

**HEPATITIS B VIRUS PREVALENCE, KNOWLEDGE, ATTITUDES, AND  
PREVENTIVE PRACTICES AMONG MEN WHO HAVE SEX WITH MEN  
ATTENDING THE MOST AT-RISK POPULATION INITIATIVE CLINIC AT  
MULAGO HOSPITAL, UGANDA: A CROSS-SECTIONAL STUDY**

**BY  
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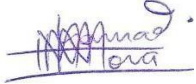
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## DECLARATION

I Mona Muhammad, do hereby declare that the contents of this dissertation are my original work and have not been presented for an award of a degree or any similar purposes in any other institution. Where someone else's work has been used, it has been acknowledged.

.....  
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## **DEDICATION**

I dedicate this dissertation to my mother, Zuhaira Amina Sebbi whose resilience is the source of my motivation and my Father Muhammad Rajab who supported my dreams to attain a Master's degree.

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## ACRONYMS AND ABBREVIATIONS

<b>APR</b>	Adjusted Prevalence Ratio
<b>ARVs</b>	Anti-Retro Virals
<b>CPR</b>	Crude Prevalence Ratio
<b>HBsAg</b>	Hepatitis B Surface Antigen
<b>HBV</b>	Hepatitis B Virus
<b>HIV</b>	Human Immunodeficiency Virus
<b>IRB</b>	Institutional Review Board
<b>KAP</b>	Knowledge, Attitudes and Practices
<b>KP's</b>	Key populations
<b>LGBTQI</b>	Lesbian, Gay, Bi-sexual, Transgender, Queer and Indeterminate
<b>MARPI</b>	Most At Risk Population Initiative
<b>MARPs</b>	Most At Risk Populations
<b>MNRH</b>	Mulago National Referral Hospital
<b>MOH</b>	Ministry Of Health
<b>MSM</b>	Men who have Sex with Men
<b>PEP</b>	Pre-Exposure Prophylaxis
<b>PLHIV</b>	People Living with HIV
<b>PWID</b>	People Who Inject Drugs
<b>SANAS</b>	South African National Accreditation Scheme
<b>VL</b>	Viral Load
<b>WHO</b>	World Health Organization

## OPERATIONAL DEFINITIONS

**Boda-Boda riders:** These are motorcycle riders who provide transportation for people and goods in exchange for money.

**Bi-sexual MSMs:** These are men who have sex with men who indulge in sexual activities with both men and women

**Homo-Sexual MSMs:** These are men who have sex with men who exclusively indulge in sexual activity with fellow men

**Key populations:** These are groups of people who due to their indulgence in specific high-risk behaviors, exhibit high HIV risk and prevalence across the globe irrespective of the epidemic type or local context. These include sex workers, men who have sex with men, prisoners, and other incarcerated people, people who inject drugs, and transgender individuals. In addition, often times the lifestyles of these populations (drug use, sex work and homosexuality) are punishable by law and shunned /unacceptable according to Ugandan culture and societal norms.

**MARP-friendly services:** Non-judgmental and confidential service provision to MARPs regardless of age, occupation, disability, sexual orientation, or HIV status while strengthening positive provider-client interaction and reducing stigma and discrimination in the healthcare settings.

**Men who have Sex with Men:** This is a term that describe all men who engage in sexual activity with other men regardless of their sexual identity (Bi-sexual, homo-sexual). This includes heterosexual males who also indulge in sexual activity with fellow males.

**Most At Risk populations (MARPs) for HIV:** These are groups that are disproportionately affected by HIV and have an HIV prevalence that is significantly greater than that of the general population. They include key populations and other priority populations.

**Priority populations:** These populations vary from country to country and they are at high risk of HIV due to their lifestyle, occupation, sexual behaviors, social characteristics, age and other reasons. They include fisher folk, uniformed forces, adolescent girls and young women, truck drivers, and Boda Boda riders.

**Unsuppressed HIV viral load:** HIV Viral load above 1000 copies per ml

## **ABSTRACT**

### **Background**

It is estimated that 30% of the world is infected with Hepatitis B Virus (HBV) and about 350 million of these are chronic infections causing approximately 1 million deaths per annum. Men who have Sex with Men (MSM) are known to have a very high risk of HBV infection due to their lifestyle choices, risky sexual behaviors and other unique factors. Despite the known risk, there is limited evidence regarding the HBV burden among this population to drive action. This study, therefore, sought to estimate the prevalence of HBV infection among this population and to assess their knowledge, attitudes and practices concerning HBV infection and prevention.

### **Specific objectives**

The major objective of this study was to estimate the prevalence of HBV infection among MSM attending the Most At Risk Population Initiative (MARPI) clinic in Uganda and to assess their knowledge, attitudes and practices towards HBV infection and prevention. In addition to determining the association between the predictors and levels of knowledge, attitudes and practices towards HBV infection and prevention among MSM attending the MARPI clinic.

### **Methods**

A cross-sectional study was conducted and quantitative data was collected from MSM attending the MARPI clinic at Mulago National Referral Hospital. Upon consent, the individuals were subjected to a questionnaire to assess their demographic information, knowledge, attitude, and practices towards HBV infection and prevention and thereafter tested for HBV infection. The quantitative data generated was analyzed descriptively and inferentially using STATA 14.0 to demonstrate the HBV prevalence, knowledge, attitudes and practices.

### **Results**

Out of the 385 participants that were included in the study the mean age was 25.4 and 77.4% identified as homosexuals. The prevalence of HBV among MSMs was 3.1% and all of the MSM diagnosed with HBV stated that they indulged in condomless-anal sex. The prevalence of HBV was significantly higher among those who were HIV positive at 8.9% as compared to 2.5% among the HIV negatives at  $P=0.05$ . Among injectable drug users, the HBV prevalence was at 17.7% as compared to 2.5% among those who don't use injectable drugs ( $P<0.001$ ). The study found that 60.5%, 56.9% and 54.8% of the MSM visiting MARPI clinic had good knowledge, good attitudes and safe practices respectively. Majority of the MSMs (87.5%) acknowledged that they were at

high HBV risk and would consider visiting the health facility for testing however, 81.6% had never been tested, only 10.9% had been vaccinated against HBV and 62.3% had no idea where one can get vaccinated from. Higher Education levels, and being a homosexual were factors associated with poor knowledge, poor attitudes and practices.

### **Conclusion and recommendations**

The findings demonstrated the burden of HBV among the MSM as well as their average knowledge, attitudes and practices towards HBV infection and prevention. There is a need for intensifying awareness creation activities to promote prevention of HBV through condom use, vaccination and routine HBV screening.

## CHAPTER ONE

### 1.1 INTRODUCTION

Hepatitis B infection is one of the diseases of public health importance worldwide. It is a liver infection caused by the Hepatitis B Virus (HBV), which is spread when blood, semen, vaginal fluids or other body fluids from an infected person is transferred to the body of an uninfected person (WHO, 2008).

Similar to HIV, HBV is spread through contact with blood and other body fluids from an infected human (WHO, 2021). It can be transmitted horizontally (from person to person) through sexual contact; sharing needles, syringes, or other drug-injection equipment, tattooing and piercings, or vertically from a mother to a baby at birth (WHO, 2017). HBV is however 50 to 100 times more infectious than HIV (WHO, 2009). The HBV virus can also survive outside the body for at least 7 days during which it can cause an infection if it enters the body of a susceptible person (WHO, 2009).

In highly endemic areas, hepatitis B is most commonly spread from mother to child at birth (perinatal transmission) or through horizontal transmission (exposure to infected blood), especially from an infected child to an uninfected child during the first 5 years of life (WHO, 2021). Among adults, however, sexual transmission is more prevalent in non-vaccinated adults and those with multiple sexual partners (WHO, 2017).

HBV causes symptoms that include poor appetite, stomach pain, jaundice, nausea and fatigue (WHO, 2008). However, the majority of individuals who contract HBV infection are asymptomatic, some experience it as a short-term illness (acute HBV) while others develop a chronic infection that can lead to serious morbidity and death (Seto et al., 2018). Chronic hepatitis can cause liver cirrhosis and liver cancer which are costly and difficult to manage. These outcomes pose a serious economic burden on both the healthcare system and households of the diseased individuals (Seto et al., 2018).

Acute HBV has no specific treatment but is managed through fluid replacement and treatment of symptoms (Jindal et al., 2013). Chronic HBV on the other hand can be managed with Anti-Retro Viral drugs (ARVs) and the success of treatment is dependent on early diagnosis and presentation

to the hospital (Seto et al., 2018).

The major risk groups for HBV according to WHO includes health workers, People who inject drugs and share needles, men who have sex with men (MSM), migrants, minority and indigenous people, refugees and the incarcerated (WHO, 2017). Different countries also have additional priority populations such as female sex workers in Nigeria, fisher folks in Uganda, MSM in Europe, etc.(Falla et al., 2018; Forbi et al., 2008; Kitandwe et al., 2021a). WHO therefore recommends strengthening HBV surveillance to identify other populations at risk of HBV that can be targeted for HBV elimination (WHO, 2016).

The risk of chronic HBV infection is associated with several factors such as age at infection where about 90% of those who contract HBV in infancy develop chronic HBV infection while only 2-6% of those who get infected in adulthood develop chronic HBV (Indolfi et al., 2019). Certain groups such as PLHIV are among the groups at high risk of chronic HBV infection and it is a major cause of morbidity and mortality among this group (Rashti et al., 2020). PLHIV have a six times higher risk of developing chronic hepatitis after acute HBV infection than the general population (Rashti et al., 2020). It is therefore important that HBV prevention is emphasized among PLHIV and those at risk of HIV, as well as ensuring routine screening to facilitate early HBV detection to reduce the likelihood of chronic HBV and poor disease prognosis among PLHIV.

In 2016, the WHO adopted the first *Global health sector strategy on viral hepatitis, 2016-2020* (WHO, 2016), to eliminate HBV globally under the Sustainable Development Agenda 2030. WHO has continued to support different strategies in different countries such as raising awareness, promoting partnerships and mobilizing resources for HBV service provision (WHO, 2017). In addition, it has encouraged the development of evidence-based policy, increasing health equities within the hepatitis response, prevention of transmission and scale-up of screening, care and HBV treatment services. To develop and implement targeted strategies, there is a need for a robust HBV surveillance system that can detect new risk groups, assess population awareness and knowledge about HBV and identify opportunities to strengthen systems for HBV service provision.

## 1.2 BACKGROUND

In 2019, it was estimated that 30% of the world was infected with HBV and about 350 million of these were chronic cases causing approximately 1 million deaths per annum (WHO, 2021). Africa contributes about 25% of the global HBV burden, with approximately 81 million chronic carriers (Easterbrook et al., 2021, 2016). Uganda is among the countries with a high HBV burden in Africa with an average HBV prevalence of 10% and this burden varies geographically within the country with northern Uganda at a 17.6% prevalence of HBV (Ochola et al., 2013), 25% in the North East and as low as 4% in the South West ( Bwogi et al., 2009). The prevalence of HBV also varies among certain sub-populations such as health care workers at 8.1%, fisher folks at 7% and, pregnant women at 11.8% (Bayo et al., 2014; Kitandwe et al., 2021a; Ziraba et al., 2010a).

Both HIV and HBV are endemic in Uganda (Seremba et al., 2017), and they have similar routes of transmission, although HBV is more infectious than HIV (WHO, 2009). In HIV endemic areas like Uganda, the higher an individual's risk for contracting HIV, the higher their risk for HBV (Katusiime et al., 2016; Platt et al., 2020a). With this logic, therefore, the Most-At-Risk-Populations (MARPs) for HIV who consist of populations that are at a very high risk of contracting, transmitting and suffering from HIV are also at a very high risk of HBV infection.

The MARPs constitute those individuals who are disproportionately affected by HIV and are at a greater risk of contracting HIV due to their sexual behaviors, lifestyle choices, cultural norms, social settings, and other factors (Katusiime et al., 2016). These Individuals indulge in risky sexual behaviors such as transactional sex, cross-generational sex and other unconventional sexual behaviors. Their lifestyle involves injectable drug use, excessive alcohol consumption and other related behaviors that are also known to increase both the risk of contracting HIV and HBV (Katusiime et al., 2016).

In Uganda, the MARPs for HIV are divided into the Key Populations (KPs) who constitute (male and female sex workers, MSM, LGBTQI, people who inject drugs, transgender people and their sexual partners) and other priority populations such as uniformed forces, fisherfolks, truck drivers and Boda Boda riders (Katusiime et al., 2016).

A meta-analysis of data from European countries found that the highest HBV prevalence among



KPs was found among people in prisons (range of 0.3% - 25.2%) followed by People who inject drugs (PWID) (0.5% - 6.1%) and MSM (0.0% - 1.4%) (Falla et al., 2018). While another meta-analysis of the prevalence of HBV among injectable drug users and Female Sex Workers (FSW) found that the prevalence of HBV among PWID and FSWs with HIV was 8% and 2% respectively (Rashti et al., 2020). In Africa, studies have shown a high prevalence of HBV among the different categories of KPs. The overall HBV prevalence among the FSW was found to be 17.1% in Nigeria (Forbi et al., 2008), and 2.5% in Rwanda (Mutagoma et al., 2017). In Uganda, a study by (Thokerunga et al., 2020) in Lyantonde, found that the prevalence of HBV among commercial sex workers was 12.6% majority of whom were not aware of their status. Data pertaining the prevalence of HBV among MSM's in Uganda is however limited.

