RESEARCH
O&G Forum 2024; 34 – 3s: 3239-3248

HEPATITIS B VACCINATION STATUS AND ASSOCIATED FACTORS AMONG HEALTH CARE WORKERS INA HOSPITAL OF KICUKIRO DISTRICT-KIGALI, RWANDA

Onesime MANISHIMWE [1]*, Dr. Clemence NISHIMWE, PhD [2], Dr. Monica Nyamusi Mochama, MD [3], Ishimwe Rugamba camarade [4]
[1, 2, 3] Department of Public Health, Mount Kenya University, Rwanda
[4] Rwanda Biomedical Centre, Rwanda
*Corresponding Author Email: onesimema85@gmail.com

Abstract
Hepatitis B virus remains a major concern to world health; Hepatitis B virus infection is contracted to health care workers (HCWs) who happen to have contact with patient blood and bodily fluids. Given that HBV infection is a proven occupational hazard, unvaccinated healthcare workers run the risk of catching the pathogen while at work. In comparison to the population as a whole, healthcare workers (HCWs) are thought to be particularly vulnerable to the risk of contracting HBV infection. According to WHO, 2 million HBV infections worldwide arise from 3 million HCWs suffering work-related injuries each year, with 70% of those infections taking place in the WHO AFRO region. Due to exposure to contaminated blood and bodily fluids, especially through percutaneous injuries, HCWs are at a significant risk of developing the HBV. The results show that HCWs in Africa have a high risk of contracting hepatitis B. According to a thorough investigation and meta-analysis on the hepatitis B vaccination rate among healthcare professionals in Africa, 25% of them had got all three doses of the vaccine. Hepatitis B is highly endemic in sub-Saharan countries; insufficient Vaccination is the main reason why hepatitis B still prevails in sub-Saharan countries. Nevertheless, there is limited data on HBV vaccination status and factors associated with HBV vaccination among Rwandan health care workers. The purpose of this study was to assess the level of HBV vaccination among healthcare workers and other relevant variables in a hospital of Kicukiro-District, Kigali-Rwanda. This study employed analytical cross-sectional methodology to investigate the relationship between HBV vaccination status and different factors among 194 health care workers (doctors, nurses, laboratorians, and others) in Masaka district hospital.Gathered data were analyzed using STATA 15 at monovariable, bivariable, and multivariable analysis levels. Chi-square test and logistic regression analysis were computed to identify participants' characteristics associated with being vaccinated for HBV. During analysis, a statistical significance was assumed at a p value less than 0.05. The findings from this study show that of the 194 HCWs, about 80.4% (n=156) had received at least one dose of HBV vaccine with only 66.0% (n= 128) fully vaccinated. Regarding predictors of HBV vaccination among the HCWs; Clinical staffs were 72.3 [aOR: 72.3 with 95% C.I: 5.4-974.3] times more likely to be vaccinated than non-clinical staffs while HCWs self-perceiving to be at risk of HBV acquisition were 16.5 [aOR:16.5 with 95% C.I: 1.2-219.2] folds more likely to be vaccinated for HBV than those who do not. Overall, this study reveals HBV vaccination is still low as compared to the 100% CDC recommendation for HCWs and other people at high risk of HBV acquisition. Thus, the need for health promotion programs and interventions to avail and address main barriers to the uptake of vaccination including lack of information which make some people perceive to be at low risk of HIBV infection.
Keywords: Hepatitis B, Vaccination Status, Health Care Workers, Rwanda.

INTRODUCTION

Health care workers are thought of greater prospect of developing HBV infection compared with overall population, according to WHO 3 million HCWs annually suffer a work-related injury which result in 2 million of HBV infections globally, and seventy percent of those HBV Infections happen throughout the WHO AFRO area (Ssekamatte et al., 2020). Due to exposure to contaminated bodily fluids or blood, especially through percutaneous injuries, HCWs are at a significant likelihood of contracting the HBV.

Hepatitis B virus (HBV) is ten times more contagious than hepatitis C virus (HCV), and 100 times more contagious than HIV (Taye et al., 2019). Additional recognized methods of HBV transmission to HCWs include contact with infected objects and exposed skin, patients are also at risk from HBV-infected HCWs. HBV vaccine coverage among HCW is 60–77 percent in economically advanced and low HBV endemic regions like North America and Europe, and this has significantly reduced HBV infection rates among HCW, which are 1.5 times higher than in the general population (Ngum et al., 2021).Moreover, HBV vaccination is now included in mass immunization

programs in all economic advanced countries (Ngum et al., 2021).HBV vaccination rates among HCW have been reported to be unsatisfactory in Southern Asia and other low-income nations, about sixteen to sixty percent of HCW have gotten a full dose of HBV vaccination, according to reports from India, Pakistan, Nepal, Egypt, Brazil, and Nigeria (Tatsilong et al., 2016). Paramedics in these countries were less likely than doctors to be aware of HBV transmission and to receive HBV vaccination. Despite the severity of HBV infection among HCWs, in developed countries, whenever two-thirds of HCWs get vaccine, combined with proper application of a precautionary approach, the incidence of HBV predominance amongst HCWs falls dramatically (Soomar et al., 2021).

