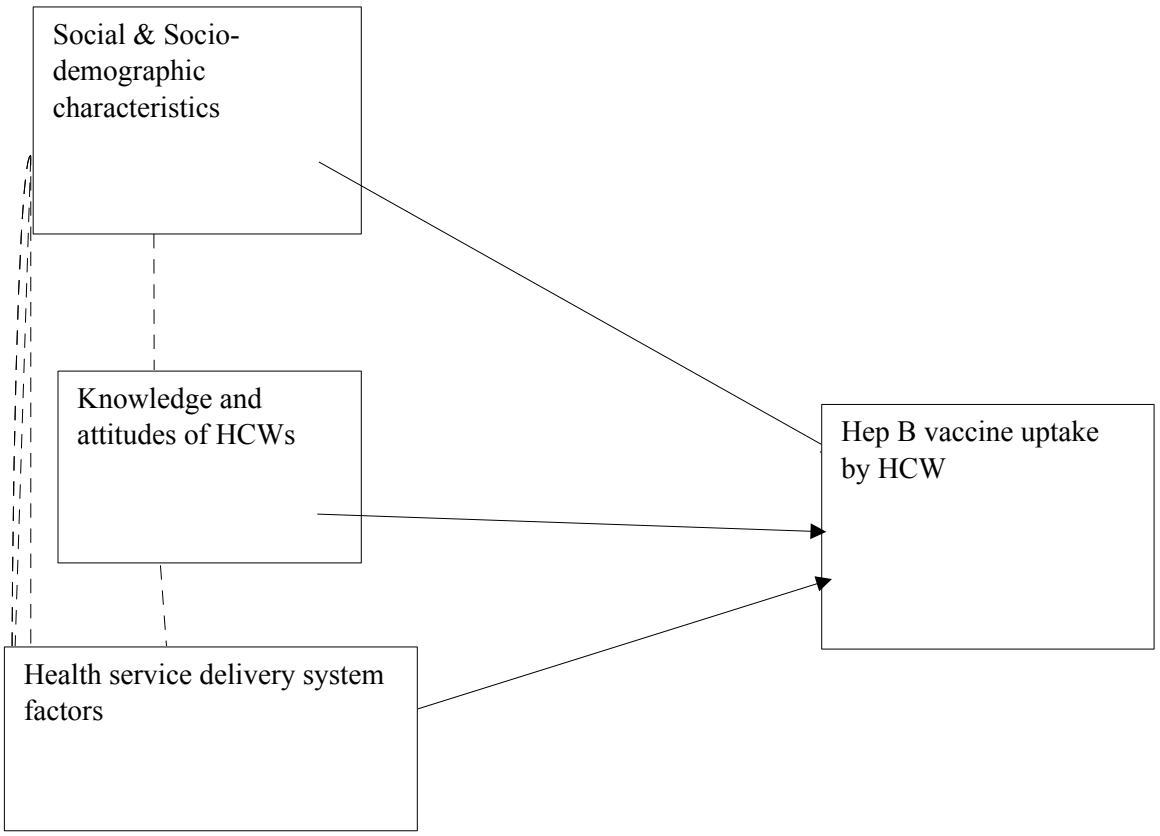

Figure 2: Social Determinants of Health Conceptual Framework [adopted from WHO 2010]

HBV vaccine is a health interventions and is influenced by the determinants of health as outlined by the WHO in 2010.According to the framework above, HBV uptake especially in the at risk groups is determined by a number of structural and social health determinants. Social and socio-demographic characteristics have a huge impact on uptake of medication. For example, health promoting factors that are found in one's working conditions, such as the distribution of income, wealth and influence, and power, influence adherence to HBV uptake.

Socio-demographic characteristics e.g. age and level of education determine HBV uptake. Furthermore, behavioural aspects such as attitudes coupled with knowledge level of an individual also determine HBV uptake. Structural determinants e.g. policies that are supportive and health service provision availability also determine HBV uptake. These structural and social health determinants must be considered when providing HBV for the at risk populations.

2.3 Significance of the conceptual framework

Uptake of HBV vaccine like any other health preventive measures requires adherence and it is determined by a number of factors that range from knowledge and perceptions, socio-demographic characteristics, structural and social health determinants. The conceptual framework highlights the key variables that can affect HBV uptake and these are discussed as below

2.3.1 Viral epidemiology and transmission

The Hepatitis B virus (HBV) is an enveloped partially double stranded DNA virus which is considered to be the prototype member of the family of Hepadnaviridae (Chang, & Lewin, 2007). It is a hepatotropic virus as implied by the taxonomic classification. The HBV DNA genome is only 3.2kb in length which makes it the smallest known virus that infects humans. Despite its small size, HBV has several unique morphological and genomic features. There are overlapping genes, which allows the virus to code for multiple proteins despite its small size. HBV produces three distinct virus related particles, of which the spherical double shelled 42- 47nm diameter Dane particle is the main infectious particle.

The Dane particle, named after the scientist who first discovered it, incorporates icosahedrally symmetrical nucleocapsids which contain the viral nucleic acid and polymerase. The other viral particles are a non-infectious spherical and a filamentous 20nm particle both of which are mainly composed of the Hepatitis B surface antigen (Datta, Chatterjee, & Chakravarty, 2012).

Hepatitis B is a viral infection that attacks the liver and can cause both acute and chronic disease. It is a major global health problem, and the most serious type of viral hepatitis. It is estimated that about 780,000 people die each year due to consequences of hepatitis B, such as liver cirrhosis and liver cancer. WHO estimates that in 2015, 257 million people were living with chronic hepatitis B infection (defined as HBsAg positive). Hepatitis B prevalence is highest in sub-Saharan Africa

and East Asia, where between 5-10% of the adult population is chronically infected (WHO,2018). Zimbabwe has an overall HBsAg seroprevalence rate of 15.4% in the general population and is classified as a high HBV endemic area, threshold of 8% (Tswana, Chetsanga, Nystrom, Moyo, Nzara & Chieza, 1996).

Zimbabwe introduced routine infant hepatitis B immunisation in 1999 and by 2005 reported that at least 90% of infants received all three doses (François, 2008). It is quite likely that the prevalence of HBV is now lower than estimates from earlier studies, especially for younger generation but unfortunately the current crop of healthcare workers is still vulnerable.

HBV infection occurs throughout the world and is endemic in Africa, Eastern Europe, The Middle East and Central and South East Asia (Poland & Jacobson, 2004). Eight different genotypes of the virus have been identified and each has a characteristic geographic and ethnic distribution. Genotype A has a global distribution being found in Northwest Europe, North America and Africa.

Genotypes B and C appear to be restricted to Asia. Genotype D is prevalent in the Mediterranean, Middle East and India, and genotype E in West Africa. Genotype F is found in South and Central America, with genotype G in France, Germany, the United States and Mexico. Genotype H, which was the last to be identified, seems to be geographically limited to Latin America (Bonino, Piratvisuth, Brunetto & Liaw, 2010).

HBV genotypes can further be differentiated into subgenotypes which have distinct geographic and ethnic distributions. Genotypes A and F each have two sub genotypes

(A1 and A2, F1 and F2), whereas genotypes B, C and D have four sub genotypes, numbered for 1 to 4. Genotype A1 has been noted to be the predominant sub genotype amongst blood donors in Zimbabwe (Gulube, Chirara, Kew, Tanaka, Mizokami, & Kramvis, 2011). This genotype has also been described in similar studies done in South Africa and Malawi and is thought to be the prevalent subtype of genotype A in Africa and Asia.

Transmission occurs efficiently via perinatal/mother to child, sexual and percutaneous exposure. Worldwide, perinatal vertical transmission has been the most common mode of transmission of HBV especially in endemic areas (Elgouhari, Abu-Rajab Tamimi, & Carey, 2008). Infection occurs at the time of birth as HBV does not cross the placenta. The risk is greatest for infants born to women who are hepatitis B e antigen positive and is as high as 90% at 6 months of age (Beasley, Trepo, Stevens & Szmuness, 1977).

Horizontal rather than vertical transmission is the predominant mode of transmission in Sub Saharan Africa. This is thought to occur during childhood via contact with non-intact skin. The exact model of horizontal transmission in childhood has not been conclusively proven but saliva, skin abrasions and traditional scarification procedures have been proposed as potential vehicles (Kiire, 1996). High levels of HBV DNA can be detected in the saliva and nasopharyngeal secretions of individuals with HBV infection particularly those with high serum viral load (Kidd-Ljunggren, Holmberg, Bläckberg & Lindqvist, 2006). This has profound implications for exposure and horizontal transmission not just in clinical settings but in the home and school environment in childhood.

HBV is found in significant amounts in the semen and vaginal secretions of infected individuals with sexual contact being a recognised mode of transmission. The risk of infection and transmission is increased in men who have sex with men (MSM), multiple sexual partners and history of prior sexually transmitted infections (Alter & Margolis, 1990).

2.3.2 Hepatitis B Infection Control

Three main strategies have been approved to be effective in preventing HBV infection. They are behaviour modification, passive immunoprophylaxis, and active immunization. The implement of mass HBV immunization program is recommended by the WHO since 1991, and has dramatically decreased the prevalence of HBV infection and HCC in many countries (Hou, Liu, & Gu, 2005).

