

## **Declaration**

I declare that this dissertation titled “**Hepatitis B vaccination coverage and determinants of vaccination among health care workers in selected health facilities in Lusaka**” which I hereby submit for the degree of Master of Science in Epidemiology to the University of Zambia is my own original work and where other people’s work has been used, it has been properly acknowledged and referenced. Neither this work, nor any part of it has been submitted to any other tertiary institution for any degree or diploma.

Full name of student: Namwaka Mungandi

Signature: .....

Date :.....

## Certificate of Completion of Dissertation

I....., hereby certify that this dissertation is the product of my own work and, in submitting it for the Degree of Master of Science in Epidemiology programme, further attest that it has not been submitted to another university in part or whole for the award of any programme.

Signature: .....

Date: .....

I, Prof..... having supervised and read this dissertation is satisfied that this is the original work of the author under whose name it is being presented.

I confirm that it has been completed satisfactorily and is ready for presentation to the examiners.

Signature of supervisor: .....

Date: .....

Head of Department: .....

Date: .....

Department: .....

## **Certificate of approval**

The University of Zambia approves this dissertation of Namwaka Mungandi in fulfilment of the requirements of the award of degree in Master of Science in Epidemiology.

Examiner's signature

Date

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## **Dedication**

I dedicate this dissertation to:

My parents Mwiitumwa and Yapoka for always being there for me and believing in me unconditionally.

Not forgetting my fiancé Simon who has been my strength and motivator during this entire program, and my daughter Nandema who has been a source of joy to me for the duration of this program.

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## Acronyms

HIV- Human immunodeficiency virus

HBV- Hepatitis B virus

HB- Hepatitis B

WHO- World health organization

CDC- Centre for disease control

HCW- Health care worker

PEP- Post prophylactic exposure

## 1.0 Summary

**Background:** Hepatitis B is a viral infection of the liver and causes both acute and chronic disease. It is transmitted through contact with an infected person's bodily fluids. It is an occupational hazard for health care workers (HCWs) and can be prevented by the administration of a vaccine. The vaccine is administered in three doses over a six-month period. The Centre for Disease Control recommends that HCWs must be vaccinated against vaccine preventable diseases including hepatitis B. In Zambia, the Ministry of Health acknowledges that this policy exists but is not implemented to its full potential. The objective of the study was to determine the prevalence and determinants of hepatitis B vaccination among HCWs in selected health facilities in Lusaka.

**Methods:** This was a cross sectional study that consisted of 331 HCWs from seven different health facilities across Lusaka district. The study group consisted of nurses, doctors, laboratory personnel and general workers. Data was collected through a self-administered structured questionnaire. The dependent variable was vaccination status and the independent variables were; age, sex, sharp injuries per year, work experience, knowledge in hepatitis B, profession, training in infection control, sector and facility level. Investigator led stepwise approach was used to select the best predictor variables in a multiple logistic regression model and this was performed using STATA version 12.

**Results:** Only 19.3% of the HCWs were vaccinated against hepatitis B, with 54.7% being fully vaccinated and 45.3% being partially vaccinated. The analysis showed that; age of the HCW, sharp injuries per year and training in infection control were the variables that were statistically significant in predicting whether a HCW is vaccinated or not vaccinated against hepatitis B. Older HCWs were more likely to be vaccinated against hepatitis B compared to their younger counterparts. HCWs who experienced more sharp injuries in a year were also more likely to be vaccinated against hepatitis B. HCWs who had undergone training in infection control were more likely to be vaccinated against hepatitis B compared to those that had not undergone any training.

**Conclusion:** There is a low prevalence of hepatitis B vaccination among Zambia's HCWs. To increase the number of HCWs vaccinated against hepatitis B, health institutions should bear the cost for vaccinating their staff and efforts should also be made to impart appropriate health education regarding hepatitis B infection and its prevention. Establishment of policies on compulsory hepatitis B vaccination of all HCWs in Zambia is recommended.

## **2.0 Background**

### **2.1 Introduction**

Health care workers (HCWs) are defined as persons whose activities involve contact with patients, blood or other body fluids in a health care, laboratory, or public health setting; for example employees, attending clinicians, public safety workers, students, contractors or volunteers (United State Public Health Service, 2001). Due to the nature of work, HCWs are at greater risk of infections from patients. Blood borne pathogens particularly, hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV) have known to infect HCWs (Advisory Committee on Immunization Practices 1997). Based on the magnitude of this problem, it has increased the total health care cost in hospitals. Hepatitis B (HB) is a viral infection of the liver caused by HBV and causes acute infection and chronic infection (Centre for disease control, 2014). Infection with this virus can cause scarring of the liver, liver failure, liver cancer, and even death (WEBMD, 2014). HB is spread by infected blood and other bodily fluids such as semen, vaginal secretions, and open sores. HBV has long been recognized as an occupational hazard for HCWs, including HCW trainees (Centre for disease control, 2014). The virus remains infectious for prolonged periods on environmental surfaces and is transmissible in the absence of visible blood (Centre for disease control, 2014). It is estimated that more than two billion people are infected with HBV worldwide and about 350 million of them suffer from chronic HB infection mainly liver cirrhosis and hepatocellular carcinoma (World health organization, 2013). HB is endemic in almost all parts of the world and 60% of the world population live in endemic areas (Ott, Stevens et al. 2012). An estimated 2 billion people are infected with HBV and 240 million live with the chronic infection (World Health Organization, 2015). 600,000 people die annually as a result of the consequence of HBV every year (Ott, Stevens et al. 2012). It is also estimated that about 500-600 HCWs are hospitalized annually due to exposure to blood products (Shazi and Abbas, 2006). The prevalence of HB chronic infection is particularly high in sub Saharan Africa ranging from 7 to 26% (Centre for disease control, 2012). HCWs are at a high risk of HB among them occupational exposure to blood, and incidence of infection among them has been estimated to be 2 to 4 times higher than in the general population (Centre for disease control, 2012). As part of occupational safety measures, all HCWs are required to be vaccinated against HBV (World health organization, 2013). Unfortunately, the World Health Organization also estimates that HBV vaccination coverage amongst HCWs is only 18-39% in low and middle income countries and 67-79% in high

income countries. HCWs have an increased risk of acquiring HB as they attend to infected patients and thus are exposed to blood and body secretions of patients (National Institute for Occupational Safety and Health, 1999). The risk of being infected is dependent upon the prevalence of the virus carriers in the environment, the frequency of the exposure of the HCW to blood and bodily fluids and the infectivity of the hepatitis B virus (National Institute for Occupational Safety and Health, 1999). According to Centre for Disease Control, 500-600 HCWs are hospitalized annually due to exposure to blood products, of which more than 200 develop chronic hepatitis. The transmission of HBV requires direct, intimate contact with or parenteral inoculation of blood and blood products, semen or tissues (Centre for disease control, 2012). The presence of or casual contact with an infected person is not counted as “exposure” (Schillie and Trudy, 2013). The risk of acquiring HB infection from an HBV carrier ranges from 6%-30 (Hamid and Faisal, 2011). The risk of transmission of an infection from HCWs to patient is also great. There has been an increase in the number of such reports. Since 1972, 50 outbreaks have been reported in which a total of 48 infected HCWs, (39 surgeons) transmitted the infection to approximately 500 people (Aziz et al., 2006). Highly viremic HBV carriers with Hepatitis B antigen transmit the virus on average to 4% of their patients (Aziz et al., 2006). According to whether their occupation involves post-prophylactic exposure (PEP) or not, these are divided into: “High Transmitter Risk”-including surgeons, operating room nurses, intensive care staff, interventional physicians, phlebotomists and emergency department staff and “Low Transmitter Risk” which includes all the remaining staff (Hamid and Faisal, 2011). Nurses report a higher number of significant exposures than any other group. Most (58%) report exposure during a procedure and some (37%) after the procedure (Hamid and Faisal, 2011). HBV vaccination is now part of the national routine immunization for children in Zambia (Ministry of Health Zambia, 2010).