HBV endemicity influences the frequency of HCW exposure to HBV, as a result, Asia and Africa account for 90% of HBV infections. In these countries, hospitals are overburdened, and HCWs serve vast communities with HBV burden of 5 to10 percent (Duodu et al., 2022). Over seventy percent of HCWs in countries with high or moderate endemicity have sharp injuries, with an average of two pricks with a needle each year and four throughout their working careers, but only roughly a third of needle-stick injuries are thought to be reported (Lancashire, 2018).

According to the data available universal precautions like safe disposal of needles, wearing gloves while performing phlebotomy, and wearing goggles were also underutilized among HCWs in low-income countries. In Taiwan, there were 645 HCWs working in 16 tertiary-care hospitals who sustained 7550 needle-stick injuries in a single year, 67 percent of the injuries were caused by hollow-bore needles (Yuan et al., 2019). Presently neither of these findings can be said to have been reported in Rwanda (Makuza et al., 2019).

HBV infection in HCWs can be reduced when certain strategies are implemented, in the United States, HBV infection decreased by ninety five percent over twelve years after 67 percent of HCW received three doses of HBV vaccine (17 000 infected HCW in 1983, 400 in 1995) (Burnett et al., 2012). The United States, on the other hand, is a low-endemic HBV country with excellent universal precautions(Kwon & Lee, 2011). In hyper-endemic and intermediate endemic countries, such a decline in HBV infection among HCWs has yet to be reported. Studies in Ethiopia have revealed that HCWs lack knowledge of HBV transmission, which prevents them from taking necessary precautions such using disposable gloves against blood-borne illnesses (Yizengaw et al., 2018). This result is consistent with other studies conducted in Kenya on factors affecting HBV vaccination in a medical training that demonstrate that untrained individuals are more likely of being infected by HBV (Maina & Bii, 2020). For health care workers (HCW), hepatitis B is a serious occupational hazard, there has been evidence that the prospect of HBV infection is four times as much for HCWsin studies conducted in Ethiopia (Azodo et al., 2012). The primary risk factor for HCWs is direct interaction with infectious material, especially blood that has been exposed to HBV, or a needle stick injury with body fluids that have been exposed to HBV(Coppola et al., 2016).Capping hollow-bore needles, in particular, seems to make needle stick injuries more likely (Soomar et al., 2021).

World health organization AFRO region is HBV endemic region, accounting for 10% of all HBV-infected people worldwide(Sonderup & Spearman, 2022). HBV Vaccination status, HCWs attitudes toward HBV vaccination, HCWs practice of universal precautions, are all lacking information that is necessary to justify approaches for better preventing HBV infection (Ssekamatte et al., 2020). In addition to that HCWs infected with HBV as a result of their work in the high-income countries have a better prognosis than HCWs in constrained resources settings, as a result of the use of post-exposure prophylaxis and vaccination status. According to WHO estimates in 2019, about 296 million were chronically infected worldwide and nearly 1 million die annually (Machmud et al., 2021). Moreover, WHO state that approximately 1.5 million of new cases are recorded globally each year(Aberra et al., 2019).

Prevalence of HBV varies across countries; the overall prevalence of HBV in developing countries mainly East Asia, sub-Saharan Africa and in the Western Pacific region were about 6% of the adult population(Malewezi et al., 2017). The WHO reports that carrier rates in South America, Asia, and Africa can reach 8%, with sub-Saharan Africa bearing 20% of the worldwide burden(Aberra et al., 2019). This suggests that there is a gap in the management and control of the pandemic in Africa. Additionally, despite the existence of a very effective HBV vaccine, adult populations in sub-Saharan African nations do not always receive vaccinations(Ngum et al., 2021).

Data on HBV vaccination status in east Africa are isolated and limited to studies of certain subgroups, such as blood donors, expectant mothers receiving prenatal care, and HIV-positive people. There are few studies in the literature that look at HCWs' vaccination status at the national and regional levels (Muvunyi et al., 2018).Data gathered shows that HCWs in East Africa are disproportionately affected by HBV infection compared to the general population due to occupational exposure risks (Ochwoto et al., 2021). Studies have shown varying prevalence rates of HBV infection among HCWs in different East African countries, ranging from 3% to 26% (Kiire et al., 2020). Factors contributing to HBV transmission among HCWs include inadequate vaccination coverage, inconsistent adherence to infection control measures, lack of access to personal protective equipment (PPE), and limited awareness of occupational risks (Kiire et al., 2020).

This indicates that HCWs have not had their risk for HBV infection thoroughly assessed. Understanding the HBV vaccination status would therefore provide evidence-based information on that status as well as a variety of suspected risk factors for HBV infection among HCWs.

Moreover, prophylaxis against this elevated risk of infection is essential to reducing the risk of infection, few research in sub-Saharan Africa have looked at how HCWs view HBV(Sonderup & Spearman, 2022). This is crucial because HCWs' awareness of HBV has a dual effect. In Rwanda the current statistics show the prevalence in different specific population(Makuza et al., 2019).Study conducted among people who attended a screening campaign in 2018 across 24 districts in Rwanda showed the prevalence of 3.9% among the participants(Muvunyi et al., 2018).