Behaviour Modification

Changes in sexual practice, hygiene levels and improved screening measures of blood products have reduced the risk of transfusion-associated hepatitis. Behaviour modification is thought to be more beneficial in developed countries than in developing countries, where neonates and children in early childhood are at the greatest risk of acquiring infection. In these groups, immunoprophylaxis, both passive and active, will be more effective.

HBV can remain stable on and infectious on environmental surfaces for at least 7 days, thus there is potential for infection indirectly via contaminated surfaces and objects (Shepard, Simard, Finelli, Fiore, & Bell, 2006). This is of particular concern

in the health care setting where contaminated surfaces have been documented to be reservoirs for HBV especially in dialysis units.

Passive Immunoprophylaxis

Hepatitis B Immune Globulin (HBIG) is a sterile solution of ready-made antibodies against hepatitis B. HBIG is prepared from human blood from selected donors who already have a high level of antibodies to hepatitis B and used in passive immunoprophylaxis. Passive immunoprophylaxis is used in four situations:

- newborns of mothers infected with hepatitis B-high risk babies
- after needle stick exposure-as post exposure prophylaxis
- after sexual exposure, and
- After liver transplantation.

Immunoprophylaxis is recommended for all infants born to HBsAg positive mothers. Current dosing recommendations are 0.13ml/kg HBIG immediately after delivery or within 12 hours after birth in combination with recombinant vaccine. The combination results have a higher-than-90% level of protection against perinatal acquisition of HBV (Stevens, Taylor, Tong, Toy, Vyas, Nair, & Krugman, 1987). Between 3.7% to 9.9% of infants still acquire HBV infection prenatally from HBV-infection mothers, despite immunoprophylaxis (Xu, Yan & Xu, 1999). Failure of passive and active immunoprophyxis in this setting may be the result of in utero transmission of HBV infection, perinatal transmission related to a high inoculum, and/or the presence of surface gene escape mutants.

In a study in China to understand the effectiveness of HBIG, the rate of intrauterine transmission in the group received 200/400IU of HBIG fall to 5.7%, compared to 14.3% in control group. ($P < 0.001$) (Zhu, Yu, Yu, Lu, Gu, Dong, & Zhang, 2003).

Hepatitis B immune globulin remains a central component of prophylaxis in HBV-infected patients undergoing liver transplantation. HBIG monotherapy given at a high dosage can prevent recurrence in 65% to 80% of patients. Because the cost of long-term prophylaxis with high-dose HBIG is extremely high and combination therapy using HBIG with a nucleoside analog is more uniformly effective, the current protocol is combination HBIG with a nucleoside analog after liver transplantation. These combination protocols have reduced the rate of virologic breakthrough to 10% or less (Terrault & Vyas, 2003).

Active Immunization

Prevention of primary infection by vaccination is an important strategy to decrease the risk of chronic HBV infection and its subsequent complications. The first-generation hepatitis B vaccine, an inactive plasma-derived vaccine, became available in 1982. Consequently, the second generation of HB vaccine, a DNA recombinant HB vaccine was also available for general use in 1986. Both of the vaccines were proven to be safe and efficacious in preventing HBV infection.

Hep B vaccine was first licensed in 1986 and after three intramuscular doses of Hepatitis B vaccine, more than 90% of healthy adults and more than 95% of infants, children, and adolescents (from birth to 19 years of age) develop adequate antibody

responses. Immunogenicity of HBV vaccine was 90 – 97% in healthcare workers in a study in Iran (Azami, Hafezi Ahmadi & Sayehmiri, 2017).

In 1991, the World Health Organization (WHO) recommended that hepatitis B vaccination should be included in national immunization system in all countries with a hepatitis B carrier prevalence (HBsAg) of 8% or greater by 1995 and in all countries by 1997. By May 2002, 154 countries had routine infant immunization with hepatitis B vaccine (Lavanchy, 2004).

The world's first universal vaccination program for HBV infection was launched in 1984 in Taiwan. During the first 2 years of the program, coverage was provided mainly for infants whose mothers were carriers of HBsAg. Vaccination was subsequently extended, first to all newborns and then to unvaccinated preschool-age and elementary school-age children. Since 1991, catch-up vaccinations have been given to children in the first grade. This program reduced the overall HBsAg prevalence rate from 9.8% in 1984 to 1.3% in 1994 among children <15 years of age (Ni, Chang, Huang, Chen, Hsu, Chiu & Chen, 2001).

In 1999, vaccination rates were 80–86% for young children and higher than 90% for older children; the prevalence of HBsAg was reduced to 0.7% for children younger than 15 years of age (Ni et al, 2001).

To evaluate the long-term efficacy of hepatitis B (HB) vaccination in newborns, one of the longest HB vaccine follow-up studies in the world was conducted in Shanghai, China (Zhou, Wu, Sun, Dai, Zhou, & Liu, 2003). Children who were born in 1986

and immunized with hepatitis B vaccine at birth were followed up at least once a year. Serum HBsAg, anti-HBc and anti-HBs were tested. The positive rates of HBsAg in the vaccine group with the period of 16 years were 0.46%-0.97%, the average being 0.61%, which was much lower than those of baseline before vaccination and external control. The long-term efficacy of newborn vaccination was 85.42%.

In countries such as Italy and the United States, the incidence of acute hepatitis B has declined dramatically during the past decade after vaccination program for HBV infection, particularly among persons in younger age group (Goldstein, Alter, Williams, Moyer, Judson, Mottram & Margolis, 2002).

Universal HB vaccination was proven to be effective in the prevention of HCC in several large cohort studies in Southeast Asia. In a study done in Taiwan the average annual incidence of HCC in children 6 to 14 years of age declined from 0.70 per 100,000 children between 1981 and 1986 to 0.57 between 1986 and 1990, and to 0.36 between 1990 and 1994 ($P<0.01$) in the first vaccinated cohort in Taiwan (Chang, Chen, Lai, Hsu, Wu, Kong, & Chen 1997). The corresponding rates of mortality from hepatocellular carcinoma also decreased.

After universal vaccination against HB in 1987 in Long'an, Guang Xi, a highly endemic area in Southern China, a birth cohort study was used to evaluate the efficacy of hepatitis B vaccination. The incidence of HCC dropped from 3.27/10,000 to 0.17/10,000, a 94.8% decrease, in the group of 0-19 year-olds. The average incidence of HCC in general population for the period from 1996 to 2002 dropped to

27.86/100, 000 from 48.18 for the period from 1969 to 1988 (Li, Yang, Gong, Li, Huang, Fang ... & Zhuang, 2004).

The protective effect of HBV vaccination against liver cancer in adults was also investigated in a cohort study in Korea. This study suggested that the immunization with HB vaccine, even in adulthood, could reduce the risk of liver cancer (Lee, Kim, Kim, Lee, Kim, Park & Ahn, 1998). The decrease in the rate of HCC after universal vaccination against hepatitis B provides further evidence that HBV is a cause of HCC.

Hepatitis B vaccine is given as three doses at 0, 1 and 6 months interval then booster every 10 years because anti-HBs may disappear in a substantial proportion of vaccine after initially successful vaccination. Is it necessary to boost after initially successful vaccination? The results of long-term follow-up studies, together with assessment of the role of immunological memory among vaccines, now question the necessity of providing booster doses following a successful course of primary immunization.

In China, a long-term follow up study on HB vaccine immune efficacy showed that within the period of 16 years, the positive rate for HBsAg of the children born in 1986 ranged between 0.46 % ~ 0.97 % with the average being 0.61 %, which was much lower than those of the background group before vaccination, despite the rate of HBsAg positive and the geometric mean titre declined (Zhou, Wu, Sun, Dai, Zhou, & Liu, 2003).

Long-term B-cell memory has been confirmed by demonstrating either the presence of anamnestic anti-HBs responses, or the presence of circulating B cells to produce anti-HBs by a spot-enzyme-linked immunosorbent assay (ELISA) (Wisman, Van Hattum, De Gast, Bouter, Diepersloot, Maikoe, & Mudde, 1991). The accumulated data indicate that protection is dependent on immune memory, rather than declining anti-HBs responses. European Consensus Group on hepatitis B immunity recommend that following a complete course of vaccination, booster doses are unnecessary in immunocompetent persons (Kane, Banatvala, Da Villa, & Esteban, 2000). In some economies evaluating immune competence is expensive than giving boosters hence choosing the later.

Even though there are infection control practices and administration of hepatitis B immune globulin following suspected exposure to reduce the risk of HBV transmission, none have been as effective as active immunization with hepatitis B vaccine, which remains the single most important hepatitis B prevention measure (Shepard, Simard, Finelli, Fiore & Bell, 2006).

2.3.3 Socio demographic characteristics

Socio demographic characteristics such as age, sex, years of employment, education level and occupation have been found to affect uptake of HBV among health workers. A study by Ssekamatte, Mukama, Kibira, Ndejjo, Bukenya, Kimoga, & Mutyoba, in Uganda (2020) showed that of the 306 health care workers enrolled in the study, 230 (75.2%) had ever screened for HBV infection while 177 (57.8%) were fully vaccinated.

At the same time being male was positively associated with 'ever been screened' for HBV infection (Adjusted PR = 1.27, 95% CI 1.13–1.41). This concurs with study findings by Tatsilong, Noubiap, Nansseu, Aminde, Bigna, Ndze and Moyou (2016) in Cameroon which showed that forty-seven percent (47 %) of workers had good level of knowledge of HBV infection and the men were 3.20 times (95 % CI: 1.02–9.19, $p = 0.04$) more likely to have a good level of knowledge than women.

