

Determinants and uptake of Hepatitis B virus vaccination among healthcare workers: A Survey in a government-owned teaching hospital Nigeria

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Abstract:

Hepatitis B virus (HBV) infection is a primary worldwide health concern, partly due to poor vaccine uptake among healthcare workers who have increased chances of occupational exposure. Nigeria has one of the highest burdens of HBV infection, with an estimated 15% prevalence. Hence, the study objective assessed the determinant and uptake of the Hepatitis B vaccine among Health Care Workers (HCWs) in a Government-owned Teaching Hospital in Ogun State, Nigeria. The study utilized a descriptive cross-sectional design. Samples were determined using Kish Leslie's formula. Convenience sampling was used to select 124 healthcare workers. Data were collected using a self-administered questionnaire with a reliability of 0.723. Data analysis was done using descriptive, and Pearson Chi-Square and results were presented in tables depicting frequencies and percentages. Findings revealed that 62.9% of HCWs had been vaccinated at least once. However, only 10.5% of respondents were fully vaccinated, indicating a notable gap in the HBV vaccination among the different medical cadres. Factors influencing the uptake rate include vaccine availability (98.4%), distance to vaccination center 74.2%), needle prick (85.5%), HCWs attitude (81.5%), lack of awareness (85.5%), and lack of motivation (87.1%). There was a significant relationship between categories of healthcare workers and uptake of the HBV vaccine ($p=0.000$). In conclusion, the study calls for concerted efforts from healthcare institutions and policymakers to enforce full vaccination coverage among HCWs to mitigate the burden of Hepatitis B infection in healthcare settings, thus safeguarding the health of both HCWs and the broader community.

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INTRODUCTION

Hepatitis B (HB) is a dynamic, multi-modal, highly contagious, and pathogenic illness primarily affecting the human liver and caused by the HB virus. It is a blood-borne, vaccine-preventable liver disease with a higher risk of infecting the diseased liver with acute and chronic infections (Ndunguru et al., 2023). With almost 2 billion victims globally and the highest rates of morbidity and death seen in Africa and Asia, it is undoubtedly one of the 10 deadliest illnesses (Liu et al., 2021). Hepatitis has become a challenge to international public health as compared to other major infectious diseases such as HIV, tuberculosis, and malaria.

Among the severely impacted African nations, Sub-Saharan Africa has the highest endemicity of HB, with over 8% of the population infected with the virus. Other countries, like Zambia, Kenya, and Senegal, have intermediate endemicity, while North African nations have lower rates. Sub-Saharan African nations, including Nigeria, Namibia, Gabon, Cameroun, and Burkina Faso, have 240-400 million individuals with chronic HB, the leading cause of chronic liver disease. The virus

affects 15% of Nigeria's population, with 12-50% living with the infection in various states and cities (Alege et al., 2020).

Healthcare workers (HCWs, including general physicians, surgeons, nurses, and other medical staff) are a group with increased chances of occupational exposure to the Hepatitis B Virus (HBV) via horizontal transmission (Al-Abhar et al., 2020). Thirty-three percent of African healthcare professionals are exposed to percutaneous injuries at work each year, designating them as a high-risk category of contracting the disease (Issa et al., 2023). Severe healthcare conditions in developing countries, such as inadequate medical facilities and equipment and low healthcare worker-to-patient ratio, intensify the spread (Akazong et al., 2020). Approximately 3 million HCWs per year are exposed to occupational injury through accidental sharps injury, mucocutaneous contact, or blood contact with exposed skin, and about 2 million are exposed to HBV (Maltezou et al., 2019). The danger for healthcare workers is consequently four times higher than it is for the general population (Ndunguru et al., 2023).

The Centers for Disease Control and Prevention recommended a three-dose HBV vaccination to prevent the transmission of HBV among HCWs. However, HB vaccination has been in use since 1982. It is one crucial tactic for preventing and getting rid of the infection. The vaccine is administered within six months; the first dose is on day zero, the second is after a month, and the third is after six months. In 2016, the World Health Organization (WHO) set targets for eliminating viral hepatitis as a public health threat by 2030 and provided a global health sector strategy (GHSS) on viral hepatitis for 2016–2021 that has since been adopted and endorsed by 194 countries. Nigeria joined the League of Other Nations to sign up for the GHSS. It was among the few African countries that developed firm goals for eliminating viral hepatitis (Danjuma, 2019).