Another investigation carried out at the university teaching hospital of Butare in Rwanda between October and December 2013, found the prevalence of 4.5 % HBV infection among HCWs(Kateera et al., 2014).Another study revealed a prevalence of 2.9% of acute and chronic HBV infection among medical staff at tertiary and teaching hospitals in Rwanda in a Cross-sectional study of chronic hepatitis B virus infection in Rwandan high-risk groups (Umutesi et al., 2021).

Since 2015, the ministry of health in Rwanda has adopted the national guidelines on the prevention and management of HBV which encompasses a wide range of different measures and interventions, designed to reduce the incidence of HBV infections such measures include the effective use of safety

devices, training of health care workers on safety protocols and vaccination (Muvunyi et al., 2018). This has helped to lower the risk of HBV transmission, but little is known on vaccination status and associated factors among health care workers in Rwanda (Walker & Musabeyezu, 2015).

As known, the WHO Global action plan for the elimination of HBV; targets is 90% reduction of new HBV infections by 2030(Auta et al., 2018).Health care workers HBV infections are estimated in the range of 1.4–9.5 per 100 workers per year, at the global level, and this range is believed to be even higher in developing countries(Garzillo et al., 2020).The Government of Rwanda has done an excellent work to address this problem, by implementing different effective intervention, notably the vaccine-based interventions, since 2015 the MOH introduced the policy of vaccinating all HCWs, since they are at increased risk of being infected by HBV(Walker & Musabeyezu, 2015).Training of the HCWs on safe injection practice and other infection, prevention and control practice (IPC), as well as the introduction of cost effective and reliable diagnostic tools(Kateera et al., 2014).Despite the accessibility of vaccination and adoption of high infection control quality, there are strong evidence that HBV prevalence among HCWs in sub-Saharan Africa is high and Vaccination status data are scarce. Moreover, ancillary staff (cleaners) in low-resource health care settings are not required to be vaccinated against HBV and have poor infection prevention and control knowledge (Simidele et al., 2018).To ensure the elimination of HBV, all HCWs must get vaccinated, but there is limited up to date data on Vaccination status of HBV and associate factors amongst Rwandan healthcare workers. The purpose of this study was to assess the extent of vaccination against HBV infection among healthcare workers and the variables that affect vaccination status among healthcare workers in a hospital of Kicukiro District, Kigali-Rwanda.

MATERIALS AND METHODS

Research design

In this study, the researcher used a cross-sectional research design and adopted a quantitative research approach.

Participants

The study population consisted of all health care workers in a hospital of Kicukiro district, Specifically Masaka district hospital, in total 194 health care workers (doctors, nurses, laboratorians, etc.) participated in the survey.

To determine the sample size, we used the rule of thumb: This technique involves using a general guideline to determine sample size. For example, a common rule of thumb for survey research is to have at least 100 participants. In our case all HCWs in Masaka District Hospital who participated in the survey was (n) = 194.

Inclusion Criteria

Health care workers working in Masaka district hospital in Kicukiro who were willing to participate in our study were enrolled.

Exclusion Criteria

HCWs who refused to consent to participate in the study were excluded.

Research instruments

By using sample questionnaires from various guiding papers as a guide, the questionnaire was created by matching the questions to the study's aims and research questions. The survey was broken into several sections, including: the questionnaires for background information, knowledge of hepatitis B infection transmission and prevention, hepatitis B vaccination, and awareness of hepatitis B in healthcare settings. These surveys were modified to take into account Rwanda-specific population and health challenges.

Several stakeholders who are hospital administration representatives were asked for their opinions. The appropriate institutions assessed and approved the survey protocol. The background details the questionnaire included all pertinent demographic data that were used to determine the risk factors for HBV among hospital staff in Masaka. The data collected were demographic data, such as age, sex, marital status, level of education, and occupation, collected. The knowledge on transmission and prevention of hepatitis B infection's questionnaire. We also gathered data on variables influencing HBV vaccination status among HCWs at Masaka Hospital, like awareness of the complications of hepatitis B infection and awareness of the disease's prevention methods, which among other factors, raises the danger of contracting hepatitis B in a medical environment. Information on HBV vaccination status was determined using the Hepatitis B Vaccination Questionnaire confirmed with hospital personnel files. The HCWs were asked questions on the following topics: How effective they believe the hepatitis B vaccine is at preventing hepatitis B virus infection and whether they have ever taken the vaccine. To see if there was a connection between vaccination status and other characteristics, the data will be connected with one another.

Data analysis procedure

Data collected for the study was arranged by breaking them down into constituent parts to enable the researcher extract new meaning from them. The techniques whereby the researcher exploring manipulates available data/information to expose latent information that would enable a summary description of the subject studied to be made is referred to as data analysis. The first step was data preparation through data entry and cleaning and then data were imported into Stata from spreadsheet, this was done while also checking for any missing or inconsistent data and handle them appropriately, the following step was data Inspection to understand its structure and the types of variables either categorical or continuous. Frequency tables were generated for categorical variables such as gender, job category, years of service, vaccination status etc. Chi-square test was performed to check for associations between categorical variables and vaccination status.