Type of occupation was found to be one of the factors associated with HBV vaccine uptake among health workers. A study done by Omotowo, Meka, Ijoma, Okoli, Obienu, Nwagha and Ugwu (2018) in Nigeria showed that the odds for uptake of hepatitis B vaccination were 22% lower among nurses compared to doctors (AOR = 0.78, 95% CI = 0.54–0.98, $P = 0.037$). This concurs with a study by Auta, Adewuyi, Kureh, Onoviran and Adeloye (2018) which showed that doctors were more likely (OR: 2.6, 95% CI: 1.8–3.7) to be fully vaccinated than nurses with estimated pooled estimates of 52.4% (95% CI: 31.1–73.8) and 26.3% (95% CI: 9.7–42.9), respectively.

This however contradicts findings by Panhotra, Saxena, Al-Hamrani and Al-Mulhim (2005) in Saudi Arabia which showed an overall HBV vaccine compliance rate of 71.6% (932/1302) was observed among HCWs including that of 79.5% (492/619) among nurses, 78.3% (242/309) among technicians, and 52.9% (198/374) among physicians. Thus, physicians recorded the lowest compliance (OR, 3.211; 95% CI, 2.259-4.567; $P < .0001$) to HBV vaccine.

Another study done by Ogoina, Pondei, Adetunji, Chima, Isichei, and Gidado (2014) revealed that House officers and laboratory scientists were more likely to be

unvaccinated than resident doctors, consultant doctors and nurses. A study by Ziraba, Bwogi, Namale, Wainaina and Mayanja-Kizza (2010), identified that being a nursing assistant (OR = 17.78; p value = 0.007) or a laboratory technician (OR = 12.23; p value = 0.009) were associated with a higher risk of current hepatitis B virus infection. Laboratory technicians (OR = 3.99; p value = 0.023) and individuals with no training in infection prevention in last five years (OR = 1.85; p value = 0.015) were more likely to have been exposed to hepatitis B virus infection before.

Age was found to affect uptake of HBV and a study by Omotowo et al (2018) showed that as age increases the uptake of HB vaccination increased (AOR = 1.30, 95% CI = 1.08–1.59, $P < 0.001$). This does not concur with a study by Ogoina et al (2014) which revealed that full vaccine coverage was associated with younger age. The previous mentioned study concurs with findings by Yuan, Wang, Zheng, Zhang, Miao, Sun, and Cui (2019) which showed that an age of 30–39 years increased the odds of complete hepatitis B vaccination by 1.3-fold [95%CI (1.1–1.7)].

Duration of work experience was found to be a factor that affects HBV uptake among health workers. Increasing duration of work in the hospital (AOR = 1.19, 95% CI = 1.09–1.32, $P = 0.032$) increased uptake (Omotowo et al, 2018). This concurs with findings from a study by Ibekwe and Ibeziako (2006) in Enugu Nigeria which identified years of occupational practice to have a significant influence on vaccination uptake (P = 0.00).

The previous study also concurs with a study by Ansa, Ofori, Houphouet, Amoabeng, Sifa, Amenuveve and Odame (2019) in Accra which indicated that working for more than 16 years (OR: 3.8, CI: 1.02-12.72) to be one of the factors

associated with being vaccinated amongst the health workers. The previous studies further concur with findings by Getnet, Bayu and Abtew (2020) which indicated that junior HCWs were significantly more likely (AOR 2.265, CI 1.187–4.320, *P* 0.013) to have no complete vaccination uptake than senior HCWs.

A study by Auta et al (2018) showed that HCWs with 10 or more years of experience were more likely to be vaccinated than those with less than 10 years of experience (OR: 2.2, 95% CI: 1.5–3.3). A study by Ciorlia and Zanetta (2005) in Brazil, also showed that among the occupational factors, time in service contributed to a 14% increase in the chances of having positive serology, and work-related injuries increased the risk of HBV infection 4.29 times. A study by Ziraba, Bwogi, Namale, Wainaina and Mayanja-Kizza (2010) in Uganda also concurs with previous studies, his study showed that longer duration in service to be associated with a lower risk of current infection (OR = 0.13; p value = 0.048).

In concurrence is another study by Napolitano, Bianco, D'Alessandro, Papadopoli, and Angelillo (2019) in Italy which showed that two-thirds (62.2%) knew that hepatitis B and influenza vaccines were recommended, and this knowledge was significantly higher among HCWs aged between 50 and 59 years ($p = 0.01$) compared with those aged < 30 years, and in those who search for information about recommended vaccines for HCWs ($p = 0.012$). The same study showed the vaccine knowledge to be significantly lower among nurses and nursing supporting staff compared with physicians ($p = 0.032$). However, previous mentioned studies do not concur with findings by Ogoina et al (2014) which showed that full vaccination was associated with shorter years of professional experience.

Level of education was found to affect HBV uptake among health workers. A study by Omotowo et al (2018) revealed that uptake was about twice higher among those that had tertiary education than others that had less education (AOR = 1.96, 95 CI = 0.76–5.07, $P = 0.164$). This concurs with findings by Ogundele (2017) which identified HCWs educational level (AOR 1.55, 95% CI 1.02-4.51) as predictor of willingness for vaccination. This also further concurs with study findings by Tatsilong, Noubiap, Nansseu, Aminde, Bigna, R., Ndze and Moyou (2016) which indicated that participants with a university study level were more (95 % CI: 3.17–25, $p < 0.0001$) likely to have a good level of knowledge than those with a high school study level.

The same findings were indicated in a study by Getnet, Bayu and Abtew (2020) which showed that the HCWs who had below BS degree were significantly more likely (AOR 2.417, CI 1.326–4.404, P 0.004) to have noncomplete vaccination uptake than those who had BS degree or above. This further concurs with Byrd, Lu, and Murphy (2013) in a study in the United States which revealed independent predictors of vaccination to include having more than a high school education, direct patient contact,, influenza vaccination in the past year, and ever having been tested for HIV.

2.3.4 Knowledge and attitudes about HBV

Knowledge and attitude about HBV was also found to affect HBV uptake among health workers. A study by Yuan et al (2019) showed that the possession of acceptable hepatitis B knowledge increased the odds of complete hepatitis B vaccination by 1.3-fold [95% CIs (1.1–1.5). This concurs with a study by Ogundele,

Fehintola, Adegoke, Olorunsola, Omotosho and Odia (2017) in Nigeria which showed knowledge of HBV (AOR 1.50, 95% CI 1.31-5.84) as a high predictor to vaccine uptake.

In the same previous study perceived risk of contracting HBV (Adjusted odds ratio (AOR) 2.01, 95% confidence interval (CI) 1.20-6.20), was also found to be a predictor for vaccine uptake among health care workers. A study by Omotowo, Meka, Ijoma, Okoli, Obienu, Nwagha and Ugwu (2018) in Nigeria revealed that unvaccinated health workers provided following reasons for non-vaccination: they had not been offered a chance for hepatitis B vaccination (98 individuals, 65.3%), or they were very careful and observed standard precautions while at work (70 individuals, 46.7%).

This concurs with a study by Aaron, Nagu, Rwegasha and Komba (2017) in Tanzania which showed the following reasons for non-vaccination as: 98 (65.3%) reported that they had not been offered the vaccine; 70 (46.7%) observed standard precautions to ensure infection prevention and 60 (41.3%) blamed a low level of awareness regarding the availability of the hepatitis B vaccine. A study done by Abeje and Azage (2015) in Northwest Ethiopia, only 52% of the respondents were knowledgeable about hepatitis B infection. In the same study, only 62% of health care workers were knowledgeable about hepatitis B vaccine. From the total of 370 respondents, only 20(5.4%) reported that they took three or more doses of hepatitis B vaccine.

According to a study done by Omotowo et al (2018) in Nigeria showed the reasons for non-uptake of vaccination included: ‘did not believe they could be infected’ 28

(6.6%). In this study, 64.7% of respondents perceived their risk of acquiring hepatitis B infection very high or high. A study by Briggs and Thomas (1994) showed that the reasons given by staff for non-uptake included fear of side-effects or injections, misconceptions about hepatitis B transmission, the alternative use of homeopathic vaccine, pressure of work, difficulties in arranging vaccination, forgetfulness, and `inertia'. Of the 54 unvaccinated staff, 55.6% believed themselves to be at high risk of contracting hepatitis B as a result of their occupation; 33% of 202 fully vaccinated staff were unaware of the use of booster doses of vaccine to maintain long-term immunity.

This also concurs with study findings by Ibekwe and Ibeziako in Nigeria (2006) which also found the most common reason for non-vaccination to be lack of opportunity (43.08%). Furthermore, a study by Kateera, Walker, Mutesa, Mutabazi, Musabeyesu, Mukabatsinda and Orikiiriza, (2015) in Rwanda showed that of the 17 participants (4.5%; 17/378) who reported having received the HBV vaccine, only 3 participants (0.8%) had received the three-dose vaccination course and only 42 HCWs (42/378; 11.1%) were aware that a HBV vaccine was available.