### **Prevalence of Hepatitis B vaccination and determinants associated with hepatitis B vaccination status**

One of the first studies that investigated HBV vaccination was a clinical trial conducted by Dienstag et al (1984) showed that of the vaccine recipients, 58% responded within 1 month and 97% within 9 months. The vaccine proved to be highly effective with five hepatitis B infections being identified in placebo recipients and one in a vaccine recipient. In a seroepidemiologic survey of 624 health workers representing a spectrum of exposure to blood and patients, the authors detected serologic markers of hepatitis B virus infection in 16%, significantly greater than the 5% prevalence in 462 volunteer blood donors (DIENSTAG and

RYAN, 1982). According to the same study, the prevalence of HBV infection was a function of contact with blood, previous hepatitis history, years in occupation, and age but not as a function of contact with patients, years of education, previous needle stick, transfusion or globulin injection. A study by Khurram Nasir (2012) aimed to assess HBV vaccination among health care workers and students of a medical college. It discovered that only 49% health care workers and 42% of medical students were vaccinated. The main reasons for non-vaccination (47.7%) among HCWs was the high cost of vaccination, while the most often cited reason (33.7%) among medical students was the belief that they were not at risk. This belief was also prevalent among nurses (36.4%), laboratory workers (38.6%) and paramedics (33.2%).

A study by Mengal et al (2008) examined the prevalence and factors that relate to the acceptance of the hepatitis B vaccination in nursing students. The findings were that there were two possible reasons why nursing students who did not receive the Hepatitis B vaccination: (a) the differences in support policies in each hospital, and (b) a better socioeconomic status and follow-up system, so that a higher proportion of those who missed the scheduled vaccination were encouraged to receive fee-for-service vaccine (Mengal, Howteerakul et al., 2008). This could mean that the vaccination policies of high levels of risk hospitals need to be revised. In Pakistan, the vaccine is free for health care workers but not necessarily for the students that undertake internships at these institutions; therefore, it's important to be able to change the policy so as to have the vaccine be offered to students free of charge. A study by Sheikh (2007) also highlighted the reasons for non-immunization of HCW which were: lack of motivation (38%) and high cost of the vaccine (28%). As previously suggested it is important for HBV vaccine to be provided free of charge and also making immunisation compulsory for them. Motivation of the HCW can be achieved by regular health education to improve the immunization status (Sheikh and Seema, 2007).

Another study, also conducted in Pakistan, that looked at HBV vaccination status of health care workers in primary health care revealed that the determinants of HBV vaccination amongst HCW (Yousafzai, Siddiqui et al., 2013). These were: type of the HCWs, type of facility, work experience, age of the HCW, sustaining at least one sharp injury in the last one year, knowledge regarding modes of transmission of hepatitis B virus, compliance with standard precautions, barriers to vaccination, perceived disease threat after exposure to blood and body fluids, perceived self-efficacy in practicing standard precautions and perceived benefits of practicing standard precautions (Yousafzai, Siddiqui et al., 2013). In Nigeria, a

similar study was conducted but this time looking more into the knowledge and risk perception that HCW had of HBV (Daboer, Jonathan et al, 2010). Out of a sample size of 288, 249 (86.5%) had good knowledge of HB infection though only 31 (10.8%) of them had ever attended any training or workshop on standard safety precautions and blood borne infections (Doboer and Chingle, 2010). As many as 238 (82.6%) mentioned immunization as a strategy to prevent HB infection although only 12 (5.2%) had good knowledge of the vaccine. Furthermore only 52 (19.8%) had received at least a dose of the vaccine (Doboer and Chingle, 2010). The determinants of the vaccination of HCWs in health facilities have also been researched on. The study by D Ogoina et al (2012) notes that senior cadres of doctors, those with longer work experience, and those with prior training were more likely to be vaccinated than other HCWs. The author also suggests that routine HB vaccine was not offered on study sites. It is plausible that younger HCWs had poorer vaccine uptake due to their lower access to HB vaccine or poorer knowledge of the need for HB vaccination.

In relation to the coverage of HBV vaccination, a study in Uganda showed that only 34.8% of HCWs were vaccinated, and from these only 6.2% had completed the full immunization. In Kuala Lumpur, a study with a sample size of 625 subjects showed that an average of 82.2% had taken at least one dose of the hepatitis B vaccine. However, only 58.4% (365 of 625) had finished the schedule as universally recommended (Heshan and Zamberi, 2005). There seems to be a trend in terms of the coverage of the fully immunized HCWs. An additional study in Nigeria that also looked at hepatitis B vaccination prevalence and results showed that out of 290 HCWs who participated in the study, 185 (64.5%) had received at least one dose of HBV vaccine; 105 (36.2%) had full coverage of three doses. This incomplete vaccination could be due to the unavailability of the vaccine or the HCWs not making a follow up on their next dose.

### **Why vaccinate HCWs against HBV?**

Health care personnel are at increased risk of occupational acquisition of HB (Thomas, Factor et al., 1993). HCWs are in constant contact with patients and patient's bodily fluids on a daily basis, and this predisposes them to many diseases. Some of these diseases are vaccine-preventable diseases such as influenza and HB. HCWs face a wide range of hazards on the job, including needle prick injuries and stress (World health organization, 2013). Although it is possible to prevent these occupational hazards, HCWs are still at increased risk of getting infected by various diseases on the job (Wilburn and Eijkemans, 2004). Effective measures to

prevent infections from occupational exposure of HCWs to blood include immunization against HBV, eliminating unnecessary injections, implementing Universal Precautions, eliminating needle recapping and disposing of the sharp into a sharps container immediately after use, use of safer devices such as needles that sheath or retract after use, provision and use of personal protective equipment, and training workers in the risks and prevention of transmission (Wilburn and Eijkemans, 2004). A study conducted in the nineteen eighties, discovered that 35% of all needle prick injuries amongst HCWs was due to disposable syringes (Jagger, Hunt et al., 1988). Another study placed the mean rate of 4.0% (range 1.0–6.2%) sharps injuries per 10 000 HCW involving more than 7000 HCW. Nurses and doctors were most at risk of sharps injuries, frequently from hollow-bore needles (Trim and Elliott, 2003). Another study conducted in Germany, reported 31.4% of the HCWs that participated in the study having had at least one needle prick injury in the past 12 months (Wicker, Jung et al., 2008). From these studies highlighted, it can be seen that needle prick injuries are a problem among HCWs. Many of these needles are used and contaminated with all kinds of pathogens including HBV. Therefore, there is a great need to protect HCWs from contracting vaccine-preventable diseases by vaccinating them against HBV.

### **Hepatitis B Vaccination status of HCWs in Zambia**

In Zambia, literature concerning hepatitis B vaccination status among HCWs in Lusaka district is currently unavailable. However, prevalence of HBV infection among other groups of individuals has been done. A study conducted in Zambia shows that the overall prevalence of HBV in pregnant women was 6.5% (Oshitani et al, 2010). The studies that relate to HBV vaccination, are cross-sectional studies with sample size averaging 400 participants, with some studies taking as little as two months and others as long as two years.

## **3.0 Research Focus**

### **3.1 Statement of the problem**

Occupational hazards in health facilities in Zambia are high with sharps injury rate per worker at 1.3 injuries per annum (Phillips, Simwale et al., 2012). Despite the fact that infection is preventable through vaccination and post-prophylactic exposure, HCWs are unaware of the risks of HBV infection and appropriate preventative measures (Khan and Ross, 2013). In Zambia, the prevalence of HBV is 12% in the general population, which is amongst the highest in the world (World Health Organization, 2015). An estimated 25% of children die in later life as a consequence of HBV infection (World Health Organization, 2012). From these figures it can be seen that HCWs are at great risk of contracting the disease through routine work in the health care facilities. Due to the high probability of occupational hazards in the health facilities, HCWs need to be vaccinated against vaccine-preventable diseases. HCWs, if infected can transmit HBV to their patients therefore contributing to the incidence of HBV infection in the country. A study conducted by Phillips et al (2012) conducted in 5 health facilities in Zambia shows that the prevalence of hepatitis B vaccination amongst HCWs is only 8%. This study is the only published study that investigates hepatitis B vaccination among health workers in Zambia. There was a gap of information regarding how prevalent HBV vaccine is among high risk groups, especially HCWs. If HCWs are not being vaccinated against hepatitis B, it would mean that the disease is most likely to spread across the population (Khan and Ross, 2013).