These KPs face inequities in health services provision due to their poor health-seeking behaviors, mobile nature and other barriers such as (discrimination and stigma) that are unique to them (Delany-Moretlwe et al., 2015). They also face legal and societal implications that may deter them from accessing general health care, for instance, transactional sex and homosexuality are considered criminal acts in Uganda (“Penal Code Act (Chapter 120) | Ulii,” 1950) and are shunned by the community. A sex worker/ MSM will therefore not openly disclose their sexual orientation and preferences in a hospital, limiting the health worker's knowledge about the client's level of risk towards HBV. The KPs, therefore, require special services such as MARP-friendly services, which are client-oriented to ensure equitable access to health care by these populations without discrimination (Easterbrook et al., 2016).

One of the largest HIV service providers for KP's in Uganda is a clinic owned by MARPI, a non-profit organization which is located at Mulago National Referral Hospital (MNRH) and serves KPs from all over the country. The unit houses the national STD reference clinic and conducts public health research among KPs. Among the services provided at the clinic include, HIV/STI/SRH services, HIV counseling, testing and treatment, PrEP, cervical cytology screening and proctology, behavioral change and risk reduction programs, HIV self-testing and gonococcal/antimicrobial resistance surveillance activities among others for MARPs.

In Uganda, HIV services have been extended to KPs through differentiated service delivery models such as home-based testing, drug deliveries, etc. to enhance their equitable access to HIV services

(Atuhaire et al., 2022). Despite these efforts, HBV services haven't been similarly extended to these populations as HIV services.

Uganda is among the WHO member states that acknowledged the World Health Organization (WHO) set strategies to eliminate HBV as a major global health threat by 2030 (Easterbrook et al., 2021). HBV vaccination for all infants after birth was initiated in 2002 (Bwogi et al., 2009; MOH, 2019) and a phased country-wide vaccination and screening program was also rolled out beginning with areas of high HBV prevalence such as Northern Uganda and the Busoga region (Hees et al., 2020). Despite the efforts, the national HBV programs do not include comprehensive public health approaches and neither do they put into consideration the KPs and their unique contexts. This causes inequities in health service provision and continued HBV spread within these populations. The challenge is that to demonstrate the need and ascertain the effectiveness of strategies developed for this population towards HBV control, there is a need for baseline epidemiological data for these population concerning HBV.

There is limited HBV-related data among KP's most especially the MSM's in Uganda (Katusiime et al., 2016). This information must be sought to promote the scale-up of HBV programs for these groups which consequently enables control of HBV in the population at large (Easterbrook et al., 2021). The knowledge, attitudes and practices should also be assessed to determine the gaps and requirements for awareness promotion and sensitization to ensure that these populations are aware of their risk of HBV infection, and the methods for prevention, screening, treatment and management of HBV.

## CHAPTER TWO

### 2.0 LITERATURE REVIEW

#### 2.1 HBV BURDEN AMONG MEN WHO HAVE SEX WITH MEN

MSM are at high risk of acquisition and transmission of sexually transmitted infections (STIs) including HBV infection (Yuan et al., 2019). They are part of the KPs that are disproportionately affected by HIV and exhibit some of the highest HIV prevalence among different subpopulations worldwide (Wanyenze et al., 2016). This group, therefore, faces a double burden in HBV and HIV endemic areas. MSMs are 2 to 4 times and 3 to 6 times more likely to be infected with HBV and HIV, respectively, as compared to the general adult population of reproductive age (Adeyemi et al., 2021). According to WHO and the ministry of health in Uganda, MSMs are among the populations at a very high risk of HBV (MOH, 2019; WHO, 2016).

Data concerning the prevalence of HBV among MSM in Africa varies from country to country. A study in Kenya reported a 17.4% HBV prevalence among Kenyan MSM. It highlighted the need for prioritization of HBV prevention services among this population. A study in West Africa, (Burkina Faso, Côte d'Ivoire, Mali, and Togo) demonstrated an overall HBV prevalence of 11.1% among MSMs. With Côte d'Ivoire having the highest prevalence of 17.3% (Dah et al., 2019). Another study in Nigeria found a 10% prevalence of HBV among MSMs which was higher than the national prevalence of 6% (Adeyemi et al., 2021). Similarly, another study in Lagos demonstrated a 10% HBV prevalence among the MSM in Lagos and 18% among MSM in Ibadan (Adebajo, 2014). Both studies however demonstrated a less than 5% vaccination uptake by the MSM which is insufficient in preventing active HBV infection.

In Uganda however, there is limited data about the prevalence of HBV among MSM. This is attributed to the nature of the population and their unique barriers to health. The Ugandan law criminalizes homosexuality and in 2023 the anti-Homosexuality Bill (AHB) was passed into law (Hama-Owamparo, 2023). According to this bill, those who commit the offence of homosexuality are liable to life imprisonment. The MSM, therefore, do not freely disclose their sexual preferences and orientation at hospitals. In addition, the HMIS tools used for HBV surveillance in Uganda, do not capture the information concerning the categories of KPs(MOH, 2010). It is therefore important that the HBV burden is characterized among MSMs in Uganda to contribute to epidemiological evidence required to target this population for HBV elimination.

## **2.2 KNOWLEDGE ABOUT HBV INFECTION AND PREVENTION AMONG MEN WHO HAVE SEX WITH MEN**

The Knowledge, Attitudes and Practices (KAP) studies are based on the KAP behavioral model which originated in the 1950s in the fields of family planning and population research (SPRING, 2014). They are commonly used to measure, enhance, establish a baseline and suggest intervention strategies concerning the knowledge, attitude, and practices towards specific themes.

These surveys can provide information that is representative of a specific population, concerning what is known, believed and done in the context of the topic of interest. (SPRING, 2014). It should ideally precede an awareness program or an intervention to provide useful insight into developing public health interventions. The typical questions to assess knowledge about a disease condition include knowledge about the causes, symptoms, transmission and prevention of the illness under investigation (Rajamoorthy et al., 2019).

A study by (Shimakawa et al., 2017), demonstrated that there is limited knowledge about HBV across Africa. The study involved anthropological research investigating local understandings of hepatitis B in sub-Saharan Africa in the Gambia, Côte d'Ivoire, Burkina Faso, Central African Republic and Madagascar. It highlighted communication challenges between healthcare workers and local populations, leading to less than 1% knowledge of hepatitis in the local contexts. A systematic review of knowledge gaps concerning STIs (including HBV) in Africa demonstrated that 53.8% of the participants knew what HBV was and only 42.5% of them knew that HBV was transmitted through sexual contact (Badawi et al., 2019). A study in the USA reported that 32% of MSM had no information about hepatitis and the findings suggested that MSM lacked information about HBV risk and vaccination, and are engaging in behaviors that put them at risk for HBV infection (Rhodes Scott D et al., 2000).

A study in Kenya among KPs (including the MSM, FSW, PWID and truck drivers) in the northern transport corridor in Kenya demonstrated that only 43.2% of the participants knew about HBV, 22.8% considered HBV to be more serious than HIV. In addition, only 20.9% of the participants knew about the HBV vaccine (Mwangi et al., 2022).

In Uganda, there is limited data on the knowledge of HBV among MSMs. However, studies

demonstrate limited HBV knowledge in the general population. A qualitative study in southwestern Uganda by (Mugisha et al., 2019) demonstrated that there is no specific word for HBV infection in local languages with limited knowledge regarding the cause, mode of transmission, and treatment of HBV. In this study, several health workers were not aware that HBV is sexually transmitted. This, therefore, raises concern and demonstrates the need to determine the knowledge of HBV infection and prevention among the MSM in Uganda.

### **2.3 ATTITUDES TOWARDS HBV INFECTION AND PREVENTION AMONG MEN WHO HAVE SEX WITH MEN**

Attitude has been defined as “a learned predisposition to think, feel and act in a particular way towards a given object or class of objects”. Attitudes vary from individual to individual and are molded by complex interactions of one's practices, values, environment and feelings throughout their lifetime (ul Haq et al., 2012).

There is limited evidence about the attitudes of MSM towards HBV infection and prevention in Africa and globally, much of the existing literature is focused on the effect of their attitudes towards HBV vaccination. A qualitative study assessing the awareness and attitudes of MSM towards STIs in England demonstrated that the MSM ranked HBV as one of the scariest infections among other STIs (Datta et al., 2019). Another study among gay men in the Netherlands demonstrated that the respondents had an above-average attitude towards HBV vaccination, they considered HBV to be severe but they thought their chances of contracting HBV weren't very high (Schutten et al., 2002).

In Uganda, the attitudes of MSMs toward HBV infection and prevention haven't extensively been studied. However, in the general population, a study in Wakiso demonstrated that 41.8% of the primary health care workers had a negative attitude and this was positively associated with their level of knowledge (Ssekamatte et al., 2021a). Another study in Sironko district demonstrated that 47% of the participants mentioned the reason for non-vaccination was fear of side effects (Kikoso and Kalungi, 2022). There is a need to determine the attitude of MSM towards HBV infection and prevention in Uganda since this information is crucial in informing the development of behavioral change interventions and uptake of HBV services.

## **2.4 PRACTICES TOWARD HBV INFECTION AND PREVENTION AMONG MSM**

Practices in KAP surveys usually yield information on people's behaviors or on what they know should be done for example in the use of preventive measures or different health care options. HBV prevention practices include vaccination, routine HBV screening, obtaining full HBV vaccination dosage, Condom use, use of post-exposure prophylaxis, screening of sexual partners for HBV, practicing safe sexual intercourse, etc. (Vittal and Ghany, 2019).

A study in the USA among MSM demonstrated that Anal-genital intercourse, oral-anal intercourse, and rectal douching were significantly related to evidence of HBV infection (Schreeder et al., 1982). Another study in the USA, demonstrated that 9% of the MSM had been immunized against hepatitis B, 73% reported that they did not know of the HBV vaccine, and out of the 36% who were identified as high risk, 3% reported ever having injected drugs and 6% reported ever sharing needles (MacKellar et al., 2001). This study demonstrated low immunization against MSM in USA as well as their indulgence in practices such as sharing needles that could expose them to HBV.

In Kenya, a study among KPs that included the MSM demonstrated that only 4.6% of the participants had ever been tested for HBV, 11.3% were vaccinated and 58.8% of the vaccinated completed the 3 doses (Mwangi et al., 2022). Similar studies ought to be conducted in Uganda to determine the practices of MSM towards HBV infection and prevention.

In Uganda, among the general population, a study in Wakiso demonstrated that 41.5% of the primary health workers exhibited poor HBV prevention practices.

## CHAPTER 3

### 3.1 PROBLEM STATEMENT

The MSM are 2 to 4 times and 3 to 6 times more likely to be infected with HBV and HIV, respectively, as compared to the general adult population of reproductive age (Adeyemi et al., 2021). This is due to their high-risk behaviors such as drug abuse, alcohol abuse and risky sexual behaviors which expose them to HBV (Musinguzi et al., 2015; Tumwesigye et al., 2012; Wanyenze et al., 2016). In Uganda, despite WHO's recommendations and being highlighted as a high risk group for HBV in the MOH guidelines, there is limited data concerning the HBV prevalence, knowledge, attitudes and practices towards HBV infection and prevention among MSM (MOH, 2019; WHO, 2016). This, therefore, limits the availability of evidence required to advocate for and prioritize equitable HBV services for this population.

In addition, MSMs experience unique barriers to health care services such as discrimination, legal implications and stigma related to their lifestyle choices and sexual behaviors or orientation. They often shy away from health facilities and require specific MARP-friendly services (Wanyenze et al., 2016). Consequently, only a small percentage of MSM's with Hepatitis B either know their serostatus or can access the treatment, care and support they need (Katusiime et al., 2016). To control Hepatitis B infection in Uganda, sensitization of the masses, vaccination, screening and treatment services should be equitably availed to the entire population including the KPs who contribute significantly to the overall HBV burden in Uganda. This requires evidence on the knowledge, attitudes and practices towards HBV infection and prevention to ensure targeted and effective interventions are put in place for the different populations.

This study, therefore, seeks to estimate the prevalence of HBV among MSM, and determine their knowledge, attitudes and practices toward HBV infection and prevention. The findings would generate evidence to demonstrate the need for prioritization of HBV services for this population, advocate for awareness creation and health education for this population as well as support the development of guidelines and policies that support HBV service integration into existing services.