A study by Yuan et al (2019) showed that the main self-reported reason for incomplete hepatitis B vaccination was “forgot to complete follow-up doses” among 43% (234/547) of respondents. This study concurs with findings from a literature review of articles by Malewezi, Omer, Mwagomba, and Araru (2016) which indicated that HBV awareness and vaccination were relatively high, but vaccination rates were lower, with 4.6–64.4% of those “ever vaccinated” completing the vaccination regimen. In addition, the reasons commonly cited for non-uptake of

vaccine included cost, lack of awareness of vaccine availability, and inadequate information concerning the vaccine (Malewezi et al, 2016).

Furthermore, a study by Hamissi, Tabari, Najafi, Hesameddin, Zahra (2015) in Iran discovered the reasons for none-vaccinated group to include: high cost (7.2%), insensitivity and ignorance to the risks (45.8), non-availability of vaccines (19.5%), inertia (22%), pregnancy (1.2%) and fear of complication (2.4%). Ninety-seven point five (97.5%) of the dentists reported routine use of gloves and 70.6% routine use of masks whilst 61.3% of the respondents also reported using protective garment constantly and 44.4% of dentists reported routine use of eye wear.

A study by Abiola, Omoyeni, and Akodu (2013) showed that the majority (70.2%) had good knowledge of hepatitis B infection and vaccination and the mean knowledge score (%) was 61.2 ± 20.7. Majority (90.4%) knew that hepatitis B virus can be acquired through a needle stick injury. Majority (67.9%) were aware of the existence of an effective vaccine against hepatitis B infection; however, only 45.1% knew correctly that a post hepatitis B vaccination test is necessary to confirm protection. Majority (86.9%) knew that a complete dose of hepatitis B vaccine is 95% effective; however, only 49.4% knew for how long the vaccine protects. Only 36.9% knew correctly that hepatitis B virus is 100 times more infectious than HIV. Attitude towards hepatitis B vaccination was good among all of the respondents and the mean attitude score (%) was 92.9 ± 14.3. This is similar to findings by Ogundele et al (2017) which found that 62.7% of the HCWs perceived self to be at high risk of contracting HBV while (37.3%) perceived self to be at low risk.

2.3.5 Health service factors

Is the vaccine readily available when one needs it? Are the systems in place to assist healthcare workers to get vaccinated?

Others reported that there was not enough awareness concerning access to hepatitis B vaccination (62 individuals, 41.3%). According to a study done by Ibekwe and Ibeziako (2006) in Nigeria, the most common reason for non-vaccination was lack of opportunity (43.08%). And according to Omottowo et al (2018) revealed that the cost of vaccine 48 (10.8%) was a deterrent to being vaccinated among the health workers in the study. This concurs with findings by Auta et al (2018) which also indicated the common reasons for non-vaccination of HCWs were unavailability of vaccine 50.5% (95% CI: 26.5–74.4), busy work schedule 37.5% (95% CI: 12.6–62.4) and cost of vaccination 18.4% (95% CI: 7.1–29.7).

A study by Abiola, Omoyeni and Akodu (2013) in Lagos State Africa, showed that among those who were not vaccinated, the majority (67.6%) sighted non-availability of the vaccine as the major reason for non-vaccination.

A study by Yuan et al (2019) revealed that HCWs in workplaces offering a free hepatitis B vaccine with vaccination management were 1.4 times more likely (OR = 1.4, 95% CI: 1.1–1.8) to complete their hepatitis B vaccination compared to HCWs in workplaces that did not offer a free hepatitis B vaccine. Furthermore, the same study showed that the receipt of training on hepatitis B was also associated with a higher percentage of completing the hepatitis B vaccination (OR = 1.5, *95% CI*: 1.2–1.8). It was also discovered that hospitals that did not provide hepatitis B vaccination

activities (40%) were the top reasons mentioned for refusing hepatitis B vaccination (Yuan et al, 2019).

A study by Aaron, Nagu, Rwegasha, and Komba (2017) revealed the following reasons for non-vaccination were given: 98 (65.3%) reported that they had not been offered the vaccine; 70 (46.7%) observed standard precautions to ensure infection prevention and 60 (41.3%) blamed a low level of awareness regarding the availability of the hepatitis B vaccine.

The presence of infection control guidelines was found to be a factor that affects uptake of HBV vaccine. A study by Ssekamatte et al (2020) in Uganda found that working in a healthcare facility with infection control guidelines (Adjusted PR = 0.79, 95%CI 0.66–0.95) to be negatively associated with being fully vaccinated. This does not concur with findings by Alege, Gulom, Ochom, & Kaku (2020), which showed that availability of vaccines in the health facility ($p<0.027$), and availability of guidelines followed by all health workers in this facility ($p<0.006$) were the factors independently associated with the uptake of hepatitis B vaccination.

One of the factors found to be associated with vaccine uptake was the type of health sector. It was found in a study by Burnett et al (2011) that working in the private sector to be statistically significantly associated with vaccination uptake (OR: 1.73; 95% CI: 1.01–2.98; chi-square *p*-value: 0.035).

2.4 Summary

This chapter presents a literature review on HBV vaccine uptake amongst health workers globally, regionally and locally. Special focus was given to what other studies have reported as potential barriers and enhancers for the low uptake of HBV vaccine among health workers.

CHAPTER 3 METHODOLOGY

3.1 Introduction

This chapter outlines the research design, study setting, study population, sampling criteria and methods, data collection methods, data analysis plan and ethical considerations.

3.2 The Research Design

An analytical cross sectional study was carried out to solicit more information on HBV uptake among health workers in all Mutare City clinics. The research design was chosen for its strength in determining association between variables. Furthermore, this design was found to be suitable as it is cheap and less time consuming. Both quantitative and qualitative methods will be used in data collection.

3.3 Study setting

This study was carried out in Mutare City Council clinics, Manicaland, Zimbabwe. The district is about 300 km to the east of Zimbabwe's capital, Harare. The latest data based on 2012 census projections showed that its' population is approximately 188,243 urban (Zimbabwe National Statistical Agency (ZIMSTAT, 2012). Mutare City runs 9 health institutions in total and these are found in the urban areas of Mutare.

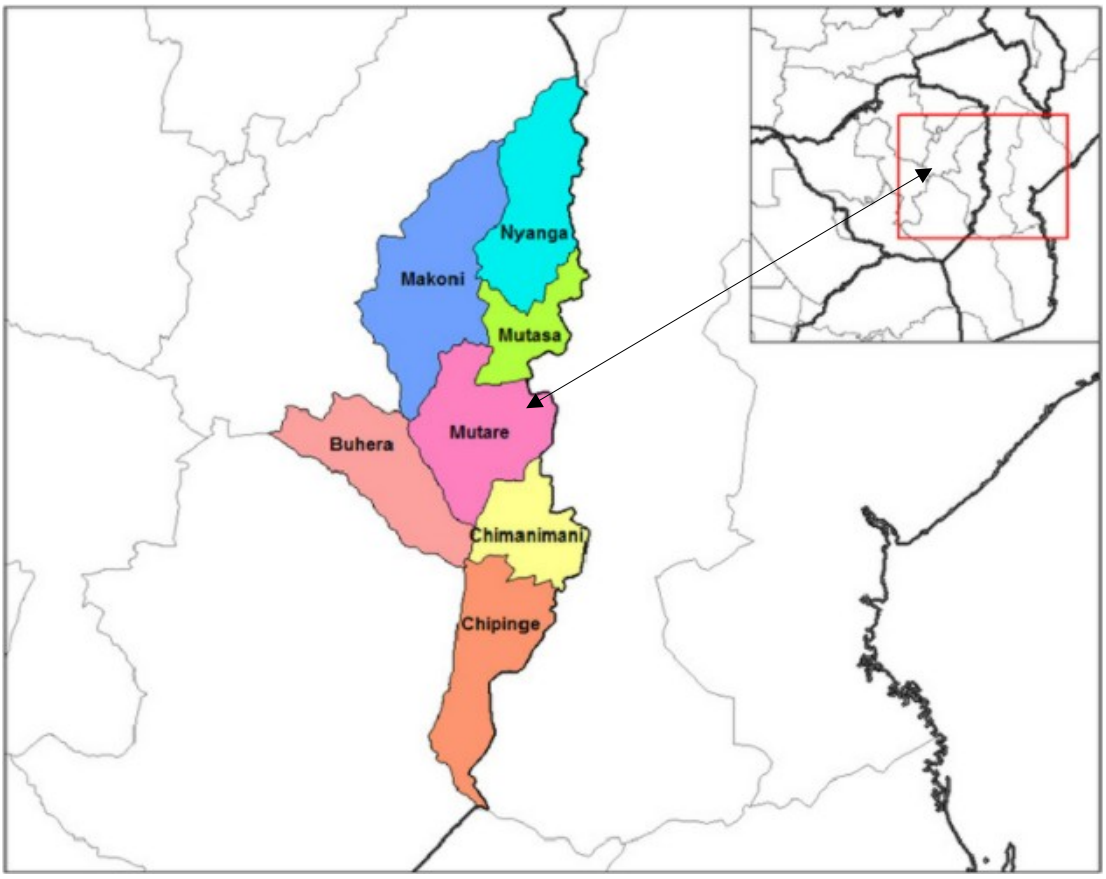

Figure 2: Study Area

3.4 Study population

The source population of this study were all the health service providers employed under city clinics who are involved in direct health care service for clients and patients were included in this study in all departments, including trained nurses, medical attendants, and clinicians – both surgical and medical-related specialties and laboratory technicians.