Despite the WHO strategy, the reduction in transmission of hepatitis was practically zero. This resulted in the need for efforts to support the provision of this vaccination to groups of healthcare professionals who have not yet contracted the disease while restricting treatments for other groups of infected employees (Ndunguru et al., 2023). Additionally, a few other elements contributed to the uptake of the hepatitis B vaccine, elements such as knowledge, perception, and awareness of the vaccination and health system factors such as vaccine accessibility and availability (Omotowo et al., 2018). Among the challenges causing this poor uptake identified by several studies include the cost of vaccination, fear of needle prick, and vaccine availability (Alege et al., 2020; Issa et al., 2023; Ogundele & Omotosho, 2020). It is worth noting that the Nigerian government only funds the childhood hepatitis B vaccination program, which means vaccination among HCWs will bear some costs. No policy or law mandates HBV vaccination for all healthcare workers in Nigeria. While few receive the HBV vaccination, many HCWs do not recognize the need for HBV vaccination, and of the few that received the vaccination, many of them did not receive a complete three doses (Hegazy et al., 2016; Issa et al., 2023; Orji et al., 2020). Hence, this study aims to assess the determinants and uptake rate of Hepatitis B virus vaccination among healthcare professionals at a Government-owned Teaching Hospital.

METHOD

The study adopted a descriptive cross-sectional design to assess the uptake rate of the Hepatitis B vaccine among healthcare workers in Olabisi Onabanjo University Teaching Hospital, Sagamu Ogun State. A descriptive cross-sectional design was chosen because the study is a survey and only gives a snapshot of the data collected.

Study Setting

This study was carried out among healthcare workers in Olabisi Onabanjo University Teaching Hospital, Sagamu, Ogun state, and included doctors, nurses, pharmacists, medical laboratory scientists, and health attendants. Inclusion criteria entail healthcare workers who are gainfully employed with Olabisi Onabanjo University Teaching Hospital and those who provide direct patient care or have direct contact with patients during their routine tasks. Exclusion criteria entail healthcare workers on an internship program, visiting, or for medical posting.

Sampling Size and Sampling Technique

The sample size for this study was estimated using a convenient sampling method. This method involves selecting participants based on their accessibility and availability to the researcher. This was done by recruiting available and willing HCWs to complete the questionnaire.

The sample size for this study was determined using Kish Leslie's formula, which was used by a similar study (Yakubu et al., 2017) at a 95% confidence interval and marginal error of 5%, considering a 10% nonrespondent rate. A 92.0% prevalence of hepatitis B vaccination among health workers from the Abiola et al. study was used (Abiola et al., 2016). 10% of the sample size was calculated and added to compensate for non-response/attrition rates. Therefore, 124 healthcare workers at OOUTH were recruited for the study.

Instrument, Data Collection, and Analysis

An adapted and structured questionnaire was designed to obtain information from the residents or respondents. The items in the questionnaire were generated from the literature reviewed in line with the research objective (Issa et al., 2023; Oni et al., 2022). The questionnaire consists of four sections. Section A consists of socio-demographic data, which includes age, gender, and work experience. Section B was titled Level of Knowledge of Healthcare Workers about Hepatitis B Vaccine. This entails twelve questions measured using Yes or No. A score of one (1) was allotted to each correct answer and zero (0) to each incorrect answer. The level of knowledge was classified into three parts: scores between 0 - 4 were classified as low knowledge, scores between 5-9 were classified as moderate knowledge, and scores between 10-11 were classified as high knowledge. Section C consists of questions to get data on the rate of uptake of the Hepatitis B vaccine among healthcare A total of three (3) questions were asked in this section: uptake status, number of doses taken as well as the healthcare worker's status on the booster dose of hepatitis B. Section D: This was titled factors influencing uptake of Hepatitis B vaccine among healthcare workers, the section has ten questions using Yes or No.