### **3.2 JUSTIFICATION**

Hepatitis B is responsible for significant morbidity and mortality in Uganda (Bwogi et al., 2009). Despite the efforts toward controlling the spread of hepatitis B infection such as vaccination of all newborn children, the HBV burden is still a menace in Uganda (MOH, 2019; Ochola et al., 2013). There is a need for equitable health service delivery and extension of health services to reach underserved populations in addition to targeted strategies to effectively utilize the available limited health resources in Uganda. Epidemiological data concerning the prevalence of HBV among the KPs for HIV is required to express the magnitude and urgency to concentrate efforts on this group. In addition, it is necessary to determine the level of knowledge and awareness of HBV among this group to provide baseline information, highlight gaps in knowledge and awareness of HBV, and hindrances to HBV elimination in this group. It enables identification of the need for awareness creation activities and health education since this is known to promote health-seeking behaviors and utilization of health services by individuals.

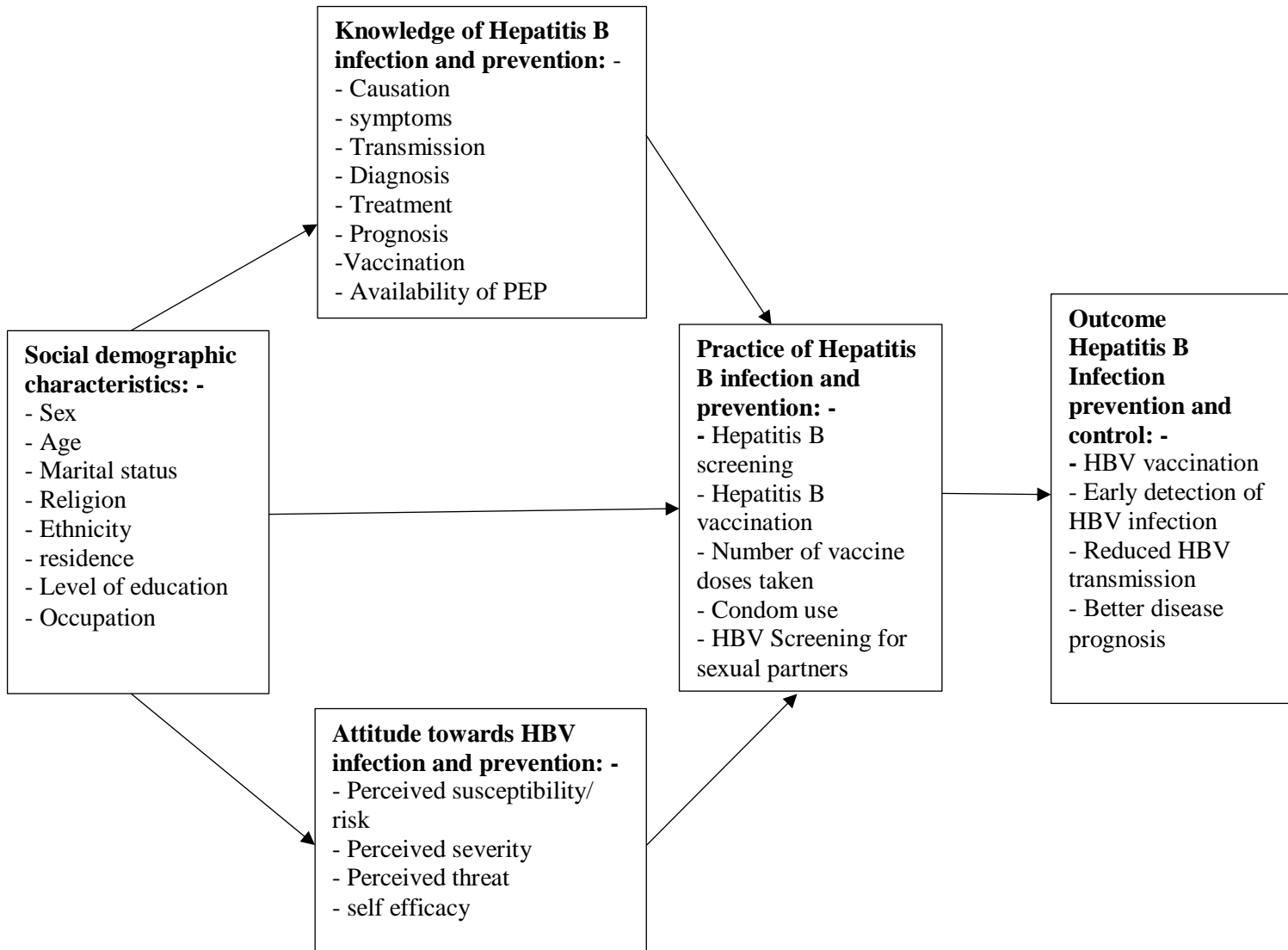
The findings of this study would therefore support HBV programming and policy development for KPs such as MSMs in Uganda. This would enable the institution of programs that support early identification of HBV cases, early treatment before the disease progresses to severe forms and health education and awareness promotion. It would provide evidence for the need for HBV guidelines for KPs for HIV. These efforts will significantly reduce the HBV burden among this group, reduce its transmission and consequently contribute to the reduction of Uganda's overall HBV burden.



### **3.3 CONCEPTUAL FRAMEWORK**

The conceptual framework was adopted for this study based on the KAP-O (Knowledge, Attitude, Practices and Outcome framework), (Rav-Marathe and Wan, 2016; SPRING, 2014). The KAP-O framework states that there is an interactional relationship between the knowledge, attitude, practices and outcomes of disease prevention. It postulates that if knowledge is improved for example through educational interventions, the attitude towards prevention can improve and this is translated into good practices of disease prevention and ultimately lead to improved outcomes. For this study, therefore, the conceptual framework demonstrates that MSM knowledge concerning HBV infection and prevention (cause, transmission, symptoms, diagnosis, treatment and vaccination) and attitudes (perceived susceptibility, severity and threat) towards HBV infection and prevention, interact with their socio-demographic characteristics including health education, to influence their practices (HBV, vaccination, vaccination dosage, post-vaccination testing, condom use, testing of their partners) of HBV infection prevention. This interaction ultimately culminates in desirable HBV infection prevention outcomes which is beyond the scope of this study. Guided by existing literature (Kikoso and Kalungi, 2022; MOH, 2019; Mugisha et al., 2019; Schreeder et al., 1982; Schutten et al., 2002), the socio-demographic characteristics considered in the study include sex, age, marital status, religion, ethnicity, residence, and participant's level of education. The conceptual framework also recognizes that knowledge of hepatitis infection prevention can influence attitudes towards HBV infection and prevention.

**fig 1: Conceptual framework describing the relationship between knowledge, attitudes and practices towards HBV infection and prevention among MSMs in Uganda (Rav-Marathe and Wan, 2016)**



## **CHAPTER FOUR**

### **4.0 RESEARCH OBJECTIVES**

#### **4.1 GENERAL OBJECTIVE**

The main objective was to estimate the prevalence of HBV and determine the knowledge, attitudes and practices toward HBV infection and prevention among MSM attending the MARPI clinic to generate evidence and demonstrate the need for prioritization of HBV services for this population, advocate for awareness creation and health education as well as support the development of guidelines and policies that support HBV service integration into existing services.

#### **4.2 SPECIFIC OBJECTIVES**

- i) To estimate the prevalence of HBV among MSM attending the MARPI clinic
- ii) To determine the knowledge about HBV infection and prevention among MSM attending the MARPI clinic
- iii) To determine the attitudes toward HBV infection and prevention among MSM attending the MARPI clinic
- iv) To determine the practices toward HBV infection and prevention among MSM attending the MARPI clinic
- v) To determine the association between the predictors and levels of knowledge, attitudes and practices towards HBV infection and prevention among MSM attending the MARPI clinic

#### **4.3 RESEARCH QUESTIONS**

- i) What is the prevalence of HBV among MSM attending the MARPI clinic?
- ii) What is the knowledge about HBV infection and prevention among MSM attending the MARPI clinic?
- iii) What are the attitudes towards HBV infection and prevention among MSM attending the MARPI clinic?
- iv) What are the practices towards HBV infection and prevention among MSM attending the MARPI clinic?
- v) What is the association between the predictors and levels of knowledge, attitudes and practices towards HBV infection and prevention among MSM attending the MARPI clinic?

## CHAPTER FIVE

### 5.0 METHODOLOGY

#### 5.1 STUDY SETTING/AREA

MARPI is a Ugandan non-profit organization that promotes health, protects SRH rights and provides HIV/STI/SRH services including culturally sensitive HIV counseling and testing, HIV treatment, PrEP, cervical cytology screening and proctology, behavioral change and risk reduction programs, HIV self-testing and gonococcal antimicrobial resistance surveillance activities among others for MARPs and vulnerable populations for HIV in Uganda. It is affiliated with the MOH and is located at MNRH. The organization is Uganda's largest provider of HIV services for KPs and its clients come from all the regions across the country.

MNRH was founded in 1913 and is among the 5 national referral hospitals in Uganda. It is located in Kawempe north division in Kampala city, Uganda (<https://mulagohospital.go.ug/>). It serves as the main national referral hospital for the entire country and a teaching hospital for the Makerere College of Health Sciences (<https://www.health.go.ug/sermon/mulago-national-referral-hospital>).

#### 5.2 STUDY DESIGN

The study employed a cross-sectional study design to obtain quantitative data about the HBV prevalence, knowledge, attitude and practices about HBV among MSM attending the MARPI clinic in Uganda. The cross-sectional study was appropriate for determining the prevalence as well as knowledge, attitude and practices about HBV among the KPs at the same point in time (Kesmodel, 2018; Wang and Cheng, 2020).

#### 5.3 STUDY POPULATION

Only MSM aged 18 years and above that visited the MARPI clinic were considered among other KPs. The STD/STI clinic at MARPI serves an estimated 400,000 individuals who are part of the MARPs. Their categories at MARPs include KPs (FSW, PWID, the LGBTQI community, MSM and incarcerated individuals) and priority populations (fisher folk, serodiscordant couples, armed forces, truck drivers, and uniformed forces among others). The clinic serves approximately 600 MSMs with about 200 who live with HIV and obtain ART and HIV care services from the clinic. The MARPI clients come from all over Uganda due to the clinic's MARP-friendly nature and specific services such as proctology that are unique to this population.

## **5.4 INCLUSION CRITERIA & EXCLUSION CRITERIA**

### **5.4.1 INCLUSION CRITERIA**

All MSM above the age of 18 who visited the MARPI clinic and consented to be part of the study were included in the study.

### **5.4.2 EXCLUSION CRITERIA**

MSM who are eligible but chose not to provide consent were not included and those who fit the inclusion criterion and cannot talk were excluded from the study.

## **5.5 SAMPLE SIZE CALCULATION**

The sample size was calculated using the Kish Leslie formula for cross-sectional studies (Kish, 1965). However, since there is limited evidence on the prevalence of HBV among MSM in Uganda, the current HBV prevalence among KPs in Uganda is unknown, therefore a 50% prevalence was used to calculate the sample size. At a 95% level of confidence, a margin of error of 0.05 was used to determine the sample size.

$$N = \frac{z^2 pq}{e^2}$$

Where; -

N= sample size

Z= standard deviation at 95% Confidence interval, z=1.96

p= HBV prevalence among MSMs in Uganda

e= margin of error

$$q = (1 - p)$$

Therefore

$$N = \frac{1.96^2 0.5 \times 0.5}{0.05 \times 0.05}$$

$$N = 384.16$$

$$N = 385$$

With a non-response rate of 10% from similar studies, the adjusted sample size was

$$N = 423 \text{ participants.}$$

## **5.6 SAMPLING PROCEDURE**

This study only focused on MSM who accessed MARPI clinic and employed systematic random sampling to select participants continuously until the minimum sample size was reached. Given that MARPI clinic has about 600 MSM's that actively visit the clinic and 423 participants are required to participate in the study, the predetermined sampling interval (k) was determined as

$$k = \frac{600}{423}$$

$k = 1.4$

$k$  is approximately 1, therefore every consecutive MSM who visited the MARPI clinic was sampled.

Since every other person was sampled using simple random sampling, a coin was tossed between the first two MSM to select the first participant. Having obtained the first participant, every other MSM was thereafter sampled until the required sample size was reached for the study. In the event that a participant refused to be part of the study, they were skipped and sampling continued until the required sample size was reached.

Upon consent, each client that is sampled was given a serially generated unique identifier (e.g. SSS-001) that was used on the subsequent questionnaire and laboratory request forms to ensure confidentiality.

## **5.7 STUDY VARIABLES**

### **5.7.1 INDEPENDENT VARIABLES**

The independent variables include individual characteristics and demographic information such as: -

- Age in years which was measured by asking participants their date of birth, then computing their age from date of birth to date of data collection.
- Sex as assigned at birth, either male or female.
- Gender, defined by the participants as how they identify (either female, male, others, or prefer not to say)
- Tribe
- The highest level of education attained by the time of data collection. It can be either primary, secondary, tertiary or no formal education
- Marital status, described as single, married, divorced, widowed, or others
- Religion

- Occupation, current job/ occupation where the participant gets their livelihood
- HIV status is defined as the result of the last HIV test that the participant took, described as either positive or negative
- HBV vaccination status, regardless of the number of doses, was described as vaccinated or not vaccinated
- Sexual orientation, described as either homosexual, bisexual, others (queer, indeterminate, asexual), or prefer not to say
- Number of sexual partners in the last 12 months
- Condom use was described as the use of condoms in the last sexual encounter

### **5.7.2 DEPENDENT VARIABLES**

All the dependent variables in this study were binary.