3.4.1 Inclusion Criteria

All health professionals employed under city health that were at high risk of contracting HBV that is nurses, doctors, laboratory scientists and clinicians.

3.4.2 Exclusion Criteria

All health professionals not working under city clinics will be excluded. Also students on attachment were excluded. Furthermore, any health worker who was unwilling to participate or incapacitated to give consent were excluded from the study.

3.5 Sample size

The sample size was calculated using Dobson's formula:

S=Z^2* (p) * (1-p)/c2

Z = Z value (e.g. 1.96 for 95% confidence level)

p = percentage picking a choice, expressed as decimal

c = margin of error (5%)

With a HBV vaccination rate of 5.9% (p=0.059), the required sample size is 1.96^2*0.059*0.941/0.05^2= 85

There are 9 clinics in Mutare urban and the staff is also limited, total of 129. The study enrolled all health staff to be study participants after seeking their consent. Key informant interviewees were the City Health Director and the Senior Nursing officer for Mutare City.

Total health professionals employed under Mutare City clinics is 12, this constitutes nurses, clinical officer, nurse aides and medical doctors.

3.6 Sampling Procedure

Purposive sampling procedure was used. The investigator approached healthcare workers through the hospital administration and the heads of the departments and explained the purpose of the study; get written consent and make appointments to interview the staff. All found on duty were recruited into the study. A pretested interviewer administered questionnaire was used to obtain information from the consenting participants.

3.7 Data collection instruments

The investigator used a structured interviewer administered questionnaire to collect information on demography, knowledge on HBV, factors associated with HBV uptake and other relevant information. A key informant guide was used to interview key informants.

3.7.1 Dependent variable

The dependant variable was the HBV vaccination status of the health workers, and this is measured by noting whether the participant HBV status is complete, incomplete but on track and incomplete.

3.7.2 Independent variables

The demographic characteristics of the health workers, knowledge, attitudes and health systems factors were the independent variables. This included the age, education level, religion and marital status of the health workers.

3.8 Pretesting of Instruments

The questionnaire was evaluated for test-retest reliability using 10% of the sample size and they were excluded from the larger study sample. The test-retest assessments were carried out 5 days apart and participants were not told that they would be re-tested to minimise bias. Item completion of the questions and percentage agreement between test–retest assessments were calculated for each question. The results determined the adoption of the questionnaire for use in the study. Face and construct validity was enhanced through subjecting the questionnaire to review by experts in public health and aligning the research instrument to the conceptual framework that predicts HBV uptake. The questionnaire was not translated into Shona since health professionals are conversant in English.

3.9 Data collection procedure

A written informed consent was obtained from the participants who would have volunteered to participate in the study. Following a written informed consent, participants were interviewed in a private and confidential space using an interviewer-administered structured questionnaire. The place of interview was of the participants' choice either at the clinic or at home. The key informant interview guide was used to interview the Director City Health and the Senior Nursing Officer. Standard protocols for COVID 19 prevention were observed. Interviewer was at least one metre apart from the participant and masks were appropriately worn all the time. Data collection process was done over a period of three weeks.

3.10 Data analysis and organisation

In this analysis, Epi info version 7 was used for capturing, cleaning and tabulation of all the data collected using questionnaires. Univariate analysis was employed to describe distribution of social determinants by characteristics of participants. In order to determine the association between HBV uptake and the independent variables, a bivariate analysis was conducted. To determine the predictors of HBV uptake, a multivariate logistic regression analysis was performed to generate odds ratios including all the factors that showed a significant association with the outcome variable. Thematic analysis was used to analyse qualitative data. The differences between participants with complete/on-schedule vaccination and those with incomplete or no vaccination was tested using student's t- and chi-squared tests as appropriate.

3.11 Dissemination of results

Study findings were shared with Africa University, City Health executive, City Health workers and Ministry of Health and Child Care staff. Efforts were done to disseminate the findings to the rest of the community and the general public locally, nationally and regionally.

3.12 Ethical considerations

The investigator obtained ethical approval from the Ethics Committee of Africa University (AUREC). The permission to collect data was sought from the City health directorate. A written informed consent was obtained from all participants prior to each session, no coercion was used. All the participants were assured that they can

withdraw from the process whenever they want with no disadvantage to their employment. Privacy and confidentiality was maintained throughout the study process. Measures to ensure confidentiality included telling clients that no information was shared to other people and privacy was maintained, no names were used on the questionnaires but they were coded using numbers. Furthermore, collected data was kept in a safe and locked cupboard.

3.13 Summary

This chapter presented the study methodology, outlining the design, the study setting, study population, sampling and sampling procedure, data collection and analysis together with ethical considerations that were observed in this study.

CHAPTER 4 DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

Chapter 4 presents analyses and discusses the results of the study. The study sought to determine factors associated with uptake of HBV vaccine by health professionals in Mutare City Council health facilities. The study used a sample of 111 health professionals who constituted of nurse aids, nurses, clinical officer and doctors.

4.2 Socio-demographic characteristics of the study participants

The study results revealed that the prevalence of HBV vaccination uptake stand at 21% among health professionals in Mutare district. The mean age of the participant was 40.7 years with a standard deviation of 2.5. The majority of the participants 85 (76%) were married. The dominant sex for the study sample was female 82 (74%).With regards to the level of education, participants had predominantly reached secondary or tertiary education and nurses 62 (56%) constituted the greatest proportion of the sample study participants.

Of the interviewed participants, the average household expenditure was predominantly between 250 and 500 USD per month and Christians were the dominant religion constituting 86 (77%) of the study sample. The association between HBV uptake and demographic variables was assessed using the Chi-square test. Only age (p=0,001); education level (p=0.045); profession (p=0.05); household expenditure (p= 0.032) and religion (p= 0.048) were significantly associated with HBV uptake by health professionals in Mutare. Table 1 below summarise the results on the demographic characteristics of participant

Table 1: Demographic Characteristics of participants and HBV uptake (N=111)

Variable	Category	Vaccination against HBV (%)		Chi-square P-value
		Yes	No	
		23 (21.0)	88 (79.0)	
Age	Mean age = 40.7 years (SD=2.5)			0.001*
Marital status	Married	26 (76.5)	67 (87.0)	0.241
	Previously married/ never married	8 (23.5)	10 (13.0)	
Sex	Female	21 (61.8)	69 (89.7)	0.062
	Male	13 (38.2)	8 (10.3)	
Education	Primary	0 (0.0)	0 (0.0)	0.045*
	Secondary	16 (47.0)	33 (42.8)	
	Tertiary	18 (53.0)	44 (57.0)	
Profession	Nurse Aid	3 (6.8)	10 (13.0)	0.050*
	Nurse	40 (90.9)	67 (87.0)	
	Clinical officer	1 (2.9)	0 (0.0)	
Household expenditure	>$200	2 (5.9)	10 (7.8)	0.032*
	$250 -$500	14 (41.1)	88 (68.8)	
	$500+	18 (53)	30 (23.4)	
Religion	Christian	25 (73.5)	67 (87)	0.048*
	Muslim	3 (8.8)	8 (10.4)	
	Apostolic	6 (17.7)	2 (2.6)	

The dominant sex in the study was female and this is consistent with the health worker sex pyramid in Zimbabwe where females are more predominant than males in this field. Contrary to what one would think that women easily take up

recommended health care service packages, female health care profession who constituted the greater proportion of the study participants were not vaccinated.

A study in Nigeria reported that differences in age, sex, duration of practice and respondent's institution between vaccinated and unvaccinated ORP were not significant (P > 0.05) (Kesieme, et al, 2019). The findings of this study contradicts with study findings Ssekamatte, et al (2020) in Uganda showed that of the 306 health care workers enrolled in the study, 230 (75.2%) had ever screened for HBV infection while 177 (57.8%) were fully vaccinated. At the same time being male was positively associated with 'ever been screened' for HBV infection (Adjusted PR = 1.3, 95%CI 1.13–1.41).

Age was a statistically significant predictor of HBV uptake with older health care professionals being the greater proportion of those who were not vaccinated. This could be explained by the fact that vaccine hesitancy is also influenced by social norms and cultural beliefs and older generations are more likely to base their personal decision on health including decisions to get vaccinated from what they had been socialised in the past. The younger generations are more likely to be receptive to changes in medical technology with lesser resistance.

The findings from this study are similar to what a study by Omotowo et al (2018) which showed that as age increases the uptake of HB vaccination increased (AOR = 1.3, 95% CI = 1.08–1.59, P < 0.001). However, this does not concur with Ogoina et al (2014) whose study revealed that full vaccine coverage was associated with younger age. These results also concurred with findings by Yuan, Wang, Zheng, Zhang,

Miao, Sun, and Cui (2019) which showed that an age of 30–39 years increased the odds of complete hepatitis B vaccination by 1.3-fold [95%CI (1.1–1.7)].

Health care professionals with higher levels of education (secondary and tertiary education) were less likely to have been vaccinated against Hepatitis and those belonging in higher wealth quintiles were also less likely to have taken the HB vaccine. The researcher attributes this unexpected level of vaccine hesitancy to myths and misconceptions that are perpetuated against vaccinations globally. Myths and misconceptions coupled with inaccurate and inconsistent messaging have been reported globally to be significantly associated with poor uptake of vaccines (Tesfaye et al, 2018; WHO, 2017).