Data collection was executed through a self-administered structured questionnaire within four weeks (between August and September 2023). Similarly, data collection was facilitated by the recruitment of two research assistants, both of whom were nursing undergraduates. These individuals were selected for their familiarity with healthcare settings and ability to interact effectively with healthcare professionals. Before commencing data collection, the research assistants received training on the study's objectives, data collection procedures, and ethical considerations. The administered questionnaires were retrieved immediately after the process was completed.

Descriptive analyses were done and presented in tables indicating the percentage score and frequency. Inferential analysis was done to test hypotheses using the Pearson Chi-square test. The Statistical Package for Social Science (SPSS package) 26th edition was used for the data analysis.

A test-retest was done to ascertain the reliability of the instrument. The instrument's reliability was measured using 10% of the respondents (10% of 124=12). These questionnaires were shared amongst 12 healthcare workers at Babcock University Teaching Hospital. After collecting the questionnaires, they were assessed using Cronbach's alpha, and the reliability index was 0.723.

Ethical Consideration

The study received ethical approval from the OOUTH Health Research Ethics Committee. Participants were presented with an informed consent form detailing the study's purpose and requesting their consent to participate. The researchers ensured adherence to ethical principles, including informed consent, confidentiality, beneficence, non-maleficence, and justice. The information derived from the respondents in this study was treated with high confidentiality to protect private information. The respondents have the right to decide not to participate in the study. At any point, they might withdraw from this study with or without a valid reason.

RESULT

Socio-Demographic Characteristics of the Respondent

Most respondents were 88 (71.0%) females, 62 (50.0%) of whom were between the ages of 31-40. Also, the majority of the respondents are nurses; 45 (36.3%) and 55 (44.4%) of the respondents have between 11 and 15 years of experience (Table 1). 95 (76.61%) knew that the hepatitis B vaccine should be given as Post post-exposure prophylaxis. More than half of the respondents knew that the hepatitis B vaccine could be used to treat acute hepatitis B infection, and 113 (91.13%) Respondents knew that the whole dose hepatitis B vaccine protects against HBV. In comparison, 89 (71.77%) knew the vaccine was safe in pregnancy. However, only 10 (8.1%) respondents had a low knowledge of hepatitis B vaccine.

Over half of the respondents (66.9%) had a moderate level of knowledge, while 31 (25.0%) respondents had a high level of knowledge (Table 2).

Table 1. Socio-demographic characteristics of the respondent (N=124)

Socio-demographic characteristics		Frequency	Percentage
Sex	Male	36	29.0
	Female	88	71.0
Age	20-30yrs	30	24.2
	31-40yrs	62	50.0
	41-50yrs	29	23.4
	51yrs and above	3	2.4
Medical cadre	Nurse	45	36.3
	Doctor	19	15.3
	Med Lab scientist	26	21.0
	Ward attendant	20	16.1
	Cleaner	2	1.6
	Pharmacist	12	9.7
Year of experience	1-5yrs	16	12.9
	6-10yrs	32	25.8
	11-15yrs	55	44.4
	16-20yrs	14	11.3
	21 yrs and above	7	5.6

Table 2. Level of knowledge of healthcare workers about Hepatitis B vaccine

Level	Frequency	Percent
Low	10	8.1
Moderate	83	66.9
High	31	25.0

Uptake of Hepatitis B vaccine among healthcare workers

The result of the uptake of the Hepatitis B vaccine among healthcare workers revealed that 75.6% of nurses, 78.9% of doctors, and 76.9% of medical laboratory scientists were ever vaccinated with at least a dose of Hepatitis B vaccine. Overall, 78 (62.9%) of healthcare workers had ever been vaccinated, out of which only 13(10.5%) had taken three doses of the vaccine. However, most of them (76.6%) have not taken the booster dose of the vaccine (Table 3).

Table 3. Uptake of Hepatitis B vaccine among healthcare workers

Healthcare Workers	Vaccination Status			Number of doses			Uptake of booster dose	
	Yes (%)	No (%)	Never (%)	1 (%)	2 (%)	3 (%)	Yes (%)	No (%)
Nurse	34 (75.6)	11 (24.4)	11 (24.4)	34 (75.6)	23 (51.1)	7 (15.6)	17 (37.8)	28 (62.2)
Doctor	15 (78.9)	4 (21.1)	4 (21.1)	15 (78.9)	10 (52.6)	2 (10.5)	7 (36.8)	12 (63.2)
Med. Lab. Scientist	20 (76.9)	6 (23.1)	6 (23.1)	20 (76.9)	12 (46.2)	4 (15.4)	5 (19.2)	21 (80.8)
Ward Attendant	2 (10.0)	18 (90.0)	18 (90.0)	2 (10.0)	1 (5.0)	-	-	20 (100.0)
Pharmacist	5 (41.7)	7 (58.3)	7 (58.3)	5 (41.7)	-	-	-	12 (100.0)

Factors Influencing the Uptake of Hepatitis B Vaccine among healthcare worker

One of the challenges influencing vaccine uptake was the availability of the vaccine (98.4%). Moreover, 106 (85.5%) respondents believed distance could hinder access to vaccination centers, and 85.5% affirmed that fear of vaccine needle prick could influence the uptake level negatively. In comparison, 87.1% of respondents attested that lack of motivation to visit vaccination centers can influence the uptake level of the vaccine (Table 4).

Table 4. Factors Influencing the Uptake of Hepatitis B Vaccine among healthcare worker

Statements	Yes (%)	No (%)
The vaccine is available within the healthcare facility	122 (98.4)	2 (1.6)
I had a needle prick from a patient	92 (74.2)	32 (25.8)
Distance hinders access to the vaccination center	106 (85.5)	18 (14.5)
Attitude of vaccinators	101 (81.5)	23 (18.5)
Time spent at vaccine before being attended to	110 (88.7)	14 (11.3)
Fear of vaccine needle	100 (85.5)	18 (14.5)
Lack of motivation from the workplace to visit the vaccination center	108 (87.1)	16 (12.9)

Relationship between the categories of healthcare workers and level of knowledge to the uptake of Hepatitis B vaccination

The results in Table 5 revealed a significant relationship between the categories of healthcare workers and uptake of the Hepatitis B vaccine ($X^2 = 34.859$, $p = 0.000$). Likewise, there was a significant relationship between healthcare workers' knowledge level and uptake of the Hepatitis B vaccine ($X^2 = 6.335$, $p = 0.042$).

Table 5. Pearson Chi-square test showing the relationship between the categories of healthcare workers and level of knowledge to the uptake of Hepatitis B vaccination

Categories	Uptake of Vaccination		Total	X^2 (p-value)
	Yes	No		
Nurse	34 (75.6)	11 (24.4)	45	34.859 (0.000)
Doctor	15 (78.9)	4 (21.1)	19	
Med Lab scientist	20 (76.9)	6 (23.1)	26	
Ward attendant	2 (10.0)	18 (90.0)	20	
Cleaner	-	2 (100.0)	2	
Pharmacist	7 (58.3)	5 (41.7)	12	
Level of knowledge				
Low	3 (30.0)	7 (70.0)	10	6.335 (0.042)
Moderate	52 (62.7)	31 (37.3)	83	
High	23 (74.2)	8 (25.8)	31	

DISCUSSION

This cross-sectional tertiary hospital-based study on determinants of HBV vaccination status among HCWs revealed that the level of knowledge of HBV vaccination was between moderate and high. Most healthcare workers had moderate knowledge about the vaccine; a quarter of them (25%) had a high level of knowledge, while only 10 (8.1%) had a low level of knowledge about the vaccine. This finding was in line with the study in Cameroon, which found an acceptable level of knowledge among healthcare providers (Nouetchognou et al., 2016). Similarly, there is moderate knowledge about the Hepatitis B vaccine among healthcare providers in Uganda and Nepal (Rashid & Swaibu, 2021; Shrestha et al., 2020). The slight difference observed concerning the current study findings and reviewed literature might be due to the differences in the study setting and accessibility of information.

The uptake of HBV vaccine (at least one dose vaccination) by different HCWs varies; 75.6% of the nurses, 78.9% of the doctors, and 76.9% of the medical laboratory scientists, while only 13(10.5%) had taken three doses of the vaccine, this showed a very low complete vaccination of HCWs even though they are at high risk of contracting the concerned disease condition(Oyibo et al., 2022). A contrasting result was revealed by Ssekamatte et al., where a high percentage of healthcare workers were fully vaccinated in Uganda (Ssekamatte et al., 2020). Meanwhile, a similar result was reported in Southern Nigeria by Patrick et al. and Kooffrey-Ada et al., which revealed a low uptake level of the vaccine among healthcare workers (Kooffreh-Ada et al., 2021; Oyibo et al., 2022). A contrasting result was reported by Mwangi et al. who found that most healthcare workers in Kenya have been seroprotected against the hepatitis B virus(Mwangi et al., 2023). Also, over half of the healthcare workers in Tanzania and Accra have been vaccinated with hepatitis B (Aaron et al., 2017; Ansa et al., 2019). From the researchers' point of view, the disparity in the uptake level could be due to other studies being conducted on various HCWs in different hospitals. In contrast, the current study focused on one tertiary hospital.

Furthermore, this aligned with the study by Kisangau et al. (2019), which found a low percentage of fully vaccinated healthcare workers. In this study, only 10.5% of the respondents reported receiving the full three doses of the immunization, meaning that many HCWs are not fully immunized against HBV. Similarly, in Somalia, a study revealed that only 2.8% of medical students were fully vaccinated with HBV vaccine (Ali et al., 2023). The similarities in the results from these studies may be likened to the fact that the studies were carried out in developing countries.

To further substantiate the cause for the low level of fully vaccinated, the study revealed that the majority of the respondents affirmed that the availability of the vaccine in healthcare facilities, distance to vaccination centers, victims of needle prick, vaccinator's attitude, lack of awareness and lack of motivation can influence the uptake of hepatitis B vaccine among healthcare workers. In line with this finding, Abidi et al. and Ozisik et al. also reported additional factors influencing the uptake of HBV as lack of knowledge and awareness, misperceptions, distrust in vaccines, cost and availability of the vaccine, and vaccine hesitancy as some of the impediments influencing uptake of the vaccine among healthcare workers within different healthcare setups globally (Abidi et al., 2012; Ozisik et al., 2017). To further emphasize the determinants of HBV vaccination among healthcare workers, several studies have also identified the unavailability of the vaccine as the main deterrent for not taking the vaccine (Ali et al., 2023; Maina & Bii, 2020; Ndunguru et al., 2023; Shah et al., 2020). In other findings, a lack of HBV vaccination policy for HCWs influences vaccine uptake in Nigeria(Ogundele & Omotosho, 2020). Although Nigeria is classified as an endemic country, hepatitis B vaccination among healthcare workers has only been recommended and not mandatory(Issa et al., 2023). Legislation of the HBV vaccination policy will significantly enhance complete (three doses) vaccine uptake. In addition, cost has been identified as the significant factor influencing vaccine uptake among healthcare workers in African countries despite the essence of vaccination in being cost-effective in reducing communicable diseases. Despite all stated challenges, the importance of vaccination against vaccine-preventable diseases has been proven during the COVID-19 outbreak (Oyewumi et al., 2022), and the benefits are evident to all.

Inferential analysis revealed a significant relationship between the categories of healthcare workers and the uptake of the hepatitis B vaccine among healthcare workers. This finding was similar

to the study conducted on the prevalence of hepatitis B vaccination among healthcare workers in Nigeria, which revealed that professional categories were independently associated with HBV vaccination. According to the argument, house officers and laboratory scientists were more likely to be unvaccinated than resident doctors, consultant doctors, and nurses (Ogoina et al., 2014). Also, this study showed a significant relationship between the level of knowledge and uptake of the hepatitis B vaccine among healthcare workers. In line with this finding, a study assessing the Level of Knowledge and Uptake of Hepatitis B Vaccination among healthcare workers at Juba Teaching Hospital, Juba City, South Sudan, found that there was a statistically significant relationship between the knowledge of Health workers about the HBV vaccine and vaccine uptake (Alege et al., 2020). This shows that the more knowledgeable the HCWs are, the more the rate of vaccine uptake.

The study has limitations, including focusing on one government-owned hospital without considering those in the private sector, who may have other views, and the uptake rate may differ.

CONCLUSION

In conclusion, the findings of this study underscore the importance of understanding the vaccination uptake among healthcare providers, particularly regarding the Hepatitis B vaccine. While the overall vaccination coverage among healthcare workers (HCWs) was moderate, there are notable discrepancies across different categories of HCWs. Nurses, doctors, and medical laboratory scientists showed higher vaccination rates than other categories, such as ward attendants, accountants, pharmacists, and cleaners, indicating a correlation between medical cadre and uptake level. However, it is concerning that less than ten percent of all respondents were fully vaccinated, highlighting the need for improved vaccination coverage, especially among specific groups of HCWs. Moreover, the low uptake of booster doses among vaccinated respondents underscores the importance of monitoring and reinforcement of vaccination programs to ensure adequate protection against Hepatitis B infection.

Overall, the studies indicate a need for improvement in the uptake rate of the hepatitis B vaccine among healthcare providers in tertiary hospitals. Healthcare institutions and policymakers must address barriers to vaccination uptake among HCWs, including access to vaccines, awareness, and education about the importance of vaccination, as well as addressing vaccine hesitancy. Strengthening vaccination programs and implementing strategies to improve coverage, particularly among underrepresented groups of HCWs, can contribute to reducing the burden of Hepatitis B infection in healthcare settings and safeguarding the health of both HCWs and the broader community.

Suggestions are made for further studies on the topics; the study can be replicated in another part of the country to ascertain the uptake of the Hepatitis B vaccine among healthcare workers. It could also be extended to secondary healthcare facilities and private hospitals. Likewise, a qualitative study can be carried out to explore factors that are more likely to influence the uptake of the HBV vaccine.

REFERENCES

- Aaron, D., Nagu, T. J., Rwegasha, J., & Komba, E. (2017). Hepatitis B vaccination coverage among healthcare workers at national hospital in Tanzania: how much, who and why? *BMC Infectious Diseases*, 17(1), 786. <https://doi.org/10.1186/s12879-017-2893-8>
- Abidi, T. F., Ahsan, S. J., & Fatima, N. (2012). Hepatitis B Vaccination Coverage and Immunization Status Among Health Care Workers in Punjab and Islamabad, Pakistan. *South Asian Journal of Emergency Medicine*, 1(1), 16–21.
- Abiola, A. H. O., Agunbiade, A. B., Badmos, K. B., Lesi, A. O., Lawal, A. O., & Alli, Q. O. (2016). Prevalence of HBsAg, knowledge, and vaccination practice against viral hepatitis b infection among doctors and nurses in a secondary health care facility in Lagos state, south-western Nigeria. *Pan African Medical Journal*, 23. <https://doi.org/10.11604/pamj.2016.23.160.8710>
- Akazong, E. W., Tume, Christopher Njouom, R., Ayong, L., Fondoh, V., & Kuiate, J.-R. (2020). Knowledge, attitude and prevalence of hepatitis B virus among healthcare workers: a cross-sectional, hospital-based

- study in Bamenda Health District, NWR, Cameroon. *BMJ Open*, 10(3), e:031075. <https://doi.org/doi:10.1136/bmjopen-2019-031075>
- Al-Abhar, N., Moghram, G. S., Al-Gunaid, E. A., Serouri, A. Al, & Khader, Y. (2020). Occupational exposure to needle stick injuries and hepatitis B vaccination coverage among clinical laboratory staff in Sana'a, Yemen: Cross-sectional study. *JMIR Public Health and Surveillance*, 6(1), 1–6. <https://doi.org/10.2196/15812>
- Alege, J. B., Gulom, G., Ochom, A., & Kaku, V. E. (2020). Assessing Level of Knowledge and Uptake of Hepatitis B Vaccination among Health Care Workers at Juba Teaching Hospital, Juba City, South Sudan. *Advances in Preventive Medicine*, 2020, 1–11. <https://doi.org/10.1155/2020/8888409>
- Ali, A. S., Hussein, N. A., Elmi, E. O. H., Ismail, A. M., & Abdi, M. M. (2023). Hepatitis B vaccination coverage and associated factors among medical students: a cross-sectional study in Bosaso, Somalia, 2021. *BMC Public Health*, 23(1), 1–8. <https://doi.org/10.1186/s12889-023-15992-2>
- Ansa, G. A., Affoh Ofori, K. N., Houphouet, E. E., Amoabeng, A. A., Sifa, J. S., Amenuveve, C. K., & Odame, G. H. (2019). Hepatitis B vaccine uptake among healthcare workers in a referral hospital, Accra. *Pan African Medical Journal*, 33. <https://doi.org/10.11604/pamj.2019.33.96.18042>
- Danjuma, A. (2019). *Tackling Hepatitis B in Africa: The First Nigerian Hepatitis Summit - Hepatitis B Foundation*. Hepbtalk. <https://www.hepb.org/blog/tackling-hepatitis-b-africa-first-nigerian-hepatitis-summit/>
- Hegazy, A., Albar, H., & Albar, N. (2016). Hepatitis B Vaccination Coverage and Knowledge among Healthcare Workers at a Tertiary Hospital in Jeddah, Saudi Arabia. *Journal of Advances in Medical and Pharmaceutical Sciences*, 11(1), 1–9. <https://doi.org/10.9734/jamps/2016/30082>
- Issa, A., Ayoola, Y. A., Abdulkadir, M. B., Ibrahim, R. O., Oseni, T. I. A., Abdullahi, M., Ibraheem, R. M., Lawal, A. F., Dele-ojo, B. F., Owolabi, B. I., & Echieh, C. P. (2023). Hepatitis B vaccination status among health workers in Nigeria: a nationwide survey between January to June 2021. *Archives of Public Health = Archives Belges de Sante Publique*, 81(1). <https://doi.org/10.1186/S13690-023-01142-Y>
- Kisangau, E. N., Awour, A., Juma, B., Odhiambo, D., Muasya, T., Kiio, S. N., Too, R., & Lowther, S. A. (2019). Prevalence of hepatitis B virus infection and uptake of hepatitis B vaccine among healthcare workers, Makueni County, Kenya 2017. *Journal of Public Health*, 41(4), 765–771. <https://doi.org/10.1093/pubmed/fdy186>
- Kooffreh-Ada, M., Okpokam, D., Chukwudike, E., Oku, A., Ameh, S., & Effa, E. (2021). Hepatitis B Virus Knowledge and Vaccination Status among Healthcare Workers in Calabar, Nigeria. *Nigerian Journal of Medicine*, 30(1), 79–85. https://doi.org/10.4103/njm.njm_196_20
- Liu, T., Li, W., Zhang, Y., Siyin, S. T., Zhang, Q., Song, M., Zhang, K., Liu, S., & Shi, H. (2021). Associations between hepatitis B virus infection and risk of colorectal Cancer: a population-based prospective study. *BMC Cancer*, 21(1), 1–10. <https://doi.org/10.1186/S12885-021-08846-W/TABLES/4>
- 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), 48. <https://doi.org/10.1186/s12889-020-8158-2>
- Maltezou, H. C., Theodoridou, K., Ledda, C., Rapisarda, V., & Theodoridou, M. (2019). Vaccination of healthcare workers: is mandatory vaccination needed? *Expert Review of Vaccines*, 18(1), 5–13. <https://doi.org/10.1080/14760584.2019.1552141>
- 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>
- Ndunguru, B., Wilfred, D., Kapesa, A., Kilonzo, S. D., Mirambo, M., Hyera, F., & Massaga, F. (2023). Low uptake of hepatitis B vaccination among healthcare workers in primary health facilities in Mwanza region, North-Western Tanzania. *Frontiers in Public Health*, 11, 1152193. <https://doi.org/10.3389/FPUH.2023.1152193/BIBTEX>
- Nouetchognou, J. S., Ateudjieu, J., Jemea, B., & Mbanya, D. (2016). Accidental exposures to blood and body fluids among health care workers in a Referral Hospital of Cameroon. *BMC Research Notes*, 9(1), 94. <https://doi.org/10.1186/s13104-016-1923-8>