The dependent variables included: -

1. The proportion of participants with HBV which was confirmed by HBsAg testing participants were either HBV infected or not.
2. The knowledge, attitudes and practices about HBV infection and prevention.

A scoring system was generated where participants were given a score for each correct answer provided. A correct response would therefore equate to one point. The total sum of points out of total number of questions answered per section (knowledge, attitudes and practices) was then calculated for each participant.

The median was used to determine the cut off point for each section. An individual having a score equal to or more than 13 out of the 19 Knowledge questions was considered to have good knowledge while those below the cut off had poor knowledge. A score equal to 7 or more out of the 10 questions in the attitude section was considered as good attitude while those below the cut off were considered to have poor attitude. For the section of practices, if one answered 3 or more of the questions right, they were categorized under safe practices while those below the median score, were categorized under un-safe practices. The proportions under each KAP category were then calculated.

### **5.8 DATA COLLECTION**

### 5.8.1 DATA COLLECTION TOOLS

A questionnaire was developed using questions adopted from standardized questionnaires in previously published and peer-reviewed studies (Gebrecherkos et al., 2020; Roien et al., 2020; Ssekamatte et al., 2021a). The adopted questionnaire were reviewed by experts at Makerere University School of Public Health and all study tools were translated into Luganda (the commonest local language in central Uganda), Kiswahili (the second national language) and Runyankole (also widely spoken in the central region (Eberhard et al., 2023)).

Before use, the questionnaire was pretested among 30 MSM who were not included in the study to assess their understanding, acceptability and validity of the tools (Perneger et al., 2015). The questionnaire was then adjusted accordingly for use in this study.

The questionnaire consists of five sections namely sections A, B, C, D and E: -

**Section A** assessed the participant's demographic data including;

Age, gender, ethnicity or tribe, the highest level of education, marital status, religion, occupation, HIV status, HBV vaccination status, sexual orientation, number of sexual partners and condom use. The list of characteristics that were considered were obtained from the (Uganda demographic health survey) UDHS 2016, and other relevant literature (Adeyemi et al., 2021, Kikoso and Kalungi, 2022; MOH, 2019; Mugisha et al., 2019; Schreeder et al., 1982; Schutten et al., 2002).

**Section B** consisted of 19 questions assessing the participant's knowledge about HBV infection and prevention. The main purpose of these questions was to measure the basic knowledge about HBV causation, symptoms, transmission, diagnosis, treatment, prognosis, vaccination and PEP. The questions were adopted from similar studies by (Gebrecherkos et al., 2020; Ssekamatte et al., 2021a)

**Section C** consisted of 10 questions assessing the participant's attitudes towards HBV infection and prevention. These questions measured whether the participants had the right attitude toward HBV infection and its prevention or not.

**Section D** consisted of 8 questions assessing the participant's practices toward HBV infection and prevention. The questions regarding the practice section aimed to measure whether the participants had ever received the HBV vaccine, have been screened for HBV, or used condoms during sexual intercourse. The response set of practice questions was set as "yes" if a participant reported that she performed the practice and "no" if she did not.

**Section E** was used by the laboratory personnel to capture the HBV test details such as the date of sample collection, date of sample processing, the name of the test kit used, its serial number, expiry date, name



of personnel who conducted the test and patient results.

### **5.8.2 DATA COLLECTION PROCEDURE**

Data collection was led by trained research assistants at MARPI. The counselors at MARPI served as a link to introduce the MSMs to research assistants in order to ensure their participation and allay any fears of confidentiality. Following informed consent to respond to the study questionnaire and sample collection (see appendix I), the participants were then subjected to the questionnaire by the research assistants.

Upon completion of the questionnaire, the participants were sent to the laboratory with their consent forms for sample collection and analysis.

### **5.8.3 SAMPLE COLLECTION AND ANALYSIS**

At the laboratory, only participants with fully filled consent forms and questionnaires were subjected to HBV testing. Whole blood was collected aseptically into two 5ml Plasma Preparation Tubes (PPT) - BD white top with EDTA, one for HBV testing and the other processed for further analysis in the event that the test was positive and participant had agreed to go for treatment. The second sample was only collected if consent for further analysis was provided. The samples were then accessioned and labeled using the participant's unique identifier (SSS-001).

The two samples were centrifuged at room temperature to obtain plasma which was then transferred into 5ml cryovials. One sample was subjected to HBV testing using the SD Bio line HBsAg Rapid Diagnostic Test (RDT) that is recommended for use in Uganda and the manufacturer's instructions were followed to determine whether the participant has an HBV infection or not. The results were then recorded in the HMIS register and at the back of the questionnaire in Section E. The results were also disseminated back to the requesting clinician, where negative participants were informed about HBV preventive measures and positive participants were referred and managed according to the clinical guidelines for HBV treatment and management in Uganda (MOH, 2019).

## **5.9 QUALITY ASSURANCE AND CONTROL**

### **5.9.1 TRAINING OF RESEARCH ASSISTANTS**

The research assistants used in this study were social workers with previous research experience. Before data collection, all research assistants received training on the study protocol and data collection tool to ensure standardization of the data collection process. They were also required to participate in a good

clinical practice course to ensure that they abide by research and ethical requirements for conducting research.

The microbiology laboratory at MNRH is SANAS (South African National Accreditation Scheme) accredited. This gave assurance that the procedures to be used for HBV testing were up to standard and that the laboratory personnel used were fully competent to carry out Hepatitis B testing.

### **5.9.2 PRETESTING**

The questionnaires were adopted and modified through extensive literature review and consideration of other studies of similar nature. Before use, the questionnaire was reviewed and pretested to assess its validity.

### **5.9.3 MISSING DATA**

Following data collection, the questionnaires were thoroughly checked by the research assistant for completeness before the participant left.

Data entry into both excel and KOBO collect was also done immediately by different data entrants to avoid missing data.

## **5.10 DATA MANAGEMENT AND ANALYSIS**

### **5.10.1 DATA MANAGEMENT**

Data was collected using hardcopy questionnaires and participants with incomplete questionnaires or data were excluded from the study. Two data entrants were used to transfer the data to KOBO tool and Excel, after which they were compared to determine any discrepancies and assess the quality/ accuracy of data entry. All data that was entered into KOBO collect app or Excel was subsequently backed up to avoid any loss of data.

To ensure confidentiality, the data was entered into Microsoft Excel and KOBO using the participant unique identifiers for each participant. Data was then exported into STATA 14.0 for analysis after data cleaning and validation was done.

### **5.10.2 DATA ANALYSIS**

Data analysis was conducted using STATA 14.0.

#### **Demographic data**

For each independent variable, data was analyzed descriptively and summarized using frequencies, and percentages that were presented in a table. For the categorical variables, the data was expressed in percentages while for continuous data such as “age”, the mean and standard deviation (SD) were determined.

### **HBV prevalence**

The overall prevalence of HBV among the participants was determined as the proportion of the participants that tested positive for HBV infection out of all the participants subjected to the HBV test during the study. It was summarized using percentages.

Furthermore, the proportions of those tested positive for HBV under each category for the independent variable was analyzed and tabulated.

### **Knowledge, attitudes and practices towards HBV infection and prevention**

To analyze data for sections (B, C and D) in STATA, we used a nominal scale, and the variables were ranked as follows:

Depending on how the questions were formulated, “yes” was sometimes the right answer, and sometimes the wrong one. Therefore, each response to a question was relabeled according to the correctness of the answer, such that the right answer is labeled (1) and the wrong answer (0).

For the sections concerning knowledge, attitudes and practice, a scoring system was generated, and participants were given a score on each correct answer provided. For each correct response to a question, the participant received one point. Therefore, if one answered all the knowledge questions correctly they would score 19 out of 19, all the attitude questions correctly 10 out of 10 and all the practices questions correctly 8 out of 8. For each section, the median was determined and used as the cut-off point. The participants with scores above the median in each section would be considered to have good knowledge, good attitude and safe practices and their counterparts with scores below the median were categorized as poor knowledge, poor attitudes and unsafe practices respectively. The proportion of participants in each category was then determined.

To further determine the association between the predictors which are the independent variables in our study (age, sex, sexual orientation, etc.) and our outcome variables (KAP), the study employed a modified Poisson regression analysis to determine the prevalence ratios and their respective 95% confidence intervals given the cross-sectional study design.

Having summarized descriptively each independent variable, using their frequencies and percentages, to

determine the association between the independent factors and each outcome, bivariate analysis was done and all factors with a P-value less than 0.25 ( $p < 0.25$ ) in addition to considering biological and theoretical plausibility were considered for multivariate analysis.

The explanatory variables were then tested for multicollinearity and those with a correlation coefficient  $r > 0.4$  were excluded. A stepwise elimination method with exclusion criteria of  $p > 0.05$  to obtain variables for the final model was conducted and variables tested for possible pairs of interaction and confounding. The final model was then assessed for its goodness of fit using the Pearson goodness of fit test in STATA yielding a  $p > 0.05$ , therefore failing to reject the null hypothesis and concluded that our count data followed the Poisson distribution and that the variables used perform well at estimating the outcome variables.

Crude Prevalence Ratios (CPR) and their corresponding 95% confidence intervals were used as a measure of risk. An analytic table showing the association between the predictor variables and each outcome variable was used to display the findings.

The Adjusted Prevalence Ratios (APR) were then interpreted for each variable in the final model while controlling for confounding and interaction to demonstrate the factors significantly associated with the KAP towards HBV infection and prevention. Considering a 95% CI, a  $p\text{-value} \leq 0.05$  was considered to be statistically significant in this study.

## **5.11 ETHICAL CONSIDERATIONS**

The study sought ethical approval from Makerere University School of Public Health (MakSPH) and MARPI.

All patient information was kept confidential and only accessible to study investigators.

Every participant was provided informed consent and where consent was not given, the participant was not included in the study. Additionally, participants were also at liberty to withdraw or refuse to participate at any point of the study.

## CHAPTER SIX

### 6.0 RESULTS

#### 6.1 STUDY PARTICIPANTS

Between March 2023 to June 2023 at MARPI clinic, 413 MSMs were randomly selected to participate in this study following the eligibility criteria. Of the selected MSMs, 21 declined to participate in the study. Of the 392 that consented to participate, 4 refused to have their sample collected out of fear of needle pricks and 3 could not complete the questionnaire. 385 MSMs were therefore, considered for the study with complete questionnaires and a HBsAg test done.

#### 6.2 PARTICIPANT CHARACTERISTICS

Out of the total of 385 participants that were enrolled in the study, the mean age of participants was 25.4 (SD± 6.1) years and median age of 24 (21-28) years. In regards to sex, all participants were males, 384 (99.7%) with the exception of one participant who was female but identifies as male (0.3%). In terms of gender, majority of the participants 365 (94.8%) identified as males and 18 (4.7%) identified as female. More than a half of the participants 212 (55.1%) were aged 18-24 years, 330 (85.7%) were not married and 242 (62.9%) were Christians. Majority of the participants 285 (74.0%) had attained a secondary education level, 261 (68.8%) were of the Baganda tribe, 46 (12.0%) were Bankyankole, 235 (61.0%) were employed while 320 (83.1) were HIV sero-negative. Majority of the participant self-reported to be homosexuals 298 (77.4%) and only about 39 (10.1%) were vaccinated against hepatitis B virus. The general description of all participants is summarized in Table 1a and table 1b.