The wealthier and more educated classes of professionals are more likely to research for both correct and wrong information on various media platforms and are more likely to base their personal decisions on what they have researched and what they have heard about the side effects and adverse effects associated with a given vaccine. Such conspiracy theories have been confirmed in different studies to be associated with high levels of vaccine hesitancy (Riaz, 2018).

Adverse events or perceived safety-related barrier causing fear of adverse events (AEFIs) has been widely reported in studies as one of the leading causes of vaccine hesitancy (Lau et al, 2018 & Tefera et al, 2018). Findings of this study contradict with findings by Omotowo et al (2018) which revealed that uptake was about twice higher among those that had tertiary education than others that had less education (AOR = 2, 95 CI = 0.76–5.07, $P = 0.164$). Also findings contradict with findings by Ogundele (2017) which identified HCWs educational level (AOR 1.55, 95% CI 1.02-

4.51) as predictor of willingness for vaccination. Furthermore, it contradicts with study findings by Tatsilong et al (2016) which indicated that participants with a university study level were more (95 % CI: 3.17–25, $p < 0.0001$) likely to have a good level of knowledge than those with a high school study level.

Findings do not agree with findings indicated in a study by Getnet, Bayu and Abtew (2020) which showed that the HCWs who had below BS degree were significantly more likely (AOR 2.417, CI 1.326–4.404, *P* 0.004) to have non complete vaccination uptake than those who had BS degree or above. In addition, findings of this study do not concur with Byrd, Lu, and Murphy (2013) whose study in the United States revealed independent predictors of vaccination to include having more than a high school education.

Opposed to what many studies on behaviour change communication and uptake of health care services that have earmarked the conservative apostolic groups as the leading objectors to vaccination, this study revealed that Christian health care workers were more likely to have been unvaccinated against Hepatitis B compared to any other religious groupings that participated in the study. This could partly be explained by the fact that Christians constituted the majority of the sampled participants. There is also a general tendency among the faith community to discredit medical interventions and focusing only on the healing power as the source of human protection even among health care professionals. This study finding was in tandem with what similar studies reported that religion is a predictor of vaccine hesitancy (UNICEF, 2017).

4.3 Knowledge on HBV of the study participants

Participants' knowledge was assessed. The questions on knowledge included a question on HBV definition, knowledge on the affordability of HBV, recommended inoculation times for complete vaccination, schedule for full HBV cover, frequency of vaccination and intervals for HBV boosters. Only 11 (10%) of the participants had correct knowledge of the definition of HBV and only 40% of the participants had the correct knowledge on the number of times one should be inoculated. Only 30% of the participants had the correct knowledge as to the intervals of HBV boosters.

Only knowledge on the cost of the vaccine and the schedule for vaccination were significantly associated with HBV uptake.

Though higher knowledge levels did not directly translate to an increased uptake of the HBV vaccine among the study participants, those who knew that the HB vaccine was free were more likely to have been vaccinated and those who had correct knowledge on the schedule for HBV were more likely to be update with their HB vaccination status. The study results revealed that lack of awareness on HBV was significantly associated with poor uptake. After controlling for age, level of education, knowledge on HBV, scheduling for taking HBV, household expenditure per month and health service factors, only age, knowledge on HBV, scheduling for HBV, household expenditure and health service factors were significant predictors of uptake of HBV by health workers for Mutare City Council.

Table 2: Knowledge on HBV

Variable	Category	Vaccination against HBV (%)		P-value
		Yes	No	
		24 (21.0)	87 (79.0)	
Definition of HBV	Correct	32 (94.1)	68 (89.1)	0.063
	Incorrect	2 (5.9)	9 (10.9)	
Vaccination against HBV Free	Yes	31 (91.1)	62 (80.5)	0.001*
	No	3 (8.9)	15 (19.5)	
Recommended inoculation times	1	6 (17.6)	15 (18.8)	0.072
	2	3 (8.8)	8 (10.2)	
	3	15 (44.1)	24 (43.0)	
	4	10 (29.4)	12 (15.6)	
	Don't know	0 (0.0)	10 (12.5)	
Schedule of HBV full cover	0,1 & 6 months	10 (29.4)	24 (31.3)	0.002*
	0, 2 &8 months	12 (35.3)	29 (37.5)	
	0, 3 & 6 months	12 (35.3)	24 (31.3)	
Times participant vaccinated against HBV	0	0 (0.0)	77 (100)	
	1	10 (29.4)	0 (0.0)	
	2	12 (35.3)	0 (0.0)	
	3	12 (35.3)	0 (0.0)	
	4+	0 (0.0)	0 (0.0)	
Recommended duration for a booster shot.	0 -5 years	10 (29.4)	48 (62.5)	0.055
	6 -10 years	13 (38.2)	10 (13.3)	
	11+ 42	11 (32.3)	19 (24.2)	

Similar studies have also reported that knowledge and attitude about HBV affect HBV uptake among health workers. A study by Yuan et al (2019) showed that the possession of acceptable hepatitis B knowledge increased the odds of complete hepatitis B vaccination by 1.3-fold [95% CIs (1.1–1.5). A study by Omotowo et al (2018) revealed that unvaccinated health workers provided following reasons for non-vaccination: they had not been offered a chance for hepatitis B vaccination, or they were very careful and observed standard precautions while at work.

A study by Abiola, Omoyeni, and Akodu (2013) showed that the majority (70.2%) had good knowledge of hepatitis B infection and vaccination and the mean knowledge score (%) was 61.2 ± 20.7. Majority (90.4%) knew that hepatitis B virus can be acquired through a needle stick injury. Majority (67.9%) were aware of the existence of an effective vaccine against hepatitis B infection; however, only 45.1% knew correctly that a post hepatitis B vaccination test is necessary to confirm protection. Majority knew that a complete dose of hepatitis B vaccine is 95% effective; however, only 49.4% knew for how long the vaccine protects. Only 36.9% knew correctly that hepatitis B virus is 100 times more infectious than HIV.

Findings from this study concur with findings from a literature review of articles by Malewezi, Omer, Mwagomba, and Araru (2016) which indicated that HBV awareness and vaccination were relatively high, but vaccination rates were lower, with 4.6–64.4% of those “ever vaccinated” completing the vaccination regimen. In addition, the reasons commonly cited for non-uptake of vaccine included cost, lack of awareness of vaccine availability, and inadequate information concerning the vaccine (Malewezi et al, 2016).

The study further concurs with findings by A study by Abiola, Omoyeni, and Akodu (2013) showed that the majority (70.2%) had good knowledge of hepatitis B infection and vaccination and the mean knowledge score (%) was 61.2 ± 20.7. Majority (90.4%) knew that hepatitis B virus can be acquired through a needle stick injury. Majority (67.9%) were aware of the existence of an effective vaccine against hepatitis B infection; however, only 45.1% knew correctly that a post hepatitis B vaccination test is necessary to confirm protection. Majority (86.9%) knew that a complete dose of hepatitis B vaccine is 95% effective; however, only 49.4% knew for how long the vaccine protects. Only 36.9% knew correctly that hepatitis B virus is 100 times more infectious than HIV. Attitude towards hepatitis B vaccination was good among all of the respondents and the mean attitude score (%) was 92.9 ± 14.3.

4.4 Health service delivery factors

The study assessed the perceptions of health service providers with regards to HBV service delivery looking at their perception on vaccine availability, perception on the adequacy of HBV vaccine awareness, affordability of the vaccine and the prevailing average cost of the HBV vaccine where health providers are requested to pay. Table 3 summarises the results on the perceptions of health services provided on the general HBV service provision. With regards to availability of the vaccine, only 24 (22%) of the participants confirmed regular availability of HBV.

Of the interviewed participants 83 (75%) claimed that there are no awareness campaigns that are being conducted to raise aware on the vaccine among health professionals and stating its essence in protecting them in the clinical area.

With regards to affordability, 62 (56%) said that the HBV vaccine is free and affordable. Of those who said it was for a cost, the reported cost ranged from $1 – 100 USD. All the service related factors were significantly associated with HBV uptake.

Table 3 Health service delivery factors

Variable	Category	HBV vaccination status (%)		P-value
		Yes	No	
		34 (30.6)	77 (69.4)	
HBV available	Yes	20 (58 .8)	16 (20.8)	0.050*
	No	14 (41.2)	61 (79.2)	
awareness of HBV done	Yes	21 (61.8)	20 (15.6)	0.001*
	No	13 (38.2)	57 (74)	
HBV vaccine free	Yes	24 (70.6)	64 (50)	0.005*
	No	10 (29.4)	64 (50)	
Cost of HBV	$5 USD	10 (29.4)	20 (15.6)	0.042*
	$100 USD	20 (58.8)	20 (15.6)	
	Don't know	4 (11.8)	10 (7.8)	

Findings from this study concur with several findings from different literatures. Findings concur with Omottowo et al (2018) which revealed that the cost of vaccine 48 (10.8%) was a deterrent to being vaccinated among the health workers in the study. This concurs with findings by Auta et al (2018) which also indicated the common reasons for non-vaccination of HCWs were unavailability of vaccine 50.5% (95% CI: 26.5–74.4), busy work schedule 37.5% (95% CI: 12.6–62.4) and cost of vaccination 18.4% (95% CI: 7.1–29.7).