### **3.2 Justification**

Studies directly related to HB vaccination status in Lusaka are vague with no available data on HB vaccination coverage of HCWs in Lusaka district. A study that was conducted by Phillips et al (2012) explored the risk of blood borne pathogens exposure among Zambian healthcare workers with HBV vaccination status being one of the variables of the study. The prevalence of HBV vaccination status among HCWs according to Phillip et al (2012) was at 8%. This particular study generalized its findings to the rest of Zambia however; this study has huge limitations given that it used convenient sampling. Knowing how many HCWs are vaccinated against HBV will bring knowledge as to how many HCWs are at risk of contracting HBV because of not being vaccinated against it. Information derived from this study helped bring awareness to selected health facilities and participants about HBV

vaccination. It also raised awareness in selected health facilities about HBV post exposure prophylaxis practices when exposed to blood or bodily fluids of an infected patient.

### **3.3 Research Questions**

- What is the number of health care workers that are vaccinated against hepatitis B in Lusaka district?
- Is the hepatitis B vaccine available at the health facility level?
- What are the determinants that are significantly associated with hepatitis B vaccination status?

### **3.4 Objectives**

#### **3.4.1 General Objective**

To determine the prevalence and determinants of hepatitis B vaccination among HCWs in selected health facilities in Lusaka.

#### **3.4.2 Specific Objectives**

1. To determine the number of health care workers vaccinated against hepatitis B in Lusaka district
2. To establish the availability of hepatitis B vaccination at health facility level
3. To identify the determinants that are significantly associated with hepatitis B vaccination status.

## **4.0 Methodology**

### **4.1 Research Setting**

The research took place at level I, level II and level III health facilities in Lusaka district, Zambia. Level I Hospitals serve a population of between 80,000 and 200,000 with medical, surgical, obstetric and diagnostic services, including all clinical services to support health centre referrals. Level II Hospitals, or general hospitals, at provincial level, have a catchment area of 200,000 to 800,000 people, with services in internal medicine, general surgery, paediatrics, obstetrics and gynaecology, dental, psychiatry and intensive care services. These hospitals also function as referral centres for the first level hospitals, including the provision of technical back-up and training functions. Level III Hospitals, or central hospitals, serve a catchment population of 800,000 people and above. These facilities are reference hospitals for level II hospitals and have sub specializations in internal medicine, surgery, paediatrics, obstetrics, gynaecology, intensive care, psychiatry, training and research. (National Human Resources for Health Strategic Plan 2011 – 2015).

### **4.2 Research Design**

This was a cross-sectional study. Due to the limitation of time and funds, this study design was chosen on the basis that it is relatively inexpensive and also time efficient compared to other study designs.

### **4.3 Target Population**

The target population comprised of both female and male HCWs of any age that were directly involved with patients or patient samples. These included doctors, nurses, laboratory personnel and general workers.

#### 4.4 Variables

**Table 1.0: List of independent variables**

<b>Independent variables</b>	<b>Type of variable</b>	<b>Indicator</b>
<b>Age</b>	continuous	Years
<b>Gender</b>	categorical	Male or female
<b>Profession</b>	categorical	Nurse, doctor, laboratory personnel, general worker
<b>Work experience</b>	continuous	Years
<b>Sector</b>	categorical	Public or private
<b>Sharps injuries</b>	continuous	Number of injuries/year
<b>Facility level</b>	categorical	Level I,II or III
<b>Training in infection control</b>	categorical	Yes or No
<b>Knowledge of Hepatitis B*</b>	categorical	Poor, fair, good, excellent
<b>Dependent variable</b>		
<b>Hepatitis B vaccination status</b>	Binary	Vaccinates or not vaccinated

\*The variable “Knowledge of hepatitis B” was a section in the questionnaire that was adapted from a World Health Organisation questionnaire that assessed knowledge on hepatitis B. There were 10 questions and were graded as follows; 0-2 (Poor), 3-5 (fair), 6-8 (good), 9-10 (excellent).

## 4.5 Sample Size

Sample size was calculated as follows:

$$\text{Sample size} = (Z\text{-score})^2 \times \text{prevalence} \times (1\text{-prevalence}) / (\text{Margin of error})^2,$$

### Assumptions

- Z-score of 1.96
- Margin of error of +/- 5%
- Prevalence of hepatitis B vaccination among healthcare workers =35% (Ziraba, Bwogi et al. 2010)

$$\text{Sample size} = (1.96)^2 \times 0.35(1-0.35) / (.05)^2$$

$$= (3.8416 \times .2275) / 0.0025$$

$$= 0.873964 / 0.0025$$

$$= 349.59$$

$$= \underline{\underline{350 \text{ participants}}}$$

## 4.6 Sampling Design

### 4.6.1 Sampling of Health Facilities

Lusaka has a total of 194 health facilities (MOH, List of Health facilities, 2012). Of these 194, 10 are classified as being level I, level II and level III health facilities. These health facilities are comprised of both private and public health facilities. The list of health facilities visited are as follows:

**Table 2.0: List of Level I, II and III health facilities visited in Lusaka district** (Adapted from the Ministry of Health Zambia, list of Health facilities 2012)

Number	Facility Name	Facility Type	Facility Owner
1	Cancer Disease Hospital	Level I	GRZ
2	Chainama Hills Hospital	Level I	GRZ
3	Hill Top Hospital	Level I	Private
4	Levy Mwanawasa Hospital	Level II	GRZ
5	Maina Soko Hospital	Level I	GRZ(Military)
6	St John's Medical Centre	Level I	Private
7	University Teaching Hospital	Level III	GRZ

These 7 health facilities selected had passed the criteria below:

- The health facilities have functional inpatient, outpatient and laboratory facilities.
- The health facilities have all professional groups being studied (qualified doctors, nurses and laboratory personnel).

### 4.6.2 Sampling of research participants

Proportionate sampling was used in the selection of HCWs in each facility. The number of HCWs chosen from each facility was dependent on the total number of HCWs employed at that facility compared to other facilities. HCWs were then categorised by profession i.e.

nurses, doctors, laboratory personnel and general workers. With the help of each department responsible for each profession, an equal number of participants were chosen from each profession by simple random sampling using random number tables.

#### **4.7 Data Collection**

Data was collected through self-administered structured questionnaires; which comprised of six categories of questions including demographic, occupational data, occupational hazards, history of training in infection control, knowledge of recommended HBV vaccination coverage for HCWs and HBV vaccination information. The availability of HBV vaccination in the health facility was determined by interviewing the HCW in charge of the health facility's stores. All HCWs that took part in the study were handed a fact sheet about HB and HB vaccination. For those that could not fill in the questionnaires on their own due to illiteracy, interviews were conducted in Nyanja/Bemba. All questionnaires were stored under lock and key in a safety cabinet only accessible by the principal investigator. Coding of the questionnaire was then done after the collection of the data in readiness for analysis.

#### **4.8 Data Analysis**

To determine the prevalence of HB vaccination among HCWs in selected health care facilities in Lusaka, the prevalence calculation was used. To test for normality of data, histograms were generated for variables that apply. For continuous data that followed a parametric distribution, means and standard deviation were reported. For continuous data that followed a non-parametric distribution medians and range were reported. For categorical data, frequencies and percentages were reported. To test any association of categorical data and the outcome, chi-squared test was used after the assumptions of the chi square test were met. Investigator led stepwise approach was used to select the best predictor variables in a multiple logistic regression model. Elimination of the least significant variable was done at each stage, and the nested model was compared to the full model using the likelihood ratio test. From this process the best predictor variables were chosen and a test for interaction was performed. The best model was then tested for sensitivity and specificity and a ROC statistic was reported. All analysis was performed using STATA software version 11.2 SE.

## **4.9 Ethical Considerations**

### **4.9.1 Ethical approval from ethical body and health facilities**

The research proposal was submitted to the University of Zambia Biomedical Research Ethical Committee (UNZA-BREC) for ethical approval. Once the ethical committee approved the study, permission from the Ministry of health Zambia was sought to conduct the study in government health facilities. Permission to conduct the study at the private health facilities was sought through the health facility management.

### **4.9.2 Ethical issues that may arise during the study**

The study is engaging with human participants and the questionnaire may have included some questions that may have been deemed private to certain participants. Participants were assured of confidentiality regarding their filled in questionnaires. Informed consent was obtained from all participants using a consent form. The questionnaires that were filled in did not include name or identity number to provide for anonymity. All filled in forms were placed under lock and key and were only accessible by me, the principal investigator. For those that could not fill in the form by themselves due to illiteracy, interviews were conducted in the shortest possible time without compromising on quality. The participants were not under any physical risks. There were no direct benefits to the participants, only that they are contributing to the body of knowledge regarding HB vaccination among HCWs. The benefits will be seen in the long term assuming HB vaccination among HCWs becomes a priority in healthcare human resource safety and management.

## **5.0 Results**

### **5.1 Characteristics of study population**

The total sample size consisted of 331 health care workers with a mean age of 35 years old (standard deviation 0.5). There were 153 (46.2%) males and 178 (53.8%) females in the study population. In the total sample, 90 (27.2%) were nurses, 86 (26.0%) were laboratory personnel, 88 (26.6%) were doctors and 67 (20.2%) general workers. The sample size was evenly distributed among the professionals. The mean work experience of the study population was 5.8 years, with the shortest being 1 year and longest 32 years. The average number of sharps per health worker per year was 0.3 (SD 0.04). A majority of health care workers had excellent knowledge in hepatitis B (47.7%), and these were doctors, nurses and laboratory personnel. Those that had poor knowledge (13.9%) were mostly general workers. A total number of 141 (42.9%) health care workers were not trained in infection control at the health facilities they work for, whereas 190 (57.4%) health care workers were trained in infection control. From the total number of participants, 78 (23.6%) were from a Level 1 health facility, 92 (27.8%) from a level 2 health facility and 161 (48.6%) from a level 3 health facility. From these, 270 (81.75%) were from the public sector and 61 (18.43%) were from the private sector. The total number of healthcare workers vaccinated against hepatitis B was 64 (19.3%) and those not vaccinated against hepatitis B was 267 (80.7%). Table 3 shows the descriptive statistics of the study population.

Table 3.0: Descriptive Statistics of Study Population

Characteristics	Study Population N=331
	% (n) or mean(SD)
<b>Age (years)</b>	35.0 (0.5) <sup>a</sup>
<b>Sex</b>	
Male	46.2 (153)
Female	53.8 (178)
<b>Profession</b>	
Nurse	27.2 (90)
Laboratory personnel	26.0 (86)
Doctors	26.6 (88)
General workers	20.2 (67)
<b>Work Experience (years)</b>	5.8 (0.29) <sup>a</sup>
<b>Sharps/per year</b>	0 (0-5) <sup>b</sup>
<b>Knowledge of hepatitis B</b>	
Poor	13.9 (46)
Fair	7.9 (36)
Good	30.5 (101)
Excellent	47.7 (158)
<b>Sector</b>	
Public	81.6 (270)
Private	18.4 (61)
<b>Facility Level</b>	
Level 1	23.6 (78)
Level 2	27.8 (92)
Level 3	48.6 (161)
<b>Hepatitis B vaccination status</b>	
No	80.6 (267)
Yes	19.3 (64)
<b>Training in infection control</b>	
No	42.6 (141)
Yes	57.4 (190)

N= total number of participants, <sup>a</sup> Mean (Standard deviation), <sup>b</sup> Median (range)

## 5.2 Prevalence of hepatitis B vaccination status among health care workers

Of the 331 health care workers that were interviewed, 64 health care workers were vaccinated against hepatitis B which gives a prevalence of **19.3%**. Of these 64 who had been vaccinated against hepatitis B, 35 (54.7%) had received the recommended three doses, with 29 (45.3%) taking less than three doses.

## 5.3 Determinants of hepatitis B vaccination status

### 5.3.1 Association between predictor variables and vaccination status

Tests of association using the chi-square test and T-test have been used to see whether predictor variables are associated with vaccination status. Table 4 shows the associations between predictor variables and vaccination status.

Table 4.0: Association between Predictors and Vaccination status with p-values

Variable	Vaccinated		P-value
	No n= 267	Yes n=64	
<b>Age</b> (mean, SD)	34.5(0.5)	37.3(1.2)	<b>p&lt;0.0001<sup>a</sup></b>
<b>Sex</b> (frequency, percentage)			
Male	121 (79.1)	32 (20.9)	0.500 <sup>b</sup>
Female	146 (82.0)	32 (18.0)	
<b>Profession</b> (frequency, percentage)			
Nurses	76 (84.4)	14 (15.6)	<b>p&lt;0.0001<sup>b</sup></b>
Laboratory personnel	58 (67.4)	28 (32.6)	
Doctors	70 (79.5)	18 (20.5)	
General workers	63 (94.0)	4 (6.0)	
<b>Work Experience</b> (mean, SD)	5.6 (0.3)	6.2 (0.5)	<b>p&lt;0.0001<sup>a</sup></b>
<b>Sharps injuries/year</b> (median, range)	0 (0-5)	0(0-5)	0.028 <sup>a</sup>
<b>Knowledge on Hepatitis B</b>			
Poor	41(89.1)	5(10.9)	0.363 <sup>b</sup>
Fair	22 (84.6)	4(15.4)	
Good	81 (80.2)	20(19.8)	
Excellent	123 (77.9)	35(22.1)	
<b>Sector</b>			
Public	218 (80.7)	52 (19.3)	0.941
Private	49 (80.4)	12 (19.6)	
<b>Facility Level</b> (frequency, percentage)			
Level 1	112 (82.3)	24 (17.7)	<b>0.014<sup>b</sup></b>
Level 2	33 (97.1)	1 (2.9)	
Level 3	122 (75.8)	39 (24.2)	
<b>Training in infection control</b>			
No	123 (87.2)	18 (12.8)	<b>0.009<sup>b</sup></b>
Yes	144 (75.8)	46 (24.2)	

<sup>a</sup>Two-sample test of proportions <sup>b</sup>Chi-square test

The mean age of those not vaccinated was 34.5 years old (SD 0.5 years) and for those vaccinated was relatively higher at 37.3 years old (SD 1.2years). Using the two-sample test of proportions it showed that there was no difference in vaccination status with age of the two groups and this was statistically significant (p-value 0.000). A total number of 121(79.1%) males were not vaccinated against hepatitis B, as was 146 (82.0%) females. Both sexes had an equal number of health workers being vaccinated at 32 (20.9%) for males and 32 (18.0%) for females. This was statistically insignificant using the chi-square test for association (p=0.500). This means that there is no association between sex and vaccination status among the participants. A total number of 90 nurses were included in this study, and of these 76 (84.4%) were not vaccinated against hepatitis B and 14 (25.6%) were vaccinated against hepatitis B. Of the 86 laboratory personnel, 58 (67.4%) were not vaccinated against hepatitis B and 28 (32.6%) were vaccinated against hepatitis B. There were 88 doctors included in the study and of these 70 (79.5%) were not vaccinated against hepatitis B and 18 (20.5%) were vaccinated against hepatitis B. A total of 63 (94.0%) general workers of 67 general workers included in the study were not vaccinated and 4 (6.0%) were vaccinated. The profession of the health care worker was significant (p=0.000), which means profession of the health care worker is associated to vaccination status of the health care worker. The average work experience of those not vaccinated was lower at 5.6 years (SD 0.3 years) compared to 6.2 years (SD 0.5 years) for those vaccinated. This was statistically significant (p=0.000), meaning there was a difference in work experience between those not vaccinated and those vaccinated. For the variable sharps injuries per year, the median number of sharps experienced was 0, as well as 0 sharp injuries for those vaccinated. This still turned out to be statistically significant (p-value 0.028) which means there was a difference in sharps injuries between the unvaccinated and vaccinated groups. Those with poor knowledge of hepatitis B totalled 46 (13.9%) health care workers and among these 41 (89.1%) were not vaccinated against hepatitis B and 5 (10.9%) were vaccinated against hepatitis B. Of a total of 26 (7.9%) health care workers with fair knowledge in hepatitis B, 22(84.6%) were not vaccinated against hepatitis B and 4 (15.4%) were vaccinated against hepatitis B. A total number of 101 (30.5%) health care workers had good knowledge on hepatitis B, and of these 81 (89.2%) were not vaccinated and 20 (19.8%) were vaccinated. A total of 158 (46.7%) health care workers that exhibited excellent knowledge in hepatitis B and of these 123(77.9%) were not vaccinated against hepatitis B and 35(22.1%) were vaccinated against hepatitis B. Knowledge

on hepatitis B turned out to be insignificant (p-value 0.363), which means there was no association between the levels of knowledge about hepatitis B and the vaccination status.

This was also true for the sector in which the health facility belonged to. Among the 270 (81.6%) health care workers from the public sector, 218 (82.3%) were not vaccinated against hepatitis B and 52 were vaccinated against hepatitis B. The private sector had 61 (18.4%) health care workers in this study and of these 49 (80.4%) were not vaccinated against hepatitis B and 12 (19.6%) were vaccinated against hepatitis B. This variable was insignificant (p-value 0.941) which means there was no association between sector of health facility and the vaccination status. Health facility level was statistically significant (p-value 0.014), which implies that the level of the health facility in which a healthcare worker belongs can determine whether or not they are vaccinated. A total number of 141 health care workers were not trained in infection control and of then 123 (87.2%) were not vaccinated against hepatitis B and 18 (12.8%) were vaccinated against hepatitis B. Of the 190 health care workers that had received training in infection control, 144 (75.8%) were not vaccinated against hepatitis B and 46 (24.2%) were vaccinated against hepatitis B. Not surprising that training in infection control was statistically significant (p=0.009), which means being trained in infection control can also determine whether a health care worker is vaccinated against hepatitis B or not.

### **5.3.2 Univariate and Multivariate logistic regression analysis**

To best understand how each variable relates to vaccination status by its own, univariate logistic regression analysis was used and the odds ratios and p-values are shown in table 6. The adjusted odds ratios and p-values obtained after performing multivariate logistic regression to see how these predictor variables relate when grouped together into a logistic regression model. The adjusted odds ratios and corresponding p-values are also shown in table 5.

Table 5.0: Univariate and Multivariate analysis of Independent variables to vaccination status

<b>Independent variable</b>	<b>Univariate analysis Odds ratio (CI)</b>	<b>P-value</b>	<b>Multivariate Odds ratio (CI)</b>	<b>P-value</b>
<b>Age</b>	1.03 (1.00-1.1)	0.28	1.05 (1.0-1.1)	<b>0.01*</b>
<b>Gender</b>				
Male	1.00		1.00	
Female	0.8(0.4-1.4)	0.50	0.9 (0.5-1.6)	0.60
<b>Profession</b>				
Nurse	1.00		1.00	
Lab personnel	2.6 (1.3-5.4)	<b>0.009</b>	4.1 (1.6-10.2)	<b>0.002</b>
Doctor	1.4 (0.6-3.01)	0.396	1.6 (0.6-4.0)	0.328
General worker	0.3 (0.1-1.1)	0.072	0.2(0.03-1.5)	0.115
<b>Work Experience</b>	1.02 (0.9-1.1)	0.93	0.9 (0.9-1.03)	0.252
<b>Sharps injuries/year</b>	1.6(1.2-2.1)	<b>0.004</b>	1.5 (1.1-2.0)	<b>0.020</b>
<b>Knowledge of hepatitis B</b>				
Poor	1.00		1.00	
Fair	1.5 (0.4-6.1)	0.580	0.6 (0.07-4.6)	0.613
Good	2.0 (0.7-5.8)	0.188	0.4 (0.06-3.3)	0.44
Excellent	2.3 (0.9-6.3)	0.097	0.03 (0.04-2.2)	0.233
<b>Sector</b>				
Public	1.00		1.00	
Private	1.02 (0.5-2.1)	<b>0.07</b>	1.6(0.5-2.7)	0.723
<b>Facility Level</b>				
Level 1	1.00		1.00	
Level 2	0.1(0.01-1.1)	<b>0.06</b>	0.7 (0.07-0.6)	<b>0.019</b>
Level 3	1.5(0.8-2.6)	0.17	1.8 (0.8-4.0)	0.122
<b>Training in infection</b>				
No	1.00		1.00	
Yes	2.2 (1.2-4.0)	<b>0.01</b>	1.9 (0.9-3.8)	0.071

\*Variables chosen to be statistically significant when  $p < 0.05$

After univariate analysis of each variable to vaccination status, the variables that turned out to be insignificant ( $p < 0.05$ ) were: age, sex, work experience and knowledge of hepatitis B. The variables that turned out to be significant ( $p > 0.05$ ) were; Profession, sharps injuries per year, sector of health facility, health facility level and health care workers training in

infection control. When all variables were analysed in a multivariate logistic regression model the variable age became significant and the variable training in infection control became insignificant. All other variables remained the same.

### 5.3.3 Predictor variables that best predict the vaccination status of health care workers

Using the investigator led step wise logistic regression method, the best predictor variables were chosen and these are shown in table 6 with their corresponding p-values.

Table 6.0: The best fit model of variables that predict hepatitis B vaccination status in health care workers.

Variable	Adjusted odds ratio(CI)	P-values
Age	1.03 (1.0- 1.06)	<b>0.042</b>
Sharps injuries per year	1.5 (1.1- 2.1)	<b>0.008</b>
<b>Training in infection control</b>		
No	1.0	
Yes	2.1 (1.1-3.2)	<b>0.018</b>

After an investigator led stepwise multivariate logistic regression, the variables that were statistically significant and were strong predictors of hepatitis B vaccination are age, sharps injuries per year and training in infection control. With every one year increase in age of the healthcare worker, they are 1.03 times more likely (95% CI 1.0-1.06 p=0.042) of being vaccinated against hepatitis B adjusting for sharps injuries per year and training in infection control of the health care worker. With every one increase in sharps injuries per year experienced by a health care worker, they are 1.49 times more likely (95% CI 1.1-2.06, p=0.015) to be vaccinated against hepatitis B, adjusting for age of health care worker and an individual's training in infection control. Health care workers who were trained in infection control were 2.1 times more likely (95% CI 1.1-3.2, p=0.018) to be vaccinated against hepatitis B compared to those that were not trained in infection control, adjusting for the age of the health care worker and sharp injuries per year experienced by the health care worker.

#### 5.4 Availability of Hepatitis B vaccine in health facilities

All seven health facilities visited currently had no hepatitis B vaccine for health care workers in their stores at the time of the interview. Only 3 (37.5%) health facilities had ever had hepatitis B vaccine in their stores at one point in time. These were two level 2 health facilities and one level 3 health facility. All health facilities visited agreed that the hepatitis B vaccine for health care workers was very important for the prevention of hepatitis B transmission from patients to health care workers and vice versa. Only one facility (level 3) had given the responsibility for vaccine procurement to each department of the health facility. This facility had more health care workers vaccinated against hepatitis B in one department (laboratory department) compared to other departments. A total of 7 health facilities were visited, four were level 1 health facilities, one was level 2 and two were level 3 health facilities. The questionnaire was answered by individuals responsible for the procurement of vaccines in the health facility. Table 7 shows the frequencies to the responses to the four questions in the second questionnaire.

Table 7.0: Frequency of responses to questions on availability of hepatitis B vaccine in health facilities.

Question	Yes	No
1. Does your health facility currently have hepatitis b vaccine in its stores?	0	7
2. If no to question (1), have you ever had hepatitis b vaccines in the stores of the health facility?	3	4
3. If you have ever had the vaccine, is the vaccine readily available to health care workers in this facility?	3	4
4. Do you think the hepatitis b vaccine is very important in the prevention of transmission of hepatitis b to health care workers and vice versa?	7	0

## **6.0 Discussion**

The findings of this research suggest that there is indeed a low number of HCWs vaccinated against hepatitis B. The number of HCWs that were vaccinated against hepatitis B from the total sample size of 331 was 64 giving a prevalence of 19.3%. In this study 85% of the HCWs know that a vaccine against hepatitis B exists and 97% of the HCWs were willing to get vaccinated if the vaccine were to become available in their institution. With a high knowledge base on the existence of the vaccine among HCWs and high willingness to be vaccinated means that the reason for low vaccination prevalence among HCWs is not by their own doing. Perhaps low vaccination rates can be due to the unavailability of the vaccine in the institution due to a non-stringent policy on the vaccination of HCWs. A study done in Uganda, found the prevalence of hepatitis B vaccination among HCWs at 38.4% (Ziraba, Bwogi et al., 2010) and 83.6% in Kuala Lumpur (Hashemi et al, 2014). Of the 64 HCWs that were vaccinated against hepatitis B, 35 (54.7%) had completed full immunization (a total of 3 doses) and 29 (45.3%) had received either one or two doses. The study done in Uganda showed that only 6.2% of the HCWs had completed full immunization which falls short to the 54.7% reported in this study. In Burkina Faso, 47.7% of HCWs had received at least one dose of hepatitis B vaccine and only 10.9% had received full immunization (Oudraogo et al, 2013). South Africa also had a higher number of HCW vaccinated against hepatitis B at 67.9%, however only 19.9% of these had received full vaccination (Burnet et al, 2011) . In contrast to these observed low rates of full immunization coverage in Africa, higher rates of 75% and 93% were reported among HCWs in the USA (Simard and Miller, 2002) and France (Loulergue and Moulin, 2009) respectively. In this study 54.7% of the vaccinated HCWs had received full immunization which is higher than most of the African studies highlighted above. As is to be explained in more detail in the next paragraph, the profession that was vaccinated the most in the study group were laboratory personnel of whom are running a program that ensures that all staff are fully vaccinated against hepatitis B. This must have contributed to the high number of HCWs that received all the 3 recommended doses for full immunization.

### **Determinants of hepatitis B vaccination status**

Even though the profession of a HCW did not come out statistically significant after data analysis, it is worth discussing because in literature it is a strong predictor variable for hepatitis B vaccination. The results show that there were more laboratory personnel

vaccinated compared to any other profession. In literature however, it shows that more doctors are vaccinated against hepatitis B compared to other HCWs (D Ogoina et al, 2012). This was not the case in this study with only 18 doctors being vaccinated against hepatitis B compared to laboratory personnel that had 28 HCWs being vaccinated against hepatitis B. In Zambia, medical students are offered the hepatitis B vaccination under their regulatory body (Zambia Medical Association) at a fee. The doctors that were vaccinated in this study consisted mainly of recent graduates and doctors that studied abroad. The laboratory personnel were the most vaccinated group in this study. Most of them being vaccinated in the level 3 health facility visited. In this health facility the procurement of this vaccine for the HCWs are the responsibility of each department. The health facility itself does not procure the vaccines for the health workers. In this facility, laboratory personnel were the most vaccinated, because the laboratory has made it a priority for its HCWs. The need for protective measures against acquiring of blood borne transmitted disease is crucial in the laboratory at this health facility. The health facility receives funds from donors for each department and these departments then decide what to do with these funds in relation to hospital activities. This laboratory department chooses to use part of its funds to procure vaccines for its staff members, as part of a safety precaution under its quality management system for laboratories. Most hospital laboratories in Zambia are taking part in enhancing the quality of their laboratories so as to foster on research and improve on the quality of processing of samples and reporting of results. One of the requirements to attain accreditation is to have the laboratory personnel vaccinated against vaccine preventable diseases that includes hepatitis B vaccination. This might be one of the reasons the laboratory personnel had more vaccinated HCWs compared to other groups. From the group of HCWs vaccinated against hepatitis B, only 14 nurses were vaccinated and they consisted of the largest group sampled (90 nurses). Most nurses vaccinated against hepatitis B was as a result of post prophylactic procedures, with the highest sharps injuries per year being experienced by the nurses (average two sharp injuries per year). The least vaccinated HCWs were the general workers, with only 4 being vaccinated against hepatitis B. This is agreeable with literature; this group may be the least knowledgeable about hepatitis B and its prevention being vaccinated against it might not be a priority to them.

The age of the health worker was also a determinant for hepatitis B vaccination. According to the analysis, with every increase in age a health care worker is 1.03 times more likely to be vaccinated against hepatitis B adjusting for sharps injuries per year and training in infection

control. The odds ratio found in this study is not particularly high, but it does support literature findings that highlight that age indeed is a determinant for hepatitis B vaccination in HCWs. Ogoina states that, "it is plausible that younger health care workers had poorer vaccine uptake due to their lower access to hepatitis B vaccine or poorer knowledge of the need for hepatitis B vaccination" (D Ogoina et al, 2012). Due to more experience, older HCWs are more knowledgeable about hepatitis B and its risks and health impacts and are more likely to take extra precaution to prevent themselves from contracting hepatitis B. This would suggest that health education in safety practices be strengthened in colleges/universities in order for young graduates looking for employment in clinical setting be well informed about their options in preventing themselves from infection with hepatitis B.

In this study, HCWs that had experienced at least one sharp injury in a year were 51 out of the total of 331 health care workers (15.4%). A study done in Pakistan reported that health care workers having experienced at least one sharp injury in a year was at 44% (Naveed and Muhammad, 2010) with the highest frequency being in doctors. In this study nurses (37.3%) experienced the most sharp injuries per year at an average of 2 sharp injuries per year, followed by doctors (29.4%) at 1.6 sharp injuries per year, laboratory personnel (23.5%) at 1.2 sharp injuries per year and general workers (5.8%) at 1 sharp injury per year. In this study it is reported that the more sharp injuries per year a health worker experiences the more likely they are to be vaccinated against hepatitis B. Although the percentage of sharp injuries in this study is not too high, it should be minimized as it is one of the most significant modes of transmission. Moreover, needle prick injuries pose a greater risk than splashes and those from hollow-bore needles. Sharp injuries can be prevented by always wearing gloves, properly discarding needles and minimizing the contact with blood products of infected patients. HCWs that experienced a sharp injury, would undergo post-prophylactic procedures (PEP), with a majority of them undergoing HIV PEP. The remainder of the health workers either didn't undergo PEP or they underwent hepatitis B PEP which consists of taking 3 doses of the vaccine making them immunized against hepatitis.

All HCWs must be trained in ways to protect themselves from acquiring diseases in their work environment. Truth be told, HCWs are exposed to many diseases each and every day due to the contact that they have with patients and patients' bodily fluids. All health institutions must make sure that their staff are trained in infection control practices in order to effectively protect themselves from acquiring diseases from the hospital environment in

which they work. This study has shown that a health care worker trained in infection control is more likely to be vaccinated against hepatitis B compared to a health care worker not trained in infection control. D.Ogoina et al (2012) states that prior training in infection control of a HCW means they are more likely to be vaccinated against hepatitis B. Yousafzai et al (2013) also that suggests that training of a HCW in the practice of standard precautions makes them more likely to be vaccinated against hepatitis B.

### **Availability of hepatitis B vaccine**

The study also investigated the availability of the hepatitis B vaccine for HCWs at the respective health institutions. Of the seven health facilities visited, only two ever had the vaccine available in their stores. The HCWs vaccinated at one health institution were taken to receive the vaccine outside the health institution itself, to a clinic that was offering the vaccine at a fee. But this happened very long time ago, since then no efforts have been made to procure the vaccine in house. As mentioned earlier, another health institution had given the responsibility to the procurement of this vaccine to each department of the health facility, thus one department was doing far much better in procuring the vaccine compared to other departments. This is questionable on managements part, particularly because this means that only HCWs from that department in this entire health facility would have more HCWs vaccinated against hepatitis B therefore excluding the majority of the HCWs in that facility. HCWs all believed that the vaccination was important, therefore the main barrier to better compliance to the guidelines is not lack of acceptance among employees but the failure of the employer to ensure that the policies are implemented. HCWs are the responsibility of the health facility they work in, and efforts must be made on the employer's part to be able to procure these vaccines for their HCWs as part of their occupational health policy. Efforts must also be made to educate all HCWs on the importance of hepatitis B vaccine, and any other vaccine-preventable disease so as to give the HCWs a platform to make informed decisions.

#### **6.1 Limitations of the study**

The study did not sample its minimum sample size of 350 HCWs according to the calculations, and only sampled a total of 331 HCWs. This was due to time management issues that could have been addressed earlier on in the study. Financial constraints also contributed to the failure to sample all 350 HCWs. The results have also been skewed due to the proportionate sampling method used, with the majority of the HCWs being sampled

coming from level 3 health facilities that had a larger population of HCWs. This will affect the generalizability of the results to the entire Lusaka district. True vaccination status of the HCWs is questionable because vaccination certificates were not being produced. However, the results give an idea of the prevalence of hepatitis B vaccination among HCWs.

## **6.2 Conclusion**

The elimination of the transmission of hepatitis B to HCWs through the contact of infected patients' bodily fluids and vice versa can be achievable through the vaccination of HCWs against hepatitis B. HCWs are an accessible group that have demonstrated to be at a great risk for hepatitis B infection for whom hepatitis vaccination has been available for more than 20 years. The prevalence of hepatitis B vaccination among HCWs although low, still gives an indication that the vaccination is being taken up by some HCWs. However, it is hopeful to learn that HCWs have knowledge regarding hepatitis B and the vaccine and are willing to be vaccinated against it. From this study it has been shown that the age, training in infection control and sharp injuries per year are the best predictors of hepatitis B vaccination in HCWs. This suggests that younger HCWs must be educated in the importance of preventive measures against hepatitis B through appropriate health education regarding hepatitis B infection and prevention. Training in infection control must be made a priority in health facilities in order to decrease occupational accidents such as sharp injuries. The availability of hepatitis B vaccine in health facilities at the time of the study was zero despite the health facility having policies on the vaccination of HCWs against vaccine-preventable diseases. The reasons to this were not explored in this study and it is recommended that further research must be done to answer this question.

## **6.3 Recommendations**

Efforts should be made to increase hepatitis B vaccination coverage among all HCWs, especially those at greatest risk for exposure to blood or other potentially infectious material. Hospitals also need to identify successful vaccination strategies focused on exposed, but unvaccinated HCWs. In order to increase the number of HCWs vaccinated against hepatitis B, health institutions should bear the cost for vaccinating their staff. The Ministry of Health Zambia must also implement and strengthen its policy on hepatitis B vaccination among HCWs, making it compulsory for HCWs to be vaccinated against hepatitis B in Zambia by the inclusion of hepatitis B education during orientation programs for new interns or new staff.

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## **8.0 Appendices**

### **8.1 Appendix I: Information Sheet**

#### **TITLE: “HEPATITIS B VACCINATION STATUS AMONG HEALTH CARE WORKERS IN SELECTED HEALTH FACILITIES IN LUSAKA DISTRICT”**

My name is Namwaka Mungandi and I am a student studying the Master of Science in Epidemiology programme at the University of Zambia. This research is in partial fulfilment of the requirements for obtaining my masters degree. I am here at your institution to carry out my master’s thesis titled “Hepatitis B vaccination status and determinants of vaccination among health workers in selected health facilities in Lusaka district”. The research will be at your institution to collect data. My study group consists of a total of 350 nurses, doctors, laboratory scientists/technicians, clinical officers and general workers.

#### **The aim of the research**

The aim of the study is to determine the prevalence and determinants of hepatitis B vaccination status among health care workers in selected health facilities in Lusaka district.

#### **Study procedure**

You will be asked a series of multiple choice questions from a questionnaire and the interview will take approximately 25 minutes.

#### **Confidentiality**

The information that you will provide in this study will be kept confidential. The questionnaire will not include your personal information. Only the questionnaire number will be included on the questionnaire and will not be linked back to you. The answered questionnaire will be stored under lock and key only accessible by the principle investigator.

### **Risks and discomforts to you**

There are no known physical or emotional risks for you in this study, although some questions may be deemed sensitive

### **Benefits of the research and benefits to you**

There will be no direct benefits to you, only that you will be contributing to the body of knowledge regarding hepatitis B vaccination among healthcare workers. The benefits will be seen in the long term assuming hepatitis B vaccination among healthcare workers becomes a priority in healthcare human resource safety and management.

### **Voluntary participation**

Your participation in the study is completely voluntary and you may choose to stop participating at any time.

### **Withdrawal from the Study**

You can stop participating in the study at any time, for any reason, if you so decide.

### **Questions about the research**

If you need any further clarifications, you can contact the Principal Investigator, Principal Supervisor or the chairperson of the ethics committee as given below;

The Chairperson UNZA-Biomedical Ethics Committee

Telephone: 0211-256067

Fax: 0211-250753

E-mail: [unzarec@zamtel.com](mailto:unzarec@zamtel.com)

The Principal Supervisor

Dr. Patrick Musonda

Cell number: 0963256318

E-mail: [pmuzho@hotmail.com](mailto:pmuzho@hotmail.com)

The Principal Investigator

Namwaka Mungandi

Cell number: 0977158323

E-mail: [namwakamungandi@yahoo.com](mailto:namwakamungandi@yahoo.com)

**Thank you.**

## **8.2 Appendix II: Informed Consent Form**

### **TITLE: “HEPATITIS B VACCINATION STATUS AMONG HEALTH CARE WORKERS IN SELECTED HEALTH FACILITIES IN LUSAKA DISTRICT”**

The purpose of the study has been adequately explained to me and I understand the aim, risks, benefits and confidentiality of this study. I further understand that if I agree to take part in this study, I can withdraw at anytime without having to give an explanation and that taking part in this study is voluntary.

If you are willing to take part in the study, please do so by signing below.

**Signature/ thumbprint:** .....

**Date:** .....

**Witness:** .....

For further information, please contact the following;

The Chairperson UNZA-Biomedical Ethics Committee

Telephone: 0211-256067

Fax: 0211-250753

E-mail: [unzarec@zamtel.com](mailto:unzarec@zamtel.com)

The Principal Supervisor

Dr. Patrick Musonda

Cell number: 0963256318

E-mail: [pmuzho@hotmail.com](mailto:pmuzho@hotmail.com)

The Principal Investigator

Namwaka Mungandi

Cell number: 0977158323

E-mail: [namwakamungandi@yahoo.com](mailto:namwakamungandi@yahoo.com)

**Thank you for your time and cooperation.**

### **8.3 Appendix III: Questionnaire**

#### **Hepatitis B vaccination coverage and determinants of vaccination among health care workers in selected health facilities in Lusaka**

**QUESTIONNAIRE Number:** .....

**Date:** .....

**Health facility name:** .....

**Level of health facility:** .....

**Sector: Public sector of Private sector:** .....

**Interviewers name:** .....

#### **Instructions to the interviewer**

**Before this interview begins, make sure the participant has understood the purpose of the study and has signed the consent form. Perform the interview in a room that is private and comfortable. Tick the box for the answer given. If there is no box provided write down the answer to the question. This interview should take approximately 25 minutes.**

**Part I: Demographic characteristics**

1. How old are you in years? .....

2. Gender?

Male  Female NR

3. What is your religion?

Christian Muslim  NR  other (please specify).....

4. What is your marital status?

Single  Married  Divorced  Widowed NR

5. Do you have children?

Yes No NR

6. If Yes (from above question) how many children to you have...

If No skip question.

7. Where do you live?

With-in Lusaka (specify).....  Out-side Lusaka (specify).....

**Part II: Occupational data**

8. What is your profession?

Nurse Doctor Laboratory technician/scientist Clinical officer General worker

9. How long have you been working in this facility?.....

10. Have you worked anywhere else apart from this health facility?

Yes  No  NR

11. How many hours do you work per week?.....

**Part III: Occupational hazards**

12. Have you had any accidents relating to your line of work in the past year?

Yes  No  Do not know  NR

13. Have you had any sharps injuries in the past year?

Yes  No  Do not know  NR

14. If yes to the above question, how many sharps injuries have you had in the past year?....

15. Did you under go any post-prophylactic procedures?

Yes  No  Do not know  NR

16. If yes, which post-prophylactic procedure did you undergo?  HIV post-prophylactic procedure  Hepatitis B post-prophylactic procedure  Other(specify) .....  NR

**Part IV: Training in infection control**

17. In college did you have any training in infection control in your course curriculum?

Yes  No  Do not know  NR

18. Have you had any formal training in infection control in your place of work?

Yes  No  Do not know  NR

19. If yes, who sponsored the training?

Self training  Government  Private sector  Other (specify)  NR

**Part V: Knowledge on Hepatitis B virus (HBV)**

20. Do people get HBV from genes (heredity)?

Yes  No  Do not know  NR

21. Do people get HBV through the air (coughing or staying in the same room)?

Yes  No  Do not know NR

22. Do people get HBV from sexual relationships?  Yes  No  Do not know NR14. Do people get HBV during birth?

Yes  No  Do not know  NR.

23. Do people get HBV by sharing spoons or bowls for food?

Yes  No  Do not know NR

24. Do people get HBV by eating food prepared by an infected person?

Yes  No  Do not know NR

25. Does HBV have signs or symptom?

Yes  No  Do not know NR

26. Does HBV cause liver cancer?

Yes  No  Do not know NR

27. If someone is infected with hepatitis B but they look and feel healthy, do you think that person can spread hepatitis B?  Yes  No  Do not know NR

#### **Part VI: Hepatitis B virus vaccination status**

28. Do you know that a vaccine against HBV exists?

Yes No Do not know NR

29. If yes, have you been vaccinated against HBV as an adult?

Yes No Do not know NR

30. If yes, how many doses of the vaccine did you receive?

One Two Three Do not know NR

31. If you completed the vaccination (taking all 3 doses of the vaccine), did you later test for HBV antibody levels in your blood?

Yes No Do not know NR

32. Who provided the HBV vaccine to you?

Government Private sector Other (specify) NR

33. Did you have to pay to receive this vaccination?

Yes No other (specify) NR

34. How important do you think HBV vaccination is in prevention of HB in healthcare workers?

Not important Fairly important Very important NR

35. If you are not vaccinated against HBV, do you want to be vaccinated against HBV?

Yes No do not know NR

**END OF INTERVIEW**

**Thank the participant for their time and cooperation.**

#### **8.4 Appendix IV: Questionnaire for health facility's stores in-charge**

**QUESTIONNAIRE Number:** .....

**Date:** .....

**Health facility name:** .....

**Level of health facility:** .....

**Sector: Public sector of Private sector:** .....

**Interviewers name:** .....

#### **Instructions to the interviewer**

**Before this interview begins, make sure the participant has understood the purpose of the study and has signed the consent form. Perform the interview in a room that is private and comfortable. Tick the box for the answer given. If there is no box provided**

**write down the answer to the question. This interview should take approximately 10 minutes.**

**Part I: Availability of Hepatitis B vaccine in the health facility**

1. Does your health facility currently have hepatitis B vaccine in its stores?  
 Yes  No  Do not know
  
2. If yes to question (1), how many bottles of hepatitis B vaccine do you currently have?  
.....
  
3. If yes to question (2), is the vaccine readily available to HCWs in this facility?  
 Yes  No  Do not know
  
4. If no to question (1), have you ever had hepatitis B vaccines in the stores of the health facility?  
 Yes  No  Do not know

**End of interview, Thank you for your cooperation**

## **8.5 Appendix V: Hepatitis B Fact Sheet**

(Adopted from Centre for Disease Control, **Hepatitis B General Information sheet**. Available at <http://www.cdc.gov/hepatitis/HBV/PDFs/HepBGeneralFactSheet.pdf> )

### **What is hepatitis B?**

Hepatitis B is the world's most common serious liver infection. It is caused by the hepatitis B virus (HBV) that attacks liver cells and can lead to liver failure, cirrhosis (scarring) or cancer of the liver later in life. Hepatitis B is transmitted through blood, unprotected sex, use of unsterile needles, and from an infected mother to her newborn during the delivery process. It is not transmitted casually through the air or superficial social contact. Approximately 90% of healthy adults who are exposed to the hepatitis B virus (HBV) recover on their own and develop protective antibodies. However, 10% of infected adults, 50% of infected children, and 90% of infected babies are unable to get rid of the virus and develop chronic infection. These people need further evaluation by a liver specialist or doctor knowledgeable about hepatitis B.

### **Am I at risk for a hepatitis B infection?**

Health care workers who come into contact with human blood, blood products, or potentially infectious bodily fluids are at an increased risk for exposure to the hepatitis B virus.

### **How can I protect myself as a health care worker?**

The Centres for Disease Control and Prevention (CDC) recommends that all health care workers, emergency personnel, and other individuals who are exposed to blood or body fluids on the job, should be vaccinated against hepatitis B. The vaccine is safe and effective and can protect you for a lifetime. The vaccine is given in three doses over a 6 month period (0, 1, and 6 months). It is recommended that health care workers have their hepatitis B surface antibody (HBsAb) level tested 4-6 weeks after completion of the series, to make sure that they have built up protection against HBV. If a person does not develop the protective antibodies after completion of the vaccine series, then the entire series should be repeated (with antibody testing 4-6 weeks after completion of the additional second series).

### **What if I am exposed to the virus?**

For unvaccinated individuals who think they have been exposed to hepatitis B, it is recommended that they undergo "post exposure prophylaxis" as soon as possible. If the source of the exposure is known to be positive for hepatitis B, then the exposed person should receive the first dose of the vaccine and one dose of hepatitis B immunoglobulin G as soon as possible (within 24 hours if possible). After that, the remaining 2 doses of the vaccine can be given 1 and 6 months after the first dose. About one-two months after the vaccine series is completed, it is a good idea to get tested to determine whether the person developed protective antibodies. If the hepatitis B status of the source is unknown and the exposed person is unvaccinated, it is recommended that they begin the hepatitis B vaccine series as soon as possible.

### **How can I find out my hepatitis B status?**

You can find out your hepatitis B status by a blood test to detect hepatitis B antibodies or antigens. It can also be done by checking for liver damage by testing for enzyme levels in your blood that show whether your liver is damaged or inflamed.

For more information talk to a health profession or visit [www.cdc.gov/hepatitis](http://www.cdc.gov/hepatitis).

## 8.6 Appendix VI: Ethical approval letter