**Table 1a: Characteristics of respondents**

<b>Variable</b>	<b>Frequencies</b>	<b>Percent (%)</b>
<b>Age (Age in years)</b>	Mean (SD) 25.4 (6.1)	Median (IQR) 24 (21, 28)
18-24	212	55.1
25-39	159	41.3
40 & above	14	3.6
<b>Sex</b>		
Female	1	0.3
Male	384	99.7
<b>Gender</b>		
Female	18	4.7
Male	365	94.8
Others	1	0.3
Prefer not to say	1	0.3
<b>Ethnicity/Tribe</b>		
Muganda	261	67.8
Munyankole	46	12.0
Munyarwanda	21	5.5
Musoga	10	2.6
Mutoro	13	3.4
Mugisu	6	1.6
Mukiga	6	1.6
Luo	13	3.4
Others	9	2.3
<b>Education level</b>		
No formal education	14	3.6
Primary	48	12.5
Secondary	285	74.0
Tertiary	38	9.9
<b>Residence</b>		
Rural	4	1.0
Urban	381	99.0
<b>Religion</b>		
Muslims	143	37.1
Christians	242	62.9
<b>Marital Status</b>		
Married	55	14.3
Not married	330	85.7
<b>Occupation</b>		
Student	67	17.4
Unemployed	83	21.6
Employed	235	61.0

**Table 1b: Characteristics of respondents**

<b>Variable</b>	<b>Frequencies</b>	<b>Percent (%)</b>
<b><i>HIV status</i></b>		
<i>Negative</i>	320	83.1
<i>Positive</i>	45	11.7
<i>Unknown</i>	20	5.2
<b><i>Sexual orientation</i></b>		
<i>Bi Sexual</i>	62	16.1
<i>Homo-sexual</i>	298	77.4
<i>Others</i>	25	6.5
<b><i>Number of sexual partners in the last 12 months</i></b>		
<i>None</i>	10	2.6
<i>One</i>	109	28.3
<i>More than one</i>	266	69.1
<b><i>Condom less anal sex</i></b>		
<i>No</i>	96	24.9
<i>Yes</i>	289	75.1
<b><i>Injectable drugs</i></b>		
<i>No</i>	368	95.6
<i>Yes</i>	17	4.4
<b><i>Ever been Vaccinated against HBV</i></b>		
<i>No</i>	346	89.9
<i>Yes</i>	39	10.1

### 6.3 PREVALENCE OF HBV

Out of the 385 participants, 12 (3.1%) tested positive for HBV infection as shown in Table 2a below. According to education status, the proportion of HBV infection was higher among those who had achieved a tertiary level of education 4 (10.5%), followed by secondary level 7 (2.5%), primary level 1 (2.1%) and no formal education 0 (0%). This difference was statistically significant,  $p=0.047$ . The prevalence of HBV infection was significantly ( $p=0.05$ ) lower 8 (2.5%) among HIV negative as compared to among HIV positive 4 (8.9%) MSM and 0 (0%) among the unknown HIV status. All the MSM diagnosed with HBV were among those who have condom-less anal sex 12 (4.2%) and this difference was statistically significant,  $p=0.043$ .

The proportion of HBV infection was 3 (17.7%) among those who use injectable drugs compared to who don't use 9 (2.5%). This difference was statistically significant,  $p<0.001$ . Table 2a and 2b show the summary of prevalence of HBV among the study respondents in relation to their characteristics.

**Table 2a: Prevalence of HBV among MSM attending the MARPI clinic**

Variable	HBV among MSM		P- value	Confidence intervals (95% CI)
	Negative n (%)	Positive n (%)		
	373 (96.9)	12 (3.1)		
<b>Age (Age in years)</b>				
18-24	207 (97.6)	5 (2.4)	0.501	(0.010-0.557)
25-39	153 (96.2)	6 (3.8)		(0.017-0.818)
40 & above	13 (92.9)	1 (7.1)		(0.009- 0.390)
<b>Sex</b>				
Female	1 (100.0)	0 (0.0)	0.857	(0.018-0.054)
Male	372 (96.9)	12 (3.1)		
<b>Gender</b>				
Female	18 (100.0)	0 (0.0)	0.878	(0.019- 0.057)
Male	353 (96.7)	12 (3.3)		
Others	1 (100.0)	0 (0.0)		
Prefer not to say	1 (100.0)	0 (0.0)		
<b>Education level</b>				
No formal education	14 (100.0)	0 (0.0)	<b>0.047</b>	(0.039-0.252)
Primary	47 (97.9)	1 (2.1)		
Secondary	278 (97.5)	7 (2.5)		
Tertiary	34 (89.5)	4 (10.5)		



**Table 2b: Prevalence of HBV among MSM attending the MARPI clinic**

<i>Variable</i>	<i>HBV among MSM</i>		<i>P-value</i>	<i>95% Confidence intervals</i>
	<i>Negative n (%)</i>	<i>Positive n (%)</i>		
	373 (96.9)	12 (3.1)		
<b><i>Occupation</i></b>				
<i>Student</i>	67 (100.0)	0 (0.0)		
<i>Unemployed</i>	81 (97.6)	2 (2.4)		(0.006-0.092)
<i>Employed</i>	225 (95.7)	10 (4.3)	0.192	(0.023-0.078)
<b><i>HIV status</i></b>				
<i>Negative</i>	312 (97.5)	8 (2.5)		(0.013- 0.049)
<i>Positive</i>	41 (91.1)	4 (8.9)	<b>0.05</b>	(0.033-0.216)
<i>Unknown</i>	20 (100.0)	0 (0.0)		
<b><i>Sexual orientation</i></b>				
<i>Bi Sexual</i>	60 (96.8)	2 (3.2)		(0.008-0.122)
<i>Homo-sexual</i>	289 (97.0)	9 (3.0)		(0.016-0.057)
<i>Others</i>	24 (96.0)	1 (4.0)	0.963	(0.005-0.244)
<b><i>Condom less anal sex</i></b>				
<i>No</i>	96 (100.0)	0 (0.0)		
<i>Yes</i>	277 (95.9)	12 (4.2)	<b>0.043</b>	(0.024-0.071)
<b><i>Injectable drugs</i></b>				
<i>No</i>	359 (97.6)	9 (2.5)		(0.013-0.046)
<i>Yes</i>	14 (82.4)	3 (17.7)	<b>&lt;0.001</b>	(0.056-0.438)
<b><i>Ever been Vaccinated against HBV</i></b>				
<i>No</i>	336 (97.1)	10 (2.9)		(0.015-0.053)
<i>Yes</i>	37 (94.9)	2 (5.1)	0.446	(0.013-0.187).
<b><i>Number of sexual partners in the last 12 months</i></b>				
<i>None</i>	10 (100)	0 (0.0)		
<i>One</i>	102 (93.6)	7 (6.4)		(0.031-0.129)
<i>More than one</i>	261 (98.1)	5 (1.9)		(0.008-0.044)
<b><i>Residence</i></b>				
<i>Rural</i>	4 (100.0)	0 (0.0)		
<i>Urban</i>	369 (96.9)	12 (3.2)	0.718	(0.018-0.055)
<b><i>Religion</i></b>				
<i>Muslims</i>	137 (95.8)	6 (4.2)		(0.019-0.091)
<i>Christians</i>	236 (97.5)	6 (2.5)	0.349	(0.011-0.054)
<b><i>Marital Status</i></b>				
<i>Married</i>	53 (96.4)	2(3.6)		(0.009-0.136)
<i>Not married</i>	320 (96.9)	10(3.0)	0.811	(0.016-0.056)

## 6.4 KNOWLEDGE ABOUT HBV INFECTION AND PREVENTION

The study revealed that 60.5% of the respondents had good knowledge regarding HBV infection and prevention. Majority of the participants (83.6%) reported that they had ever heard about HBV and 54.8% were aware that HBV affects the liver. The majority (85.2%) also stated that death was a possible outcome of HBV infection, and (71.2%) believed that HBV can be transmitted through contact with body fluids like blood and semen. However, 52.2% of the participants thought that HBV cannot cause liver cancer, and almost half of the participants (49.6%) thought that all those with HBV infection show symptoms. Only 7.5% were knowledgeable about PEP for HBV although majority of the participants (88.8%) reported that vaccination is an important protective measure. Status of knowledge among the respondents was summarized in Table 3.

**Table 3: Knowledge about HBV among MSM attending the MARPI clinic**

	<i>Knowledge level</i>	<i>Frequency</i>	<i>Percent (%)</i>
	<i>Poor knowledge</i>	152	39.5
	<i>Good knowledge</i>	233	<b>60.5</b>
<b>Questions assessing knowledge level</b>			
	<b>Yes (%)</b>	<b>No (%)</b>	
<i>Have you ever heard about HBV?</i>	322 (83.6)	63 (16.4)	
<i>Does HBV affect the liver?</i>	211 (54.8)	174 (45.2)	
<i>Does HBV cause liver cancer?</i>	184 (47.8)	201 (52.2)	
<i>Do all those with HBV infection show symptoms?</i>	191 (49.6)	194 (50.4)	
<i>Are nausea, vomiting, and loss of appetite common symptoms of hepatitis B?</i>	161 (41.8)	224 (58.2)	
<i>Can HBV be transmitted through sexual intercourse?</i>	226 (58.7)	159 (41.3)	
<i>How about through condom less sex?</i>	229 (59.5)	156 (40.5)	
<i>Are persons with more than one sexual partner at risk of HBV?</i>	284 (73.8)	101 (26.2)	
<i>Can Hepatitis B be transmitted by using blades of the barber/ear and nose piercing?</i>	248 (64.4)	137 (35.6)	
<i>Is hepatitis B curable?</i>	329 (85.5)	56 (14.6)	
<i>Can HBV can cause death?</i>	328 (85.2)	57 (14.8)	
<i>Can HBV be transmitted through kissing?</i>	229 (59.5)	156 (40.5)	
<i>Can HBV be transmitted through contact with body fluids like blood and semen?</i>	274 (71.2)	111 (28.8)	
<i>If your partner has HBV, can they transmit the infection to you?</i>	304 (79.0)	81 (21.0)	
<i>Can HBV be spread through sharing needles?</i>	249 (64.7)	136 (35.3)	
<i>Is HBV preventable?</i>	358 (93.0)	27 (7.0)	
<i>Does HBV have a vaccine?</i>	342 (88.8)	43 (11.2)	
<i>Do you think HBV can be tested?</i>	373 (96.9)	12 (3.1)	
<i>Do you think HBV has post-exposure prophylaxis?</i>	29 (7.5)	356 (92.5)	

## 6.5 ATTITUDES TOWARDS HBV INFECTION AND PREVENTION

The study results revealed that 56.9% of the respondents had a good attitude towards HBV infection and prevention. The great majority of the respondents (97.7%) stated that they would go to the health facility if they thought they had HBV and 87.5% of them think that MSM are at a higher risk of HBV as compared to the general population. Majority of the participants (80.5%) thought that the HBV vaccine is safe and 88.3% thought that they should get vaccinated however only 37.7% knew where one can get HBV vaccination. Only 34.3% of the participants stated that vaccines were affordable or low cost and only 42.1% of the respondents stated that they can easily access Hepatitis B testing services. Table 4 summarizes all the study findings concerning attitudes of MSM towards HBV infection and prevention.

**Table 4: Attitudes toward HBV infection and prevention among MSM attending the MARPI clinic**

	<i>Attitude</i>	<i>Frequencies</i>	<i>Percent (%)</i>
	<i>Poor attitude</i>	166	43.1
	<i>Good attitude</i>	219	<b>56.9</b>
	<b><i>Questions assessing attitude</i></b>	<b>Yes (%)</b>	<b>No (%)</b>
	<i>Do you think you can get hepatitis B?</i>	354 (92.0)	31 (8.1)
<i>Do you think MSM are at a higher risk of HBV as compared to the general population?</i>		337 (87.5)	48 (12.5)
<i>Would you go to the health facility if you thought you had HBV?</i>		376 (97.7)	9 (2.3)
<i>Do you think the Hepatitis B vaccine is safe?</i>		310 (80.5)	75 (19.5)
<i>Do you believe that vaccination could prevent HBV transmission?</i>		344 (89.4)	41 (10.7)
<i>Hepatitis B is more serious than HIV/AIDS?</i>		173 (44.9)	212 (55.1)
<i>Do you know the place where one can get hepatitis B immunizations?</i>		145 (37.7)	240 (62.3)
<i>Are the vaccines affordable (free or low cost)?</i>		132 (34.3)	253 (65.7)
<i>Do you think you should receive hepatitis B vaccinations?</i>		340 (88.3)	45 (11.7)
<i>Do you think you can easily access a hepatitis test?</i>		162 (42.1)	223 (57.9)

## 6.6 PRACTICES RELATED TO HBV PREVENTION

The study found that 54.8% of the respondents exhibited safe practices towards HBV infection and prevention. Majority of the participants (97.9%) stated that they would go for further investigation and treatment if they were diagnosed with hepatitis B.

Only 18% of the participants had ever been tested for HBV, 4.4% of them knew their partners HBV status and 10.9% had been vaccinated for HBV. Majority of the MSMs (66.0%) do not wear condoms during sexual intercourse and about 10% of them share needles with others. Only 3.9% of the respondents had completed the 3 doses of HBV vaccination. Table 5 summarizes the practices towards HBV infection and prevention among the study respondents.

**Table 5: Practices related to HBV prevention among MSM attending the MARPI clinic**

<i>Practices</i>	<i>Frequencies</i>	<i>Percent (%)</i>
<i>Unsafe practices</i>	174	45.2
<i>Safe practices</i>	211	<b>54.8</b>
<b><i>Questions assessing practices</i></b>	<b>Yes (%)</b>	<b>No (%)</b>
<i>Have you ever been tested for hepatitis B?</i>	71 (18.4)	314 (81.6)
<i>Do you know your partner's HBV status?</i>	17 (4.4)	368 (95.6)
<i>Have you ever been vaccinated for HBV?</i>	42 (10.9)	343 (89.1)
<i>How many doses of the HBV vaccine did you receive?</i>	15 (3.9) full doses	370 (96.1)
<i>Is your partner vaccinated against HBV?</i>	22 (5.7)	363 (94.7)
<i>Do you wear condoms during sexual intercourse?</i>	131 (34.0)	254 (66.0)
<i>Do you share needles with others?</i>	37 (9.6)	348 (90.4)
<i>In case you are diagnosed with Hepatitis B, would you go for further investigation and treatment?</i>	377 (97.9)	8 (2.1)

## **6.7 MULTIVARIABLE ANALYSIS (FACTORS ASSOCIATED WITH KAP TOWARDS HBV INFECTION AND PREVENTION)**

### **6.7.1 FACTORS ASSOCIATED WITH KNOWLEDGE LEVEL TOWARDS HBV INFECTION AND PREVENTION.**

The study employed the modified Poisson regression analysis to assess the factors associated with knowledge level towards HBV infection and prevention. Of the 14 predictor variables, 13 variables did not show a significant association with good knowledge at the 5% level of significance. These included age, gender, tribe, residence, religion, marital status, occupation, HIV status, sexual orientation, condom less anal sex, injectable drugs, HBV vaccination status, and number of sexual partners.

At bivariable analysis, as shown in table 6a, MSM with primary level, secondary and tertiary level education were less likely to have a good knowledge than those with no formal education (CPR) = 0.56, 95% CI; 0.37-0.85, P=0.007), (CPR=0.60, 95% CI; 0.44-0.81, P=0.001) and (CPR=0.64, 95% CI; 0.42-0.97, P=0.035) respectively.

Whereas in the multivariable modified Poisson regression analysis as summarized in table 6a and 6b three variables had shown overall significant effect on good knowledge at 0.2 level of significance. These were educational status, HIV status and HBV vaccination status though only one variable was found to be significantly associated. As per the set criteria, there are variables at bivariate analysis that were not included in the final model. Those who had attained a primary, secondary or tertiary level of education were less likely to have good knowledge of HBV infection and prevention than those with no formal education level (APR)=0.57, 95% CI; 0.37-0.88, P=0.012), (APR=0.62, 95% CI; 0.45-0.85, P=0.003) and (APR=0.65, 95% CI; 0.42-0.99, P=0.046) respectively. (Table 6a).

### **6.7.2 FACTORS ASSOCIATED WITH ATTITUDE TOWARDS HBV INFECTION AND PREVENTION.**

The result of binary logistic regression analysis was summarized in Table 6a and 6b where 12 of the 14 variables did not show significant association with a favorable attitude at a 5% level of significance except Sexual orientation and educational status. In binary modified Poisson regression analysis, MSM with primary and secondary levels of education were less likely to have a positive attitude towards HBV infection and prevention as compared to those with no formal education (CPR=0.49, 95% CI; 0.33-0.72,

P<0.001) and (CPR=0.66, 95% CI; 0.52-0.84, P=0.001) respectively as seen in table 6a. Similarly, homosexuals were 31% less likely to have a positive attitude on HBV infection and prevention than bisexuals (CPR = 0.69, 95% CI; 0.58-0.82, P<0.001) (Table 6b).

In the multivariable modified Poisson regression analysis, educational status and sexual orientation, MSM with a primary and secondary level of education were less likely to have a positive attitude on HBV than those with no formal education (APR = 0.52, 95% CI; 0.36-0.77, P=0.001) and (APR=0.68, 95% CI; 0.55-0.85, P=0.001). Being a homo-sexual was 27% less likely to have a positive attitude on HBV than bisexual (APR = 0.73, 95 CI; 0.61-0.86, P<0.001) (Table 6b).

### **6.7.3 FACTORS ASSOCIATED WITH PRACTICES TOWARDS HBV INFECTION AND PREVENTION**

The result of binary modified Poisson regression analysis showed that 13 of the 14 variables did not show significant association with good practice at a 5% level of significance. HBV vaccination status was significantly associated with practices toward HBV infection and prevention. In binary modified Poisson regression analysis, MSMs who were vaccinated against HBV were 30% more likely to have good practice than the unvaccinated MSMs (CPR=1.30, 95% CI; 1.03-1.64, P=0.026) (Table 6b).

In the multivariable modified Poisson regression analysis, HBV vaccination was significantly associated with good practices towards HBV infection and prevention. MSMs that were vaccinated against HBV were 33% more likely to have good practice than unvaccinated MSM (APR=1.33, 95% CI; 1.05-1.68, P=0.018). The results of the bivariate and multivariate analysis between the respondents KAP and associated factors were summarized in table 6a and 6b.

**Table 6a: Bivariate and multivariable results showing the association between the predictors and levels of knowledge, attitudes, and practices toward HBV infection and prevention among MSM attending the MARPI clinic.**

<i>Variables</i>	<i>Knowledge</i>		<i>Attitude</i>		<i>Practices</i>	
	<b>CPR (95% CI) P-value</b>	<b>APR (95% CI) P-value</b>	<b>CPR (95% CI) P-value</b>	<b>APR (95% CI) P-value</b>	<b>CPR (95% CI) P-value</b>	<b>APR (95% CI) P-value</b>
<b><i>Age group</i></b>						
<i>40 &amp; above</i>	1.00	1.00	1.00	1.00	1.00	1.00
<i>25-39</i>	1.01 (0.58-1.74) (0.982)	0.99 (0.58-1.68) (0.967)	0.86 (0.61-1.23) (0.414)	0.87 (0.61-1.23) (0.424)	1.36 (0.74-2.53) (0.323)	1.45 (0.81-2.62) (0.213)
<i>18-24</i>	0.92 (0.54-1.59) (0.777)	0.93 (0.55-1.58) (0.781)	0.73 (0.51-1.05) (0.087)	0.76 (0.54-1.09) (0.137)	1.19 (0.64-2.22) (0.588)	1.24 (0.68-2.24) (0.482)
<b><i>Gender</i></b>						
<i>Female</i>	1.00	1.00	1.00	1.00	1.00	1.00
<i>Male</i>	1.21 (0.70-2.10) (0.491)		0.95 (0.65-1.37) (0.765)		1.39 (0.81-2.40) (0.236)	1.39 (0.80-2.43) (0.24)
<b><i>Ethnicity/Tribe</i></b>						
<i>Other</i>	1.00	1.00	1.00	1.00	1.00	1.00
<i>Muganda</i>	1.01 (0.82-1.25) (0.910)		1.08 (0.86-1.36) (0.484)		0.85 (0.53-1.37) (0.504)	
<i>Munyankole</i>	1.09 (0.87-1.36) (0.449)		1.05 (0.83-1.34) (0.676)		0.82 (0.48-1.39) (0.453)	
<i>Munyarwanda</i>	1.10 (0.87-1.40) (0.423)		1.22 (0.95-1.56) (0.116)		0.786 (0.42-1.46) (0.444)	
<i>Musoga</i>	1.03 (0.78-1.36) (0.845)		1.11 (0.83-1.49) (0.496)		0.15 (0.02-1.02) (0.053)	
<i>Mutoro</i>	1.09 (0.84-1.40) (0.519)		1.07 (0.80-1.42) (0.666)		0.58 (0.25-1.32) (0.194)	
<i>Mugisu</i>	1.07 (0.79-1.46) (0.661)		0.92 (0.64-1.33) (0.665)		0.50 (0.15-1.70) (0.267)	
<i>Mukiga</i>	0.96 (0.69-1.35) (0.834)		1.15 (0.84-1.59) (0.380)		1.0 (0.48-2.08) (1.00)	
<i>Luo</i>	1.09 (1.26-1.91) (0.64)		1.12 (0.85-1.48) (0.431)		1.04 (0.58-1.87) (0.900)	
<b><i>Education level</i></b>						
<i>No formal education</i>	1.00	1.00	1.00	1.00	1.00	1.00
<i>Primary</i>	0.56 (0.37-0.85) (0.007) **	0.57 (0.37-0.88) (0.012) *	0.49 (0.33-0.72) (0.000) ***	0.52 (0.36-0.76) (0.001) **	1.09 (0.66-1.81) (0.728)	
<i>Secondary</i>	0.60 (0.44-0.81) (0.001) ***	0.62 (0.45-0.85) (0.003) **	0.66 (0.52-0.84) (0.001) ***	0.68 (0.55-0.85) (0.001) ***	0.92 (0.58-1.47) (0.73)	
<i>Tertiary</i>	0.64 (0.42-0.97) (0.035) *	0.65 (0.42-0.99) (0.046) *	0.77 (0.56-1.05) (0.099)	0.76 (0.56-1.03) (0.073)	1.06 (0.63-1.79) (0.829)	
<b><i>Marital status</i></b>						
<i>Married</i>	1.00	1.00	1.00	1.00	1.00	1.00
<i>Not married</i>	0.98 (0.73-1.31) (0.867)		1.01 (0.79-1.30) (0.933)		1.30 (0.95-1.78) (0.104)	1.25 (0.92-1.70) (0.153)

**Table 6b: Bivariate and multivariable results showing the association between the predictors and levels of Knowledge, Attitudes, and Practices toward HBV infection and prevention.**

<i>Variables</i>	<i>CPR (95%CI) P-value</i>	<i>APR (95% CI) P-value</i>	<i>CPR (95%CI) P-value</i>	<i>APR (95% CI) P-value</i>	<i>CPR (95%CI) P-value</i>	<i>APR (95% CI) P-value</i>
<b>Occupation</b>						
<i>Students</i>	1.00	1.00	1.00	1.00	1.00	1.00
<i>Unemployed</i>	1.08 (0.73-1.58) (0.706)	1.12 (0.76-1.63) (0.573)	0.98 (0.73-1.30) (0.874)	0.98 (0.73-1.30) (0.874)	0.99 (0.76-1.31) (0.963)	
<i>Employed</i>	1.29 (0.94-1.77) (0.117)	1.29 (0.94-1.77) (0.117)	1.01 (0.80-1.28) (0.916)	1.01 (0.80-1.28) (0.916)	0.91 (0.72-1.15) (0.416)	
<b>HIV status</b>						
<i>Negative</i>	1.00	1.00	1.00	1.00	1.00	1.00
<i>Positive</i>	1.02 (0.74-1.40) (0.923)		0.99 (0.76-1.30) (0.965)	0.94 (0.71- 1.23) (0.635)	0.92 (0.68-1.25) (0.609)	
<i>Unknown</i>	0.94 (0.57-1.54) (0.792)		0.60 (0.33-1.10) (0.1)	0.66 (0.35- 1.25) (0.201)	0.99 (0.66-1.50) (0.978)	
<b>Sexual orientation</b>						
<i>Bi Sexual</i>	1.00	1.00	1.00	1.00	1.00	1.00
<i>Homo-sexual</i>	1.03 (0.77-1.37) (0.863)		0.69 (0.58-0.82) (0.000) ***	0.73(0.61-0.86) (0.000) ***	0.97 (0.68-1.40) (0.873)	
<i>Others</i>	1.11 (0.70-1.76) (0.653)		0.84 (0.61-1.17) (0.309)	0.86(0.61-1.19) (0.358)	1.01 (0.67-1.52) (0.969)	
<b>Condomless anal sex</b>						
<i>No</i>	1.00	1.00	1.00	1.00	1.00	1.00
<i>Yes</i>	0.90 (0.71-1.13) (0.35)		1.01 (0.83-1.24) (0.886)		0.90 (0.74-1.09) (0.284)	0.87 (0.72-1.06) (0.175)
<b>Injectable drugs</b>						
<i>No</i>	1.00	1.00	1.00	1.00	1.00	1.00
<i>Yes</i>	1.11 (0.70-1.76) (0.666)	0.84 (0.63-1.12) (0.236)	1.14 (0.80-1.65) (0.465)		0.85 (0.51-1.43) (0.544)	
<b>HBV vaccine status</b>						
<i>No</i>						
<i>Yes</i>	0.79 (0.60-1.06) (0.113)		1.14 (0.89-1.47) (0.30)		1.30 (1.03-1.64) (0.026) *	1.33 (1.05-1.68) (0.018) *
<b>Religion</b>						
<i>Muslims</i>	1.00	1.00	1.00	1.00	1.00	1.00
<i>Christians</i>	1.09 (0.88-1.36) (0.439)		1.11 (0.92-1.34) (0.265)	1.07(0.89-1.28) (0.488)	0.91 (0.76-1.09) (0.321)	
<b>Sex Partners</b>						
<i>None</i>						
<i>One</i>	1.53 (0.58-4.03) (0.391)		2.89 (0.83-10.10) (0.097)	2.58(0.70-9.46) (0.152)	1.42 (0.65-3.09) (0.375)	
<i>More than one</i>	1.65 (0.64-4.30) (0.302)		2.89 (0.83-10.06) (0.094)	2.55(0.70-9.27) (0.156)	1.36 (0.63-2.94) (0.43)	

\*\*\* significant at  $P \leq 0.001$ , \*\* significant at  $P \leq 0.01$ , \* significant at  $P \leq 0.05$  CPR= Crude Prevalence Ratio  
APR=Adjusted Prevalence Ratio



## CHAPTER SEVEN

### 7.0 DISCUSSION

#### 7.1 PREVALENCE OF HBV

The study was aimed at estimating the prevalence of HBV, determining the knowledge, attitudes and practices toward HBV infection and prevention and their associated factors among MSM attending the MARPI clinic. In comparison to the estimated 5.8% HIV prevalence in Uganda among adults (“UPHIA-Summary-Sheet-2020.pdf,” n.d.), the MSMs in this study had an HIV prevalence of 11.7%, of which, 75.1% of them stated that they participated in condom-less anal sex. These findings are consistent with the known risky sexual behaviors and high HIV risk among this population (Baral et al., 2007).

The overall prevalence of HBV among MSMs visiting MARPI clinic was found to be at 3.1%. This prevalence is lower than the estimated national prevalence which is between 4.3% to 10% (J. Bwogi et al., 2009; Ndibarema et al., 2022; Ochola et al., 2013). It is also lower than that observed in several studies among other sub-populations at risk in Uganda. For example, among the fisher folk in Ugandan Lake Victoria fishing communities HBV prevalence was estimated to be 7%, 4.9% among pregnant women in urban centers in Uganda and 7.1% among health workers in a tertiary hospital (Kitandwe et al., 2021b; Pirillo et al., 2007; Ziraba et al., 2010b).

Similarly, this prevalence is lower than that of the MSMs from other African countries (17.4% in Kenya, 11.1% in (Burkina Faso, Côte d’Ivoire, Mali, and Togo) and 10% in Nigeria. It is however higher than the prevalence of HBV among the MSM in Europe according to a meta-analysis of data from European countries found that the HBV prevalence among MSMs ranged between (0.0% - 1.4%) (Falla et al., 2018). This difference could be attributed to the fact that the MSMs that were sampled for this study regularly visit MARPI clinic, they therefore have better health seeking behaviors as compared to the MSMs in the general population and they have access to HIV prevention measures (condoms, lubricants etc.) which also reduce the risk of HBV.

The proportion of MSMs that were HBV infected was significantly ( $P=0.047$ ) higher among the MSMs who had attained a tertiary level 4 (10.53%), secondary level 7 (2.5%) and primary level of education 1 (2.1%) as compared to those with no formal education. This finding is unique to this study, since other studies among other populations in Uganda and MSMs in other African countries demonstrate that the higher the education status/level achieved, the lower the prevalence of HBV as they are expected to have

more knowledge and safer practices towards HBV prevention (Adeyemi et al., 2021). It is also important to note that over 75% of the MSMs in this study had attained at least secondary school education.

The proportion of MSMs that were HBV infected was also significantly higher among those who were HIV positive 4 (8.9%) as compared those who were HIV negative 8 (2.5%). This is consistent with similar studies in Uganda and globally. A global systematic review and meta- analysis by (Platt et al., 2020b) demonstrated that globally the prevalence of HIV\_HBV co-infection is 7.6% among the general population, while the mid-point prevalence among MSM was 6.1% (IQR 5.0%-9.2%) based on 70 studies. This is also explained by the fact that both HIV and HBV have similar transmission routes therefore in HBV/HIV endemic areas, the higher one's risk for HIV infection, the higher their risk for HBV Infection.

The proportion of MSMs that were HBV infected was significantly higher ( $P<0.001$ ) among MSMs who are injectable drug users 14 (82.4%) as compared to those who were not injectable drug users. Several studies have demonstrated that injectable drug users are at a higher risk of HBV infection due to their risky behaviors such as sharing needles, drug over dose and indulgence in unprotected sex (Ssekamatte et al., 2022).

All of the participants who were HBV positive stated that they indulged in un-protected anal sex and compared to those who didn't, this difference was statistically significant ( $p=0.043$ ). A study by Adeyemi et al in Nigeria also found that the only factor independently associated with HBV was self-report of condom-less sex at last anal intercourse (OR: 2.2, 95% CI; 1.3-3.6). Anal sex causes mucosal lesions that have been associated with transmission of several STIs. Several studies demonstrate that men who have un-protected anal sex are at a high risk of HBV (Adeyemi et al., 2021; Neaigus et al., 2007; Oliveira et al., 2016)

## **7.2 KNOWLEDGE ABOUT HBV**

The study revealed that approximately half of the MSMs had good knowledge (60.5%) about HBV infection and prevention. This could be attributed to their good health seeking behaviors given that the study looked at MSM who frequent the hospital setting. This finding is also comparable to other KAP studies among different populations in Uganda, a study among non-health workers attending selected health facilities in Mbale city revealed that 58.8% of the respondents were knowledgeable about HBV (Rashid and Swaibu, 2021), another study among health workers in Gulu found that only 50.8% of the health workers had good knowledge and 71.4% had a positive attitude, towards HBV infection and

prevention (Ojara et al., 2021).

Majority of the MSMs had ever heard about HBV, 93.0% of the MSMs stated that HBV it is preventable and 96.9% stated that HBV can be tested. These findings were better than a study in Kenya among KPs (including the MSM, FSW, PWID and truck drivers) in the northern transport corridor in Kenya which demonstrated that only 43.2% of the participants knew about HBV (Delany-Moretlwe et al., 2015).

Despite the fairly good knowledge, only half of the participants were aware of the severity of HBV, nearly half of them (45.2%, 52.2%) did not know that HBV affected the liver or that it caused cancer of the liver respectively and more than half of them thought HBV was more serious than HIV. This shows that the MSM are not aware of how severe HBV can be, reducing their likelihood to seek preventive measures and screening. Knowledge about the severity of a disease has been shown to influence one's attitude and practices towards prevention, this lack of awareness is therefore likely to influence the MSMs behaviors towards HBV infection. A study showed that MSMs who obtained vaccination against HBV had perceived themselves at high risk of HBV and were weary of the consequences of HBV infection (de Wit et al., 2005).

Majority of the participants were aware of the routes of transmission for HBV such as through sexual intercourse (58.7%), condom-less sex (59.5%) and multiple sexual partners (73.8%), sharing needles (64.7%). These findings are comparable to a systematic review for African countries on knowledge gaps for STIs where reusing needles (52.7%) and sexual contact (42.5%) were considered to be possible routes of HBV transmission (Badawi et al., 2019).

In regards to prevention, almost all of the MSMs (92.7%) were not aware that HBV has PEP, this finding is consistent with the low knowledge of PEP as shown in similar studies among other populations in Uganda. For instance only 48% of the PHCPs in Wakiso district were aware that PEP exists (Ssekamatte et al., 2021b), another study among health care providers in central Uganda found out that only 30.4% of the health workers had heard about HBV PEP. Post-exposure prophylaxis is effective in the prevention of hepatitis B infection and the subsequent development of severe complications if provided appropriately and timely within 24 hours of exposure. The MSM are among the groups are at Risk of HBV and likely need for PEP (Sarah Schillie et al., 2013), there severe lack of awareness concerning PEP means that the MSM would not know what preventive steps to take in the event that they are exposed to HBV infection.

### **7.3 ATTITUDES TOWARDS HBV INFECTION AND PREVENTION**

The MSM in this study had a good attitude (56.9%) towards HBV infection and prevention, with majority (92.0%) acknowledging that they could get hepatitis B and 87.5% perceiving that MSMs were at a higher risk of HBV compared to the general population. Majority (97.6%) stated that they would go to the health facility if they thought they had HBV, 80.5% thought HBV vaccines were safe and 89.4% believed that the vaccine could prevent HBV transmission. This positive attitude implies that they are likely to positively take up HBV services (vaccination, screening and treatment) if provided. A study by (Schutten et al., 2002) demonstrated that having a positive attitude was a significant predictor of intention to get vaccinated among gay men.

Unfortunately, only 42.1% stated that they could easily access a hepatitis test and 34.3% of the MSMs thought that the vaccines were affordable. The possible cost implications therefore could be serving as a barrier to access to vaccination among this population. Additionally, only 37.7% of the MSMs knew where one could get vaccinated from. This was similar to a study among psychoactive substance users in informal settlements in Kampala where 28.9% of the participants did not know where to access the vaccine (Ssekamatte et al., 2022).

In comparison to other studies in Uganda, the MSM have fairly good attitude towards HBV prevention. A study by (Rashid and Swaibu, 2021) among Non-health workers in Mbale showed that about 62.3% of the respondents thought that the HBV vaccine was ineffective.

### **7.4 PRACTICES RELATED TO HBV PREVENTION**

In regards to practices 54.8% of the participants practiced safe practices towards HBV prevention. However, 89.9% of the MSMs stated that they had never been vaccinated against HBV, 81.6% of them had never tested for HBV and 95.6% did not know their partners HBV status. These findings demonstrate the need of scaling up HBV preventive strategies (awareness creation, HBV vaccination and screening) and integrating HBV services into the MARP clinics available for this population. Majority of the MSMs (66.0%) stated that they did not wear condoms during sexual intercourse, 89.1% were not vaccinated and 81.6% were not screened for hepatitis. This is indicative of the unsafe practices that the MSM indulge in that could expose them to HBV infection. Majority of the MSMs were not protected from HBV infection and those who are infected would un-knowingly continue spreading the infection and subsequently suffer consequences of late diagnosis should the infection progress further. A study by (Favour, 2016) showed

similar findings, 90% of the youth in Adjumani (a district in northern Uganda) had never been screened for HBV and 66.7% had never been vaccinated. This shows that there is a need to scale up vaccination among youths and populations at risk across Uganda.

A study in Kenya demonstrated that only 4.6% of the participants had ever been tested for HBV, 11.3% were vaccinated and 58.8% of the vaccinated completed the 3 doses (Mwangi et al., 2022). In this study however, whereas the MSM are part of the KPs for HIV, they exhibit high HIV and HBV risk, only 3.9% had received the full doze of HBV vaccines. The MSM also face discrimination and their sexual practices are considered illegal in Uganda (Hama-Owamparo, 2023). They therefore do not freely access or disclose this information at health care facilities. The few MARP friendly facilities such as MARPI clinic do not have HBV services integrated in the HIV/STI services offered to this population. This could explain the extremely low HBV screening and vaccination numbers. This is also confirmed by the fact that majority of the participants in the study, (62.3%) did not know where one can get vaccinated for HBV, 65.7% of the MSM did not think that the vaccines were affordable and 57.9% stated that they cannot easily access a hepatitis B test. These barriers could partly explain why majority are not vaccinated or screened. There is need to conduct further research to understand and address the barriers to vaccination and screening among this population.

## **7.5 FACTORS ASSOCIATED WITH KAP TOWARDS HBV INFECTION AND PREVENTION**

In multi-variate analysis, the MSMs that had achieved a primary, secondary and tertiary level of education were (43%, 38% and 35%) significantly less likely to have good knowledge as compared to those with no formal education respectively (APR = 0.57, 95% CI; 0.37-0.88,  $P < 0.05$ ), (APR = 0.62, 95% CI; 0.45-0.85,  $P < 0.01$ ) and (APR = 0.65, 95% CI; 0.42-0.99,  $P < 0.05$ ) (Table 6a).

Additionally, the MSM with a secondary and primary level of education were 34% and 51% less likely to have a positive attitude towards HBV infection and prevention as compared to those with no formal education (APR = 0.66, 95% CI; 0.52-0.84,  $P = 0.001$ ), (APR = 0.49, 95% CI; 0.33-0.72,  $P < 0.001$ ) (Table 6a). This finding differs from other studies in Uganda for example (Nankya-Mutyoba et al., 2018) found that there was a 39% increase in the prevalence of adequate HBV knowledge among pregnant women with a secondary or higher level of education as compared to women with primary or lower education.

MSMs who are homo-sexual were 27% less likely to have a good attitude towards HBV infection and prevention as compared to the MSM who were bi-sexual (APR = 0.73, 95% CI; 0.61-0.86, P<0.001) (Table 6b). This could be because the homo-sexual are aware of the heightened risk of infections due to their indulgence in anal-sex and are therefore more open to preventive measures such as use of lubricants and condoms.

In the multivariable modified Poisson regression analysis, only vaccination status was significantly associated with safe practice. The MSM that were vaccinated against HBV were 33% more likely to have good practices than unvaccinated MSM (APR=1.33, 95% CI; 1.05-1.68, P=0.018) (Table 6b).

## CHAPTER EIGHT

### 8.0 CONCLUSION

- The prevalence of HBV among MSMs attending the MARPI clinic was found to be low at 3.1%.
- About half of the MSMs Exhibited good knowledge about HBV infection and prevention.
- The study also found out that approximately half of the MSMs attending the MARPI clinic had a good attitude concerning HBV infection and prevention. They thought themselves at risk of HBV and exhibited willing to seek HBV services such as HBV testing, vaccination and treatment. They however expressed barriers such as inaccessibility of HBV testing services and the cost of vaccination which is not affordable.
- Concerning practices, approximately half of the MSMs exercised safe practices towards HBV infection and prevention. There was however a very low vaccine uptake and very minimal HBV screening reported. Majority were unaware or did not use the preventive mechanisms such as condoms, protected sex, self and partner vaccination against HBV, routine HBV screening etc. This is expected to exacerbate their high risk of contracting HBV.
- The higher the MSMs level of education the higher their prevalence of HBV, poor knowledge and attitudes towards infection prevention and control. The MSMs are however aware that they are at Risk of HBV, are willing to get vaccinated and go to the health facility for further treatment in the event that they are found to have HBV infection.

### 8.1 RECOMMENDATIONS

- Based on the study findings, there is an urgent need for awareness creation among MSMs about HBV spread, its severity, method of diagnosis, and preventive measures among MSMs.
- The preventive measures such as condom use and vaccination need to be emphasized and readily provided given that all those with HBV infection were found to indulge in condom-less anal sex.
- There is a need to conduct further research and implementation science to improve availability of HBV services for this population in addition to integration of the HBV services into other MARP friendly services (HIV, SRH, STI) that target these populations.
- There is also a need for capacity building for the counselors, peers and community-based organizations that support these populations to ensure that they communicate HBV information,

conduct health promotion activities such as campaigns interventions and campaigns to effectively increase the knowledge towards infection and prevention as well as improving the coverage/scale-up HBV vaccination and screening among MSM.

- The MOH should ensure availability of free HBV vaccination and screening modalities are provided for KPs such as MSMs to reduce barriers to access and increase the coverage and uptake of HBV vaccination and testing among this populations.
- The MSMs need to be sensitized and encouraged to protect themselves from HBV and other STDs, through health promotion programs, integrating HBV messages in HIV programs, providing condoms and ensuring routine HBV testing There is need for further research to gain insight on the barriers to vaccination, HBV screening and condom use among the MSM. It is also necessary to carry out implementation science to devise strategies that are acceptable to the MSMs to increase the uptake and coverage of HBV preventive measures to this population.

## **8.2 LIMITATIONS**

Our study had some limitations. With relatively small proportions for KAP under the different categories of the independent variables, the multivariable model was not sufficiently powered to detect independent associations between KAP towards HBV infection and prevention and some of the demographic factors. The study only looked at MSMs who visited MARPI clinic, the findings are therefore not generalizable to the entire MSM population in Uganda. Additionally, 99.0% of the MSMs turned out to be from the urban setting with only 4 of the participants being from the rural areas. The findings are therefore not generalizable to MSMs who live in rural settings.

Given the cross-sectional design was used, the causal relationship between the different factors and the KAP outcomes could not be ascertained.



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## **APPENDIX**

**TITLE:** HEPATITIS B VIRUS PREVALENCE, KNOWLEDGE, ATTITUDES, AND PREVENTIVE PRACTICES AMONG MEN WHO HAVE SEX WITH MEN ATTENDING MARPI CLINIC: A CROSS-SECTIONAL STUDY

### **I. CONSENT FORM**

Consent forms that describe all the procedures, intent and rationale of the study was administered and all participants who agreed to be part of the study had to append their names and signature on this document for ethical purposes and evidence of no coercion.

Every potential participant was provided information concerning the study, the procedures and the fact that a blood sample will be drawn for HBV testing and further investigations.



**Version 1, 7<sup>th</sup> January 2023**

**Appendix 1: Informed consent form for MSM to participate in interviews**

Study Title: The prevalence, knowledge, attitudes and practices towards hepatitis B virus infection and prevention among men who have sex with men attending MARPI clinic: a cross-sectional study.

1. Invitation

You are being invited to take part in a study on prevalence, knowledge, attitudes and practices towards hepatitis B virus infection and prevention among men who have sex with men attending MARPI clinic. Before you decide to do so, it is important that you understand why the study is being conducted and what it will involve. Please take time to read the following information carefully. Please choose the language of your choice (Kiswahili, Luganda, Runyankole) or seek interpretation. Ask us if there is anything that you are not clear of or if you would like more information.

2. Evaluation team

We are a team from Makerere University and MARPI (Most At Risk Population Initiative) in Uganda. We are working on this study to determine the prevalence of HBV among the MSM's, their knowledge, attitudes and practices towards HBV infection and control.

3. Description of the study

Despite the efforts towards HBV service provision in Uganda over the years, HBV has continued to affect the population, with a number of people not accessing HBV services such as screening, vaccination and treatment.

Globally, the key populations (KP's) such as MSM's have been highlighted to be at high risk of contracting HBV however in Uganda, the prevalence of HBV among MSM's remains unknown. It is also unclear whether this population has the right knowledge, attitudes and practices to prevent HBV infection.

4. Purpose of the study

The main purpose of the study is to determine prevalence, knowledge, attitudes and practices towards hepatitis B virus infection and prevention among men who have sex with men attending MARPI clinic.

The findings of this research will demonstrate the burden of HBV among the men who have sex with men as well as their knowledge attitudes and practices towards HBV. This would be an important contribution to the HBV epidemiological data in Uganda. It would demonstrate the need for intensifying HBV services among this population, provide a basis for evidence-based research, highlight gaps that require interventions and inform HBV policy and guidelines development to promote equitable health service provision and elimination of HBV in this population.

## 5. Procedures

If you agree to participate in the study, you will be asked a series of questions by the research assistants concerning your knowledge, attitudes and practices towards HBV infection and prevention. We would like to record your responses in a questionnaire. There is no correct or wrong response to the questions you will be asked, what we need is your honest opinion. The research assistant will record this information in the questionnaire and only the research team will have access to this document.

Following the interview, two blood samples of 4mls each will be taken from you by trained laboratory personnel. The samples will be used to screen you for hepatitis B. The second sample will be processed for storage should there be need for further evaluations such as HBV viral load.

The sample collection procedure will be carried out with utmost care and silt to ensure minimal discomfort and associated risks.

## 6. Confidentiality

Any information obtained from you will be treated as confidential and will be used only for research purposes. The information will be accessible to the a) research team, b) Makerere University, c) Institutional Review Board and the d) Uganda National Council for Science and Technologies.

After evaluation is completed, the materials used to collect the data will be destroyed.

Your name and other potentially identifying information will not appear when we present this evaluation or publish results. The interviews will be carried out in a safe and private environment by trained researchers.

When publishing, no names or other identifiers will be used. The information will be anonymized and identification numbers will be used throughout the research to avoid linkage

of the response to your identity.

#### 7. Decision to participate

The decision to participate lies in your hands. If you need more time to consider your decision, we will give you up to 5 days to do so. In case of any clarifications or questions, feel free to ask. You will be given this information sheet to read and understand further before you consent.

#### 8. Risks and benefits

The risks to this study are minimal. Confidentiality will be exercised at all times, privacy will be provided.

In regards to sample collection, trained health workers will be used to carry out blood collection to ensure minimal risk.

You are free to disclose any information that makes you feel uncomfortable.

The benefits of participation include, screening and diagnosis of HBV and subsequent referral for HBV treatment in the event that one is found having HBV. In addition, the study will demonstrate the burden of HBV, Knowledge, attitudes and practices towards HBV infection and prevention. This will enable development of targeted strategies and ensure prioritization of the study population for HBV service provision. The research findings are important in ensuring improved HBV service delivery among MSM's.

#### 9. Duration of Interview

The interview will take 30 minutes.

#### 10. Reimbursement

The study will provide you with shs.5000 (Five thousand shillings only) to cater for refreshments after the interview. There will be no additional compensation to participating in this study. The HBV screening and treatment will be offered at no cost to all participants.

#### 11. Voluntary participation.

Participation in this study is voluntary. You have a right to withdraw from this study at any time. You will not be penalized for refusing to participate or withdrawing midway the study.

#### 12. Voluntary withdrawal

The participant is free to withdraw from the study at their own request, or they may be

withdrawn from the study at the discretion of the investigator for safety or behavioral reasons, or inability to comply with the protocol required, schedule of study visits or procedures.

### 13. Dissemination of findings

Your healthcare providers, MOH and leaders will receive feedback on the study findings and the subsequent use of the study findings.

### 14. Ethical Approval

The study has sought approval from Institutional Review Board (IRB), Makerere University and MARPI.

### 15. Questions

If you have additional questions, contact the Principle Investigator (Mona Muhammad) on Email: muhammadmonalotor@gmail.com, Tel; +256781308102.

## CONSENT FORM

### By signing this form, I agree that:

- I have received the participant information sheet; the evaluation has been explained and I understood the content. All my questions have been answered and I understand what is expected of me.

Yes

No

- I have been informed that it is my right to refuse to take part in the interview and if I choose not to take part, I do not have to give a reason.

Yes

No

- I have been informed that anything I say during the interview or discussion will remain confidential: my name will not be used and anonymous identifiers will be used.

Yes

No

- I consent to the laboratory personnel taking my blood sample for HBV screening

Yes

No

- I consent to collecting a sample from me for storage and further analysis.

Yes                       No

- I am aware that I can choose to comment on any questions

Yes                       No

- I accept to be part of the evaluation

Yes                       No

**Signature of participation:**

Name	Signature/thumbprint	Date of consent

*If participant cannot read and write, an impartial witness will be involved in the informed process.*

**Signature of witness:**

Name	Signature/thumbprint	Date of consent

**Signature of assessment staff taking consent:**

Name	Signature	Date of signature

## II. QUESTIONNAIRE

Upon informed consent, this questionnaire will be filled by the research assistant.

### SECTION A (Demographic data form)

<b>Participant ID</b>	
<b>What is your date of birth?</b>	..... Age: .....
<b>Sex</b>	A. Male B. Female
<b>What is your Gender?</b>	A. Male B. Female C. _____ D. Prefer not to say
<b>Ethnicity/Tribe</b>	
<b>Residence</b>	A. Urban B. Rural
<b>What is the highest level of school you attended: primary, "O" level, "A" level, tertiary or university?</b>	A. Primary school B. Secondary school C. Bachelor's Degree D. Master's Degree E. Ph.D. or higher F. Others .....
<b>What is your Marital Status?</b>	A. Single B. Married C. Divorced D. Widowed E. Others: .....
<b>What is your Religion?</b>	
<b>What is your Occupation?</b>	

<b>HIV status</b>	<p>A. Positive</p> <p>B. Negative</p> <p>C. Unknown</p>
<b>Have you ever been Vaccinated for HBV?</b>	<p>A. Yes</p> <p>B. No</p> <p>C. Unknown</p>
<b>What is your sexual orientation?</b>	<p>A. Homo-sexual</p> <p>B. Bi-sexual</p> <p>C. Others.....</p>
<b>Have you ever had condomless anal sex?</b>	<p>A. Yes</p> <p>B. No</p>
<b>How many sexual partners have you had in the last 12 months?</b>	.....
<b>Did you use a Condom during your last sexual encounter?</b>	<p>A. Yes</p> <p>B. No</p>
<b>Have you ever used injectable drugs?</b>	<p>A. Yes</p> <p>B. No</p>

## SECTION B (Knowledge of HBV infection and prevention)

Questions assess knowledge of HBV causation, symptoms, transmission, diagnosis, treatment prognosis, vaccination and PEP.

Question	Yes	No
1. Have you ever heard about HBV?		
2. Does HBV affect the liver?		
3. Does HBV cause liver cancer?		
4. Do all those with HBV infection show symptoms?		
5. Are nausea, vomiting, and loss of appetite common symptoms of hepatitis B?		
6. Can HBV be transmitted through sexual intercourse?		
7. How about through condomless sex?		
8. Are persons with more than one sexual partner at risk of HBV?		
9. Can Hepatitis B be transmitted by using blades of the barber/ear and nose piercing?		
10. Is Hepatitis B curable?		
11. Can HBV can cause death?		
12. Can HBV be transmitted through kissing?		
13. Can HBV be transmitted through contact with body fluids like blood and semen?		
14. If your partner has HBV, can they transmit the infection to you?		
15. Can HBV be spread through sharing needles?		
16. Is HBV preventable?		
17. Does HBV have a vaccine?		
18. Do you think HBV can be tested?		



19. Do you think HBV has post-exposure prophylaxis?		
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## SECTION C

### Questions assessing the attitudes

Question	Yes	No
1. Do you think you can get hepatitis B?		
2. Do you think MSM are at a higher risk of HBV as compared to the general population?		
3. Would you go to the health facility if you thought you had HBV?		
4. Do you think the Hepatitis B vaccine is safe?		
5. Do you believe that vaccination could prevent HBV transmission?		
6. Hepatitis B is more serious than HIV/AIDS?		
7. Do you know the place where one can get hepatitis B immunizations?		
8. Are the vaccines affordable (free or low cost)?		
9. Do you think you should receive hepatitis B vaccinations?		
10. Do you think you can easily access a hepatitis test?		

## SECTION D

### Questions assessing practices towards HBV infection and prevention

Question	Yes	No
1. Have you ever been tested for hepatitis B?		
2. Do you know your partner's HBV status?		
3. Have you ever been vaccinated for HBV?		
4. How many doses of the HBV vaccine did you receive?		
5. Is your partner vaccinated against HBV?		
6. Do you wear condoms during sexual intercourse?		
7. Do you share needles with others?		
8. In case you are diagnosed with Hepatitis B, would you go for further investigation and treatment?		

**Do you have anything else you want to add, any questions, clarification, concerns, etc.?**

**THANK YOU**

**SECTION E**

**Laboratory diagnostic results**

Patient Identifier:	
Did the participant sign the consent form?	
Date and time of sample collection	
Name of laboratory personnel who collected sample	
Date and time sample analyzed:	
Name of the testing Kit used	
The Serial number of the test kit used	
The expiry date of the Test kit used	
Name of laboratory personnel who tested sample	

Participant result: .....

Reviewed by,

Name: .....

Date: .....

Signature: .....

Approved by:

Name: .....

Date: .....

Signature: .....