A study by Abiola, Omoyeni and Akodu (2013) in Lagos State Africa, showed that among those who were not vaccinated, the majority (67.6%) sighted non-availability of the vaccine as the major reason for non-vaccination. A study by Yuan et al (2019) revealed that HCWs in workplaces offering a free hepatitis B vaccine with vaccination management were 1.4 times more likely (OR = 1.4, *95% CI*: 1.1–1.8) to complete their hepatitis B vaccination compared to HCWs in workplaces that did not offer a free hepatitis B vaccine. Furthermore, the same study showed that the receipt of training on hepatitis B was also associated with a higher percentage of completing the hepatitis B vaccination (OR = 1.5, *95% CI*: 1.2–1.8).

It was also discovered that hospitals that did not provide hepatitis B vaccination activities (40%) were the top reasons mentioned for refusing hepatitis B vaccination (Yuan et al, 2019). According to a study done by Ibekwe and Ibeziako (2006) in Nigeria, the most common reason for non-vaccination among health professionals was lack of opportunity and according to Omottowo et al (2018) the cost of vaccine was a deterrent to being vaccinated among the health workers in the study.

A study by Aaron, Nagu, Rwegasha, and Komba (2017) revealed the following reasons for non-vaccination were given: 98 (65.3%) reported that they had not been offered the vaccine; 70 (46.7%) observed standard precautions to ensure infection prevention and 60 (41.3%) blamed a low level of awareness regarding the availability of the hepatitis B vaccine. The presence of infection control guidelines was found to be a factor that affects uptake of HBV vaccine. A study by Ssekamatte et al (2020) in Uganda found that working in a healthcare facility with infection

control guidelines (Adjusted PR = 0.79, 95%CI 0.66–0.95) to be negatively associated with being fully vaccinated.

The study does not concur with findings by Alege, J. B., Gulom, G., Ochom, A., & Kaku, V. E. (2020), which showed that availability of vaccines in the health facility ($p<0.027$), and availability of guidelines followed by all health workers in this facility ($p<0.006$) were the factors independently associated with the uptake of hepatitis B vaccination.

4.5 Predictors of uptake of Hepatitis B vaccine among participants

The study conducted a step-wise multivariate binary regression analysis to determine the predictors of uptake of HBV by health service providers in Mutare. All factors that had a statistical significant association with uptake of HBV were controlled for and these included Age of the health service provider, level of education, Knowledge on HBV, household expenditure per month, scheduling for HBV, religion, profession and health service factors. Only age [AOR = 2.1, 95% CI (1.08 – 3.34)], household expenditure per month [AOR = 18.8, 95% CI (3.13 – 11.21)], knowledge on HBV [AOR =2.6, 95% CI 0.46 – 15.30], scheduling for HBV [AOR = 3.9, 95% CI (0.95 – 14.90)], and health service related factors [AOR = 10, 95% CI (2.32 – 43.25)] were statistically significant predictors of HBV uptake.

Table 4 below summarizes the results on the predictors of uptake of HBV by health professionals.

Table 4. Predictors of uptake of HBV by Health workers in Mutare City

Adherence to PrEP and:	Adjusted Odds ratio (AOR)	P value	95% Confidence Interval
Age	2.1	0.010*	1.08 – 3.34
Level of education	01	0.875	1.17 – 5.33
Knowledge on HBV	2.6	0.037*	0.46 – 15.30
Schedule of taking HBV	3.9	0.041*	0.95 – 14.90
HH expenditure per month	18.8	0.001*	3.13 – 11.21
Religion	11.8	0.279	1.03 – 13.41
Profession	2.6	0.532	0.92 – 5.32
Health service factors	10	0.002*	2.32 – 43.25

The * represents statistically significant results

4.6 Summary

The chapter presented, analysed and discussed the findings of this study.

CHAPTER 5 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the entire study, with conclusions made in light of the study results and furthermore make recommendations. This research study endeavoured to answer the following study questions:

1. What is the proportion of healthcare workers vaccinated against Hepatitis B virus at Mutare city council clinics, Manicaland province of Zimbabwe for the period January - December 2020?

2. What are the socio-demographic factors that influenced uptake of hepatitis B vaccine among healthcare workers at Mutare city council clinics, Manicaland province of Zimbabwe for the period January - December 2020?

3. What are the knowledge levels about HBV among healthcare workers at Mutare city council clinics, Manicaland province of Zimbabwe?

4.What are the health service factors that influence uptake of hepatitis B vaccine among healthcare workers at Mutare city council clinics, Manicaland province of Zimbabwe?

5.2 Discussion

This study was guided by the World Health Organization social determinants of health framework. The study hypothesised that barriers and enablers to effective uptake of the HBV vaccine among health care workers in Mutare City Council are a function of the social, individual factors such as knowledge and attitude and health

system factors. The study hypothesised that socio-demographic factors such as age, religion, wealth status, literacy, knowledge among other factors) are associated with HBV uptake among health care workers.

The prevalence for HB vaccination was very low among the health professionals for Mutare city council clinics and this could be attributed to a plethora of factors.

The dominant sex in the study was female and this is consistent with the health sector sex pyramid in Zimbabwe. Contrary to what one would think that women easily take up recommended health care service packages, female health care profession who constituted the greater proportion of the study participants were not vaccinated. Age was a statistically significant predictor of HBV uptake with older health care professionals being the greater proportion of those who were not vaccinated. This could be explained by the fact that vaccine hesitancy is also influenced by social norms and cultural beliefs and older generations are more likely to base their personal decision on health including decisions to get vaccinated from what they had been socialised in the past. The younger generations are more likely to be receptive to changes in medical technology with lesser resistance.

Health care professionals with higher levels of education (secondary and tertiary education) were less likely to have been vaccinated against Hepatitis and those belonging in higher wealth quintiles were also less likely to have taken the HB vaccine. The wealthier and more educated classes of professionals are more likely to research for both correct and wrong information on various media platforms and are more likely to base their personal decisions on what they have researched and what

they have heard about the side effects and adverse effects associated with a given vaccine.

Opposed to what many studies on behaviour change communication and uptake of health care services that have earmarked the conservative apostolic groups as the leading objectors to vaccination, this study revealed that Christian health care workers were more likely to have been unvaccinated against Hepatitis B compared to any other religious groupings that participated in the study. Though higher knowledge levels did not directly translate to an increased uptake of the HBV vaccine among the study participants, those who knew that the HB vaccine was free were more likely to have been vaccinated and those who had correct knowledge on the schedule for HBV were more likely to be update with their HB vaccination status.

The study results revealed that lack of awareness on HBV was significantly associated with poor uptake. Controlling for age, level of education, knowledge on HBV, scheduling for taking HBV, household expenditure per month and health service factors, only age, knowledge on HBV, scheduling for HBV, household expenditure and health service factors were significant predictors of uptake of HBV by health workers for Mutare City Council.

Health care systems need effective communication and information provision systems since these have been associated with vaccination coverage in many studies. Possession of community gadget (TV, radio and newspaper, access to media and internet use) are linked with successful mobilisation for vaccination programs (Maguranyanga, 2017; Mukungwa, 2015).The study also revealed health related

factors such as that availability and cost related to demanding the HB vaccine determines uptake. Is the vaccine readily available when one needs it? Are the systems in place to assist healthcare workers to get vaccinated?

5.3 Conclusion

The study results revealed that uptake of HB vaccination was unacceptably very low among health care professionals in Mutare City council clinics. The study findings revealed that age, knowledge on HBV, scheduling for HBV, household expenditure and health service factors were significant predictors of uptake of HBV by health workers for Mutare City Council. The health management team for Mutare City council need to invest more in social behaviour change communication and raising awareness on the essence and importance of the HBV vaccine to increase uptake by health care workers. There are currently no national guidelines for pre-employment screening and vaccination of HCW. Different training institutions have different policies, but none perform pre vaccination screening.

5.4 Recommendations

From the findings of the study several recommendations have been drawn in order to increase uptake of HBV by health professionals in Mutare city council health centres:

1. Effective supply chain management for HB vaccines need to be maintained to enhance availability of the vaccine and this should be done by the EPI department working collaboratively with the pharmacy department.

2. The council should make sure that HB vaccination is given for free to health professionals. This subsidisation will pay more dividends with great return ultimately. The board of directors to consider scraping off some of the user fees required.
3. The executive health team for Mutare city should develop a systematic awareness and campaign programme to consistently raise awareness among its health professionals and find ways to incentivise uptake. The level of awareness and understanding about hepatitis B vaccination of any group of health care staff should not be assumed. Refresher courses are also recommended, the DNO and DMO in collaboration with the Health Promotion department to ensure continued awareness raising.
4. High rates of vaccination can be achieved using childhood immunization systems for the distribution of vaccine to HCWs. Also, pay particular attention to newly employed health care workers to ensure they get vaccinated.
5. Strengthening on the implementation of infection control guidelines and having policy that is properly implemented and routinely monitored and evaluated, and this policy must ensure that all three doses of vaccine are administered.
6. Consider making use of vaccination reminders using technological applications like SMS, WhatsApp reminders and even calls to employs to remind them of their next scheduled inoculation date.