- Ogoina, D., Pondei, K., Adetunji, B., Chima, G., Isichei, C., & Gidado, S. (2014). Prevalence of hepatitis B vaccination among health care workers in Nigeria in 2011-12. *The International Journal of Occupational and Environmental Medicine*, 5(1), 51–56.
- Ogundele, O. A., & Omotosho, A. A. (2020). Vaccination of healthcare workers in Nigeria: A review of barriers, policies and level of implementation. *Libyan Journal of Medical Sciences*, 4(1), 9–15. https://doi.org/10.4103/LJMS.LJMS_4_20
- Omotowo, I. B., Meka, I. A., Ijoma, U. N., Okoli, V. E., Obieniu, O., Nwagha, T., Ndu, A. C., Onodugo, D. O., Onyekonwu, L. C., & Ugwu, E. O. (2018). Uptake of hepatitis B vaccination and its determinants among health care workers in a tertiary health facility in Enugu . *BMC Infectious Diseases*, 18(288), 1–9. <https://doi.org/https://doi.org/10.1186/s12879-018-3191-9>
- Oni, O. I., Osho, O. P., Oluwole, M. T., Osho, E. S., Ogungbeje, A., & Raji, H. M. (2022). Assessing the level of knowledge, uptake of hepatitis B virus vaccine, and its determinants among health workers across various levels of health facilities in Ondo, South West, Nigeria. *The Egyptian Journal of Internal Medicine*, 34(1), 1–10. <https://doi.org/https://doi.org/10.1186/s43162-022-00167-z>
- Orji, C. J., Chime, O. H., & Ndibuagu, E. O. (2020). Vaccination status and prevalence of hepatitis B virus infection among healthcare workers in a tertiary health institution, Enugu State, Nigeria. *Proceedings of Singapore Healthcare*, 29(2), 119–125. <https://doi.org/10.1177/2010105820923681>
- Oyewumi, Z. O., Akingbade, O., Afolalu, O. O., Adeyeye, S. O., Jolayemi, K. I., & Atekoja, O. E. (2022). Compliance with Standard Precaution Practices During the Early Phase of the Covid-19 Pandemic among Nurses in Nigeria. *Africa Journal of Nursing and Midwifery*. <https://doi.org/10.25159/2520-5293/12074>
- Oyibo, P. G., Akinleye, C. A., Godwin, Y. D., & Awire, E. (2022). Uptake of Hepatitis B vaccine and its predictors among healthcare workers in south-south Nigeria: a cross-sectional survey. *The Egyptian Journal of Community Medicine*, 40(2), 143–147. <https://doi.org/10.21608/EJCM.2021.84650.1181>
- Ozisik, L., Tanriover, M. D., Altinel, S., & Unal, S. (2017). Vaccinating healthcare workers: Level of implementation, barriers and proposal for evidence-based policies in Turkey. *Human Vaccines & Immunotherapeutics*, 13(5), 1198–1206. <https://doi.org/10.1080/21645515.2016.1269992>
- Rashid, N., & Swaibu, Z. (2021). Knowledge, Attitude, and Perception on Hepatitis B Vaccination Among Non-health Workers Attending Selected Health Facilities in Mbale City, Uganda. *World Journal of Public Health*, 6(4), 139–147. <https://doi.org/10.11648/j.wjph.20210604.12>
- Shah, S. M., Rodin, H., Pogemiller, H., Magbagbeola, O., Ssebambulidde, K., Zewde, A., Goers, M., Katz, B., Obaitan, I., Abdo, E. F., Hassany, S. M., Elbadry, M., Moussa, A. M., Mtengezo, J., Dedzoe, M., Henkle, B., Bah, M. B., Sabongi, M., Kayandabila, J., ... Debes, J. D. (2020). Hepatitis B Awareness and Vaccination Patterns among Healthcare Workers in Africa. *The American Journal of Tropical Medicine and Hygiene*, 103(6), 2460–2468. <https://doi.org/10.4269/ajtmh.20-0521>
- Shrestha, D. B., Khadka, M., Khadka, M., Subedi, P., Pokharel, S., & Thapa, B. B. (2020). Hepatitis B vaccination status and knowledge, attitude, and practice regarding Hepatitis B among preclinical medical students of a medical college in Nepal. *PLOS ONE*, 15(11), e0242658. <https://doi.org/10.1371/journal.pone.0242658>
- 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), e0235470. <https://doi.org/10.1371/journal.pone.0235470>
- Yakubu, A., Hassan, U. D., & Dafolio, A. (2017). Knowledge, risk perception and hepatitis B vaccination status of health workers in Sokoto, Nigeria. *Global Journal of Public Health and Epidemiology*, 4(3), 168–175. <http://www.globalscienceresearchjournals.org/>