Ethical consideration

The research committee at Mount Kenya University has given its ethical approval before the study is actually conducted. Before beginning the data collection, the Kicukiro District hospital administration granted written permission for the research to be conducted. Data gatherers asked healthcare workers to sign consent forms. Their names and identities remained anonymous. Neither names nor phone numbers was used in the survey.

RESULTS

Table 1: Demographic Characteristics of the Respondents

Variable	Frequency(n)	Percent (%)
Gender		
Male	41	21.1
Female	153	78.9
Age, M [Min, Max]	30[18,54]	
18 to 29	109	56.2
30 to 39	64	33
40 years+	21	10.8
Marital status		
Single	104	53.6
Married	81	41.8
Divorced/Separated/Widowed	9	4.6
Education		
Secondary and below	56	28.9
Diploma (A1) and Above	138	71.1
Profession/Occupation		
Clinical staffs*	142	71.7
Non-clinical staffs**	51	26.3
Work experience		
0-3 years	93	47.9
4 years +	101	52.1
Total	194	100

*Clinical staffs doctors, Nurses, Midwives, Dentists, Lab technologists, Ophthalmologists, Radiologists and social workers. **Non-clinical staffs were Cleaners

Source: Primary data 2023

The table 1 shows that of the 194 healthcare workers, majority were females (78.9%) and medical staffs (71.7%), more than a half aged 19-29 years (56.2%) and single (53.6%), and nearly a halfhad a working experience of four (4) years or more (52.1%).

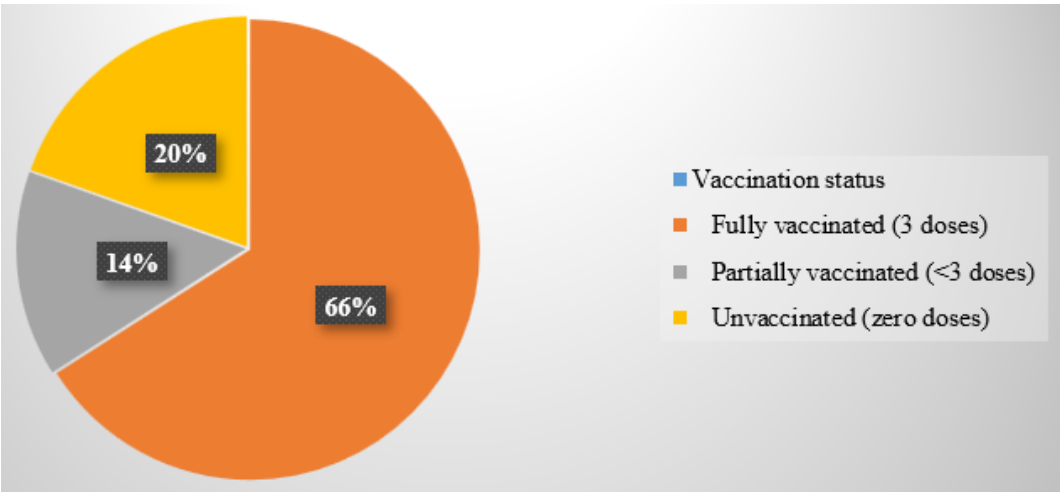

Figure 1: Proportion of HCWs ever vaccinated for HBV infection

The figure 1 illustrates that of the 194 HCWs, 66.0% were fully vaccinated for HBV while 14% were partially vaccinated and 20% unvaccinated. The following table shows further information about vaccination among the study participants.

Table 2: Vaccination Information among HCWs

Variable	Frequency(n)	Percent (%)
Have you ever received hepatitis B vaccination		
No	38	19.6
Yes	156	80.4
Total	**194**	**100.0**
Vaccination status		
Yes (3 doses)	**128**	66.0
Yes (Less than 3 doses)	**28**	14.0
No (zero doses)	38	20.0
Total	**194**	**100.0**
Whether fully vaccinated (only vaccinated)		
No	28	17.9
Yes	128	82.1
Total	**156**	**100.0**
When did you receive the last dose of hepatitis B vaccination		
1 years or less	46	29.5
2 to 3 years	57	36.5
4 years and more	53	34.0
Total	**156**	**100.0**

The table 2 shows that 80.4% (156) HCWs had ever been vaccinated for HBV. Of the 156 ever vaccinated HCWs, about 17.9.0 % were not fully vaccinated; they received 1 or 2 doses of the vaccine. The prevalence of full vaccination was about 66.0%. Moreover, about 29.5% of them were vaccinated in a less than 1-year period.

Table 3: HBV Knowledge among Health Care Workers

Variable	Frequency(n)	Percent (%)
Ever heard of hepatitis B		
No	20	10.3
Yes	174	89.7
Knows that hepatitis B is a virus		
No/No answer	51	26.3
Yes	143	73.7
Knowledge of HBV transmission modes		
HBV can be transmitted through sexual intercourse		
No	60	30.9
Yes	134	69.1
HBV can be transmitted from mother to child		
No	69	35.6
Yes	125	64.4
HBV can be transmitted blood transfusion		
No	55	28.3
Yes	139	71.7
HBV can be transmitted through sharp materials		
No	55	28.3
Yes	139	71.7
HBV can be transmitted through fluids contact		
No	175	90.2
Yes	19	9.8
Flies and mosquito spread HBV		
Yes or may be	54	27.8
No	140	72.2
Risks of to acquire HBV infection		
Unsafe injections		

Variable	Frequency(n)	Percent (%)
No	68	35.1
Yes	126	64.9
Unsafe waste handling		
No	79	40.7
Yes	115	59.3
Sharing sharps		
No	100	51.5
Yes	94	48.5
Blood transfusion		
No	138	71.1
Yes	56	28.9
Knows organ affected		
No	37	26.6
Yes	102	73.4
Knowledge of HBV symptoms		
Fever		
No	115	59.3
Yes	79	40.7
Vomit		
No	112	57.7
Yes	82	42.3
Knows HBV complications		
No	33	17
Yes	161	83
Jaundice		
No	89	45.9
Yes	105	54.1
Abdominal discomfort		
No	93	47.9
Yes	101	52.1
Clay color stool		
No	120	61.9
Yes	74	38.1
Knowledge category		
Low (0-50%)	66	34.0
Fair (51-75%)	58	29.9
Good (76-100%)	70	36.1
Total	**194**	**100**

The table 3 shows that of the 194 HCWs, about 89.7% had ever heard HBV, 73.7% knew that a virus causes HBV, 73.4% knew that HBV affect the liver, 83.0% knew complications of the infection including liver cirrhosis, cancer, and anemia. For each correctly answered question a score of 1 was given and a total of 21 questions were asked. A percentage score was computed for each study participants and score between 0 to 50% was considered low, 51 to 75% Fair, and 76 to 100% Good. This was done according to (Baig et al., 2020).Moreover, about 36.1% had good knowledge while 29.9% and 34.0% had fair and low knowledge, respectively. The vaccination status among health care workers varies, influenced by a multitude of factors. Understanding these factors is paramount for developing targeted interventions and policies aimed at improving hepatitis B vaccination coverage among health care workers. Table 4.4 shows significance of the association of the demographic, knowledge, and beliefs with vaccination status in Masaka district Hospital.

Table 4: Factors Associated with HBV Vaccination among Health Care Workers

Variables		Received HBV vaccine			
	N	No	Yes	*X2 value*	X^2 *p* value*
Socio-demographic characteristics					
Gender					

Variables		Received HBV vaccine			
	N	No	Yes	*X2 value*	X^2p value*
Male	41	4(9.8)	37(90.2)	3.2	0.074
Female	153	34(22.2)	119(77.8)		
Age group					
18 to 29	109	29(26.6)	80(73.4)	7.8	0.020
30 to 39	64	7(10.9)	57(89.1)		
40 years+	21	2(9.5)	19(90.5)		
Marital status					
Single	104	26(25.0)	78(75.0)	10.3	0.006
Married	81	8(9.9)	73(90.1)		
Divorced/Separated/Widowed	9	4(44.4)	5(55.6)		
Education					
Secondary and below	56	33(58.9)	23(41.1)	77.3	<0.001
A1 and above	138	5(3.62)	133(96.4)		
Profession/Occupation					
Non-clinical staffs	51	35(68.6)	16(31.4)	105	<0.001
Clinical staffs	143	3(2.1)	140(97.9)		
Work experience					
0-3 years	93	28(30.1)	65(69.9)	12.5	<0.001
4 years and above	101	10(9.9)	91(90.1)		
Knowledge on HBV infection**					
Low (0-50%)	66	30(45.5)	36(45.5)		<0.001
Fair (51-75%)	58	7(12.1)	51(87.9)	44.8	
Good (76-100%)	70	1(1.4)	69(98.6)		
HBV risk and vaccine perception					
Perceived effectiveness of HBV vaccine					
Ineffective	41	24(58.5)	17(41.5)		
Somehow effective	60	7(11.7)	53(88.3)	50.5	<0.001
Very effective	93	7(7.5)	86(92.5)		
Perceived risks of HBV acquisition					
Not at risk	28	22(78.6)	6(21.4)		
At risk	166	16(9.6)	150(90.4)	72.3	<0.001
HCWs are at high risk of HBV					
No-low/no answer	43	24(55.8)	19(44.2)	46.0	<0.001
Moderate to high	151	14(9.3)	137(90.7)		

* X^2p value for chi-square test **HBV knowledge: Causative agent, transmission modes, affected organ, symptoms and complications

Source: Primary Data 2023

The table 4 shows that all collected demographic, knowledge, and belief variables were statistically associated with HBV vaccination status (p value<0.05) except gender. HBV vaccination was significantly associated with increasing age (90.5%), being married (90.1%), having university diploma and above (96.4%), being a clinical staff (97.9%), and feeling at high risk of HBV (90.4%), and perceiving that HBV vaccine is highly effective (92.5%). The table also shows that non-clinical staffs were significantly less vaccinated (31.4%) as compared to medical staffs (97.9%). Similarly, vaccination prevalence was increasing participants' knowledge category; 45.5%, 87.9%, and 98.6% among HCWs with low, fair, and good knowledge, respectively.

Table 5: Multivariate Analysis of Independent Factors and Vaccination Status Among Health Care Workers

Variables	COR	95% CI		p value	aOR	95% CI		p value
		Lower	Upper			Lower	Upper	
Age group								
18 to 29	1				1			
30 to 39	3	1.2	7.2	0.017	3.8	0.7	18.3	0.100
40 years+	3.4	0.8	15.7	0.11	1.6	0.1	27.8	0.751

Variables	COR	95% CI		p value	aOR	95% CI		p value
		Lower	Upper			Lower	Upper	
Marital status								
Single	1				1			
Married	3	1.3	7.1	0.011	0.3	0.1	1.9	0.217
Divorced/Separated/Widowed	0.4	0.1	1.7	0.216	0.5	0.1	5.8	0.617
Profession/Occupation								
Non-clinical staffs*					1			
Clinical staffs*	102.1	28.2	369.9	<0.001	72.3	5.4	974.3	0.001
Education								
Secondary and below	1				1			
Diploma and above	38.2	13.5	107.9	<0.001	1.9	0.2	16.2	0.578
Work experience								
0-3 years	1				1			
4 years and above	3.9	1.8	8.6	0.001	1.6	0.3	8.7	0.555
Perceived effectiveness of HBV vaccine								
Ineffective	1				1			
Somehow effective	10.7	3.9	29.2	<0.001	1.8	0.3	10.7	0.531
Very effective	17.3	6.4	46	<0.001	3.9	0.6	26.7	0.161
Knowledge on HBV infection								
Low (0-50%)	1				1			
Fair (51-75%)	6.1	2.4	15.3	<0.001	1	0.2	5.1	0.981
Good (76-100%)	57.5	7.5	439	<0.001	0.8	0.1	14.2	0.903
Perceived risks of HBV acquisition								
No	1				1			
Yes	34.4	12.2	97.3	<0.001	16.5	1.2	219.2	0.034
HCW are at high risk of HBV								
No-low/no answer	01	0.03	0.2	<0.001	7.1	0.7	73.1	0.090
Moderate to high	1							

Source: Primary data

All variables showing a statistical significance at a chi-square *p* value less than 0.05 and fitting for logistic regression were all included in one logistic regression model producing adjusted odd ratios and individually computing crude odd ratios. The table 6 shows how every variable uniquely contribute to having received at least one dose of HBV vaccine (Yes or No).

The table 5 shows that of all (9) variables associated with HIV vaccination among HCWs, only two were uniquely predicting HBV vaccination among HCWs and they include being in clinical staffs and self-perception of being at high risk of HBV acquisition. Clinical staffs were72.3 [aOR: 72.3 with 95% C.I:5.4-974.3] times while those considering themselves at risk of HBV acquisition were 16.5 [aOR:16.5 with 95% C.I:1.2-219.2] times more likely to be vaccinated for HBV. For further understanding on apparent disproportionate risks of being non-vaccinated among non-clinical staffs, participants' knowledge level was cross-tabulated HCWs' occupation.

DISCUSSION

This study reports that of the 194 HCWs, about 80.4% had received at least one dose of HBV vaccine with only 66.0% were fully vaccinated. Clinical staffs were 72.3 [aOR: 72.3 with 95% C.I: 5.4-974.3] times more likely to be vaccinated than non-clinical staffs. Moreover, HCWs considering themselves to be at risk of HBV acquisition were 16.5 [aOR:16.5 with 95% C.I: 1.2-219.2] folds more likely to be vaccinated for HBV than those who do not. This part discusses HBV vaccination prevalence and factors associated with being vaccinated among the HCWs. Current prevalence of HBV vaccination among HCWs shows that about 80.0% HCWs ever received at least one HBV vaccine dose and 66% of full vaccination have been reported in many other studies but with varying rates.

On one hand, current rate of HCWs who received at least one dose of HBV vaccine is high in comparison to the recent available data published by WHO, The WHO has estimated that HBV vaccination coverage amongst health care workers is only 18%-39% in low and middle-income countries while it is estimated to be 67%-79% in high-income countries(Ali et al., 2023).The rates of Hepatitis B vaccination in this study are comparable to the rates of vaccination obtained in studies conducted in Europe and North America, including the USA and Canada, which report more than 70% of HCWs complete vaccinated and 90% vaccinated with at least one dose of vaccination(Marković-Denić et al., 2013). According to the results, this study's complete vaccination status rates were higher than other African countries for instance in Nigeria, healthcare workers predominantly from tertiary healthcare facilities, had a complete vaccination rate of 36.2 to 59.4%(Issa et al., 2023).

The current study suggested that different predictors were associated with complete vaccination status in a hospital of Kicukiro district, In addition to that the results of the current

study is comparable to that reported in Kenyan of82.8% of (Mwangi et al., 2023),and in Bangladeshi of66.6%(Harun et al., 2023). However, current rate is lower 96.0% reported in reported in Pakistan (Soomar et al., 2021).

Current prevalence of taking three recommended doses of HBV (66.0%), on the other hand, is higher than that reported in Kenya of 53.1%(Mwangi et al., 2023), and Nigeria of 42.0%(Mwangi et al., 2023) but slightly lower than that in Pakistan of 69.4%(Soomar et al., 2021). Alarmingly, dramatically lower proportion was reported in Cameroon of only 13.9%(Ngum et al., 2021). Differences are attributable to variations in HBV vaccination and awareness promotion programs in these countries. It is also a proxy of government effort in ensuring occupational health of people working in healthcare settings.

Additionally, these vaccination rates are still lower than the 100% recommended by the Centers for disease control and prevention for HCWs and other people at high risk of HBV(Hb et al., 2023).These findings show that there is a need to increase awareness of HCWs on infectious diseases acquired at hospital including HBV especially among supporting non-medical staffs.

Factors associated with HBV vaccination in this study including being clinical staffs [aOR: 72.3 with 95% C.I: 5.4-974.3] and perceived risk to HBV acquisition [aOR:16.5 with 95% C.I: 1.2-219.2] have also been reported in other findings. Current differences can be result of HBV knowledge levels among clinical and non-clinical staffs where non-clinical staffs disproportionally lack knowledge on healthcare infectious diseases including HBV. A Bangladeshi study revealed that HBV vaccine increase by HCWs' knowledge about HBV infection and vaccination(Harun et al., 2023).

An Ethiopian study revealed that level of education predicts HBV vaccination among HCWs along with age and marital status(Ayalew, Mohammed Biset, 2017). Moreover, a Cameroon study revealed that vaccination was associated with past exposure to HBV and perceived vulnerability to acquire HBV among HCWs(W Akazong et al., 2021). Lastly, although not reported in current study, unavailability of vaccines, inadequate knowledge about HBV, increased cost of the vaccine, and negligence were reported among factors hindering HCWs from getting vaccinated in Cameroon(Ngum et al., 2021).

CONCLUSION

This study shows the insufficient level of awareness of factors associated with vaccination status of hepatitis B infection among health care workers but a high rate of vaccination among clinical HCWs, but low in ancillary staff who should also be vaccinated against HBV. This suggests the need for a review of the policy guideline on HBV vaccination in Masaka Hospital. In addition, there is a need to increase the awareness of HBV vaccine and associated factors in order to meet the global target towards hepatitis B virus-free generations particularly in Africa.

Recommendations

The Ministry of Health and other stakeholders should increase the awareness of Hepatitis B virus and the importance of vaccination (especially among health care workers). The HCWs should be encouraged to be vaccinated and screened. HCWs should get regular trainings on IPC protocols and be educated about the causes, signs/symptoms, transmission, of Hepatitis B virus The government of Rwanda should invest in HCWs training because as it may have substantial benefits for population health specifically to reduce the burden of HBV in Rwandans.

References

1. *Duodu, P. A., Darkwah, E., Agbadi, P., Duah, H. O., & Nutor, J. J. (2022). Prevalence and geo-clinicodemographic factors associated with hepatitis B vaccination among healthcare workers in five developing countries. BMC Infectious Diseases, 22(1). https://doi.org/10.1186/s12879-022-07556-3*
2. *Kateera, F., Walker, T. D., Mutesa, L., Mutabazi, V., Musabeyesu, E., Mukabatsinda, C., Bihizimana, P., Kyamanywa, P., Karenzi, B., & Orikiiriza, J. T. (2014b). Hepatitis B and C seroprevalence among health care workers in a tertiary hospital in Rwanda. Transactions of the Royal Society of Tropical Medicine and Hygiene, 109(3), 203–208. https://doi.org/10.1093/trstmh/trv004*
3. *Kwon, S. Y., & Lee, C. H. (2011). Epidemiology and prevention of hepatitis B virus infection. In The Korean journal of hepatology (Vol. 17, Issue 2, pp. 87–95). https://doi.org/10.3350/kjhep.2011.17.2.87*
4. *Machmud, P. B., Glasauer, S., Gottschick, C., & Mikolajczyk, R. (2021). Knowledge, vaccination status, and reasons for avoiding vaccinations against hepatitis b in developing countries: A systematic review. Vaccines, 9(6), 1–26. https://doi.org/10.3390/vaccines9060625*
5. *Maina, A. N., & Bii, L. C. (2020). Factors affecting HBV vaccination in a Medical training College in Kenya: A mixed methods Study. BMC Public Health, 20(1), 1–12. https://doi.org/10.1186/s12889-020-8158-2*
6. *Makuza, J. D., Rwema, J. O. T., Ntihabose, C. K., Dushimiyimana, D., Umutesi, J., Nisingizwe, M. P., Serumondo, J., Semakula, M., Riedel, D. J., & Nsanzimana, S. (2019b). Prevalence of hepatitis B surface antigen (HBsAg) positivity and its associated factors in Rwanda. BMC Infectious Diseases, 19(1). https://doi.org/10.1186/s12879-019-4013-4*
7. *Malewezi, B., Omer, S. B., Mwagomba, B., & Araru, T. (2017). Protecting health workers from nosocomial Hepatitis B infections: A review of strategies and challenges for implementation of Hepatitis B vaccination among health workers in Sub-Saharan Africa. Journal of Epidemiology and Global Health, 6(4), 229–241. https://doi.org/10.1016/j.jegh.2016.04.003*
8. *Mwangi, I. A., Wesongah, J. O., Musyoki, V. M., Omosa-Manyonyi, G. S., Farah, B., Edalia, L. G., & Mbuchi, M. (2023). Assessment of hepatitis B vaccination status and hepatitis B surface antibody titres among health care workers in selected public health hospitals in Kenya. PLOS Global Public Health, 3(4), e0001741. https://doi.org/10.1371/journal.pgph.0001741*
9. *Muvunyi, C. M., Harelimana, J. D. D., Sebatunzi, O. R., Atmaprakash, A. C., Seruyange, E., Masaisa, F., Manzi, O., Nyundo, M., & Hategekimana, T. (2018). Hepatitis B vaccination coverage among healthcare workers at a tertiary hospital in Rwanda. BMC Research Notes, 11(1). https://doi.org/10.1186/s13104-018-4002-5*
10. *Ngum, A. M., Laure, S. J., Tchetnya, X., Tambe, T. A., Ngwayu, C. N., Wirsiy, F. S., Atuhaire, C., & Cumber, S. N. (2021a). Vaccination against Hepatitis B among health care workers in the Bamenda Health District: influence of knowledge and attitudes, Cameroon. Pan African Medical Journal, 40. https://doi.org/10.11604/pamj.2021.40.216.16856*
11. *Simidele, O. M., Oladimeji, A., Joseph, A. A., Aduayi, V., & Samuel, N. I. (2018). Burden of Hepatitis B Viral Infection among Workers in a Tertiary Health Institution*

in Southwestern Nigeria. Open Journal of Medical Microbiology, 08(04), 85–97. https://doi.org/10.4236/ojmm.2018.84008

12. *Sonderup, M. W., & Spearman, C. W. (2022). Global Disparities in Hepatitis B Elimination—A Focus on Africa. Viruses, 14(1). https://doi.org/10.3390/v14010082*
13. *Soomar, S. M., Siddiqui, A. R., Azam, S. I., & Shah, M. (2021). Determinants of hepatitis B vaccination status in health care workers of two secondary care hospitals of Sindh, Pakistan: a cross-sectional study. Human Vaccines and Immunotherapeutics, 17(12), 5579–5584. https://doi.org/10.1080/21645515.2021.1986332*
14. *Ssekamatte, T., Mukama, T., Kibira, S. P. S., Ndejjo, R., Bukenya, J. N., Kimoga, Z. P. A., Etajak, S., Nuwematsiko, R., Buregyeya, E., Ssempebwa, J. C., Isunju, J. B., Mugambe, R. K., Nalugya, A., Wafula, S. T., & Mutyoba, J. N. (2020). Hepatitis B screening and vaccination status of healthcare providers in Wakiso district, Uganda. PLoS ONE, 15(7 July).*
15. *Tatsilong, H. O. P., Noubiap, J. J. N., Nansseu, J. R. N., Aminde, L. N., Bigna, J. J. R., Ndze, V. N., & Moyou, R. S. (2016). Hepatitis B infection awareness, vaccine perceptions and uptake, and serological profile of a group of health care workers in Yaoundé, Cameroon. BMC Public Health, 16(1), 1–7. https://doi.org/10.1186/s12889-016-3388-z*
16. *Taye, M., Daka, D., Amsalu, A., & Hussen, S. (2019). Magnitude of hepatitis B and C virus infections and associated factors among patients scheduled for surgery at Hawassa University comprehensive specialized Hospital, Hawassa City, southern Ethiopia. BMC Research Notes, 12(1). https://doi.org/10.1186/s13104-019-4456-0*
17. *Umutesi, J., Klett-Tammen, C., Nsanzimana, S., Krause, G., & Ott, J. J. (2021). Cross-sectional study of chronic hepatitis B virus infection in Rwandan high-risk groups: Unexpected findings on prevalence and its determinants. BMJ Open, 11(12). https://doi.org/10.1136/bmjopen-2021-054039*
18. *Walker, T., & Musabeyezu, E. (2015). Hepatitis B in Rwanda: Closing the gaps to end an epidemic. Rwanda Journal, 2(1), 76. https://doi.org/10.4314/rj.v2i1.10f*
19. *Yizengaw, E., Getahun, T., Geta, M., Mulu, W., Ashagrie, M., Hailu, D., & Tedila, S. (2018). Sero-prevalence of hepatitis B virus infection and associated factors among health care workers and medical waste handlers in primary hospitals of North-west Ethiopia. BMC Research Notes, 11(1). https://doi.org/10.1186/s13104-018-3538-8*