7. There is a need for national guidelines which address the prevention of occupational transmission of viral hepatitis and standardise practices regarding vaccination of trainee healthcare workers at their respective training institutions.

5.5 Suggestions for further study

Further research needs to be done to determine why knowledge on HBV vaccination does not translate into uptake by health care workers. Bigger studies using mixed methods to triangulate data are likely to provide more information on how uptake of the HB vaccination can be enhanced at all levels. Further studies on economic evaluation of pre vaccination screening should be done against blanket immunisation for all, with routine infant HBV vaccination having been introduced in Zimbabwe 21 years ago the new crop of students beginning their training as HCW will have been previously vaccinated.

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APPENDICES

APPENDIX: 1 Questionnaire

Questionnaire number-

Demographic Information

#	Question	Coding	Go to---
1	How old are you in years?		
2	What's your marital status?	Married---------1 Previously/never married---2	
3	Sex	Female…..1 Male……..2	
4	What is your highest level of education	Primary--------1 Secondary-----2 Tertiary--------3	
5	Profession	Nurse Aid……1 Nurse……...2 Clinical officer…3 Doctor…….4	
6	On average, how much is the usual household expenditure in a month?	>$500----------1 $500-$1000----------2 $500+----------3	
7	What is your religion?	Christian----------1 Muslim----------2 Apostolic----------3 Other: specify……4	
8	How many years have you been practising	0-5 Years 6-10 years 11+ years	

Knowledge on HBV

9	What is HBV?	Correct……..1 Incorrect…….2
10	Is it necessary for health workers to be vaccinated against HBV?	Yes…….1 No……..2
11	How many times should one be inoculated to be fully covered?	1 2 3 4 Don't know
12	Specify the schedule that one should follow to be fully covered.	0,1 and 6 months…….1 0,2 and 8 months …….2 0, 3 and 6 months …….3
13	How many times have you been vaccinated against HBV?	0……0 1……..1 2..……..2 3……3 4+……4
14	After how many years does one receive a booster?	1-5years 6-10years 11+ years

Health service delivery factors

15 Is HBV readily available when you need it? Yes/ No

16 Is awareness raising being constantly done about HBV among health workers?

17 Is HBV vaccine free? Yes /No

18 If no how much does it cost?

APPENDIX 2: Key Informant Interview

Key informant interviews will be done to the Director of City Health and the Senior Nursing Officer. Key informant interviews aim to elicit participant's perspectives on the barriers and enablers to effective HBV uptake among health workers and recommendations to address the poor uptake of HBV among health workers in Mutare City Clinics.

Guiding questions:

1. In your opinion, what are the individual factors associated with poor uptake of HBV among the health workers in Mutare City Clinics?
2. In your view, what are the barriers and enablers to HBV uptake among health workers in Mutare City?
3. Do you think health workers have enough knowledge about the necessity to be immunized against HBV?
4. Do you think enough awareness raising is being done about HBV among health workers?
5. What are some of the effective strategies to sustainably ensure HBV uptake is increased among health workers you would recommend?

APPENDIX 3: Consent Form

Title of the study: Uptake of HBV among health workers in Mutare City Clinics.

Good morning/ afternoon. I am Joseph Nyamarebvu, a student at Africa University. I am conducting a study seeking to determine factors that affect HBV uptake among health workers in Mutare City clinics. This form gives you information about the study and will be used to document your willingness to take part should you choose to do so.

Purpose of the study

The purpose of this study is to determine and explore factors associated with poor HBV uptake in Mutare City clinics. The study is for academic purposes only. Also, information from this study will assist relevant line ministries e.g. City Health Department and Ministry of Health and Child Care at large to design effective preventive programs for health workers and the population at large.

Procedures and Duration

The eligible participants for this study are health professionals. You have been selected as a possible participant because you meet the stated selection criteria. About 116 participants will be enrolled in this study. If you decide to participate, you will be asked to answer a structured questionnaire. It will take about 20 minutes for you to finish filling in.

Benefits, Risks and Discomforts

There are no direct benefits to you for participating in this study. I am hoping that findings from this study will be used to improve HBV uptake among health workers

so that morbidity and mortality from HBV among health workers can be decreased. The risks of participating in this study are minimal. It is possible that you may feel uncomfortable with some of the questions I will ask you. You can choose to skip or to discontinue the interview if you feel uncomfortable.

Confidentiality

If you participate in this study, your personal details will not appear on the questionnaire. Any information that is obtained in connection with this study that can be identified with you will remain confidential and will be disclosed only with your permission. You will be assigned a study participant identity number which will be used to identify the questionnaire. All study records will be kept in secure, locked filing cabinets, separate from any information that identifies you personally like this consent form. Your name will not be used in any reports or publications that may arise from this study. Your details may be released to authorized individuals if required by the law. Under some circumstances, the University or Medical Research Council of Zimbabwe may need to review records for compliance audits only.

Additional Costs

There will be no additional costs to you because of your participation in this study except those related to the time taken while participating in this study.

Voluntary Participation

Participation in this study is voluntary. If you decide not to participate in this study, your decision will not affect your future regular health care services and employment status in any way**.** If you decide to participate, you are free to withdraw your consent and to discontinue participation at any time without penalty.

Authorization

Before you sign this form, please ask any questions on any aspect of this study that is unclear to you. You may take as much time as necessary to think it over. Your signature indicates that you have read and understood the information provided above, have had all your questions answered, and have decided to participate.

_____ _____

Signature/fingerprint of Participant or legally authorized representative Time

_____

Relationship to the Participant

_____ _____ _____

Name of Staff Obtaining Consent Signature Date

For any queries, contact information

College of Health, Agriculture and Natural Sciences, Africa University
Research Supervisor: Mr. E. Chikaka 0772 818 612
Field Supervisor: Dr. A.Mutara 0772 113 176
Researcher: Nyamarebvu Joseph Kudzanai
Email: nyamarebvuj@africau.edu
Mobile: +263 712 394 243

APPENDIX 4: Mutare City Council Approval Letter

ADDRESS ALL CORRESPONDENCE TO THE
OFFICE OF THE DIRECTOR OF HEALTH SERVICES

No. 1 Queensway, Civic Centre
P. O. Box 910 Mutare, Zimbabwe
PHONE: +263 20 64412
EMAIL: mutarehealthdep@gmail.com

CITY OF MUTARE

IF CALLING OR TELEPHONING PLEASE REFER THE MATTER TO:
Dr A Mutara Ext. 203

Your Ref: .....
Our Ref: AAM/can/research

Dr Nyamarebvu Joseph Kudzanai
Africa University
Mutare

9 December 2020

Dear Sir,

RE: PERMISSION TO DO RESEARCH ON UPTAKE OF HEPATITIS B VACCINATION AMONG HEALTH CARE WORKERS OF CITY OF MUTARE, MANICALAND ZIMBABWE

The above matter refers:-

I have no objection to your carrying out the above-mentioned research on the following conditions:

1) The study be purely for education purposes and the results will therefore not be published for public use without the permission of council.
2) **You will be required to do a presentation on the findings of your study to our department prior to presentation anywhere else.**

Yours faithfully,

DR A.A. MUTARA
DIRECTOR OF HEALTH SERVICES

CITY OF MUTARE
HEALTH DEPARTMENT
09 DEC 2020
P. O. BOX 910, MUTARE
SIGN

APPENDIX 5: AUREC Approval Letter

AFRICA UNIVERSITY
A United Methodist-Related Institution
Investing in Africa's future

AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC)

P.O. Box 1320 Mutare, Zimbabwe, Off Nyanga Road, Old Mutare Tel (+263-20) 60075/60026/61611 Fax: (+263 20) 61785 website: www.africau.edu

Ref: AU2101/21 28 May, 2021

Joseph Nyamarebvu
C/O CHANS
Africa University
Box 1320
Mutare

RE: UPTAKE OF HEPATITIS B VACCINE AMONG HEALTH WORKERS IN MUTARE CITY CLINICS JANUARY TO DECEMBER 2020, ZIMBABWE.

Thank you for the above titled proposal that you submitted to the Africa University Research Ethics Committee for review. Please be advised that AUREC has reviewed and approved your application to conduct the above research.

The approval is based on the following.
a) Research proposal
b) Data collection instruments
c) Informed consent guide

- **APPROVAL NUMBER** AUREC 2101/21
  This number should be used on all correspondences, consent forms, and appropriate documents.
- **AUREC MEETING DATE** NA
- **APPROVAL DATE** May 28, 2021
- **EXPIRATION DATE** May 28, 2022
- **TYPE OF MEETING** Expedited
  After the expiration date this research may only continue upon renewal. For purposes of renewal, a progress report on a standard AUREC form should be submitted a month before expiration date.
- **SERIOUS ADVERSE EVENTS** All serious problems having to do with subject safety must be reported to AUREC within 3 working days on standard AUREC form.
- **MODIFICATIONS** Prior AUREC approval is required before implementing any changes in the proposal (including changes in the consent documents)
- **TERMINATION OF STUDY** Upon termination of the study a report has to be submitted to AUREC.

AFRICA UNIVERSITY
RESEARCH ETHICS COMMITTEE (AUREC)
APPROVED
P.O. BOX 1320, MUTARE, ZIMBABWE

Yours Faithfully

MARY CHINZOU – A/AUREC ADMINISTRATORFOR CHAIRPERSON, AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE