Available Online at https://www.nepjol.info/index.php/IJOSH
International Journal of Occupational Safety and Health, Vol. 12 No. 2 (2022), 89 – 96

Factors Influencing Knowledge of Hepatitis B Vaccination amongst Healthcare Workers in a Rural Teaching Hospital in Southern Nigeria

Osagiede EF[1,2], Awunor NS[3], Osagiede ET[4], Abah SO[5,6]

[1]Department of Community Medicine, Irrua Specialist Teaching Hospital, Irrua, Nigeria, [2]Department of Community Medicine, Niger Delta University Teaching Hospital, Okolobiri, Nigeria, [3]Department of Community Medicine, Delta State University Abraka, Nigeria, [4]Accident and Emergency Unit, Irrua Specialist Teaching Hospital, Irrua, Nigeria, [5]Department of Community Health and Primary Health Care, Ambrose Alli University Ekpoma, Nigeria, [6]Department of Community Health, Federal University of Health Sciences Otukpo, Nigeria.

ABSTRACT

Introduction: Healthcare workers (HCWs) are daily exposed to hepatitis B virus (HBV) infections from the blood and body fluids of patients and clients they care for. Unfortunately, many of these HCWs are not vaccinated for hepatitis B. The aim of this study is to assess the factors influencing knowledge of hepatitis B vaccination amongst HCWs in a tertiary health facility located in a rural community in Edo State, Southern Nigeria.

Methods: A descriptive cross-sectional study design was used in this study, and data were collected from health workers randomly selected using the multistage sampling technique. 280 HCWs were administered with pre-tested, semi-structured interviewer-administered questionnaires. Data analysis was done using the Chi-square test (and Fisher Exact where appropriate) with the aid of IBM SPSS version 21.0 software, and the level of significance – alpha (α) was set at 5% (0.05).

Results: The mean age of HCWs in this study was 34.90(±9.46) years. Just above half of the HCWs, 146 (52.1%), had a good knowledge of hepatitis B (HB) vaccine. Work type ($p<0.001$) and category of HCWs ($p<0.001$) were significantly associated with the level of knowledge of hepatitis B vaccination by respondents.

Conclusion: There was poor knowledge of hepatitis B vaccination amongst HCWs with work type and category of HCW as determinants. Priority should be given to ensure targeted health promotion programmes that will improve knowledge, with a view to enhance optimal uptake of hepatitis B vaccine amongst HCWs.

Key words: Healthcare workers, Hepatitis B Vaccine, Knowledge.

INTRODUCTION

Hepatitis B vaccine is the first anti-cancer vaccine with an outstanding record of safety and high (95%) effectiveness in preventing children and adults from developing chronic infections.[1] At present, vaccination against hepatitis B virus (HBV), introduced in 1992, is the surest way to avoid occupational acquisition of hepatitis B infection and from other settings.[2,3] The first licensed hepatitis B vaccines were plasma-derived and were composed of purified HBsAg. Contemporary hepatitis B vaccines are the product of recombinant DNA technology.[4] Hepatitis B vaccines are typically given in a three-dose series at day zero, one month later, and six months after. Although HBV infections still impose a colossal socio-economic burden in several developing countries, some countries have witnessed a reduction in its impact due to the universal vaccination programmes introduced in the nineties.[5]

DOI: https://doi.org/10.3126/ijosh.v12i2.40616

Conflicts of interest: None
Supporting agencies: None

Date of submission: 28.07.2021
Date of acceptance: 01.01.2022
Date of publication: 01.04.2022

Corresponding Author
Emmanuel Friday Osagiede, MBBS, MPH, FWACP.
Public Health Physician,
Department of Community Medicine,
Irrua Specialist Teaching Hospital, Irrua, Nigeria.
Email: drosagiedeef@gmail.com
ORCID ID: https://orcid.org/0000-0001-5254-6783

Currently, the hepatitis B vaccine is one of the most widely used vaccines in the world. Since 1982, over one billion doses of the hepatitis B vaccine have been used worldwide.[1] A booster dose is not usually recommended for non-high-risk persons who have completed the three-dose vaccination schedule.[1] Post exposure prophylaxis with hepatitis B vaccination has proven efficacious in eradicating occupational hepatitis B infection in the health care delivery settings, outside universal precaution, and prevention of exposure to infected blood and body fluids. The hepatitis B vaccine has a pre-exposure efficacy of 80–100% and a post-exposure efficacy of 70–95%, depending on whether hepatitis B immune globulin (HBIG) is given with the vaccine.[6]

Hepatitis B vaccination in West African nations like Nigeria is lower than in many other countries in various regions of sub-Sahara Africa.[7] In May 2012, Nigeria began the phased replacement of diphtheria, pertussis (whooping cough), and tetanus (DPT) vaccine with the pentavalent vaccine, which contains more antigens (DPT, Haemophilus influenza type B, and hepatitis B).[8] It was reported in 2010 that Edo State, in South-South Nigeria, had a low immunization coverage, with only 13% of children (age 12-23 months) reported to have received the recommended course of immunization for their age.[9] For the most part, as high as 27% of children in the state (region) had not received any immunization.[9]

HBV infection is highly endemic in Nigeria based on studies undertaken in blood donors, pregnant women, and HIV-infected patients. These studies reveal an HBsAg carrier rate of between 9% and 39%.[10,11] Consequently, the risk of occupational exposure to HBV amongst HCWs in Nigeria remains high.[12] Despite this high rate of exposure and HBV prevalence, there is a low corresponding hepatitis B vaccination coverage among healthcare workers in Nigeria and several other African countries.[12] This study aims to assess the work-related factors influencing knowledge of hepatitis B vaccination among HCWs in a rural tertiary health facility in Edo State, Southern Nigeria.

METHODS

This study was conducted in a rural teaching hospital in Edo State, Southern Nigeria.[9] The teaching hospital is a 375-bed facility with an ongoing 60-bed expansion project and is one of the few public teaching hospitals in a rural location South-South, Nigeria.[13] The study was conducted between February and March 2018 using a descriptive cross-sectional study design amongst 280 consenting Healthcare workers of the health facility. The selection of participants for the study was made through a multistage sampling technique. The different strata of HCWs selected for this study using stratified random sampling were doctors, nurses, laboratory scientists, scientific officers, pharmacists and pharmacy technicians, health, porters, administrative officers, confidential secretaries, account and audit staff. There were 389 doctors, 624 nurses, 84 laboratory scientists, 24 scientific officers, 110 health attendants, 119 porters, and 295 non-clinical health care personnel (246 administrative staff and 49 account/audit departments) in the hospital. This gave rise to a total population of 1684 HCWs in all the selected subgroups in the hospital.[14]

The proportion of HCWs in a previous study who were aware of hepatitis B vaccination (average prevalence, P) was 86.8%.[15] The proportion of the respondents not aware of hepatitis B vaccination among HCWs (1-*P*) was 13.2%. The standard normal deviate, $Z_{1-\alpha/2}$ at 95% confidence interval is 1.96 at two-tailed. The alpha error *d i*s the margin of error allowed for the study, which measures the desired precision/degree of accuracy or deviation, usually at *5%*.

Computing for the sample size (n) using the formula given as

$$n = \frac{\left(Z^2 1-\frac{\alpha}{2}\right)P(1-P)}{d^2}$$ – – equation (1).[16]

Where, p = 86.8% = 0.868 and 1-p = 13.2% = 0.132; d = 5% = 0.05; and z = 1.96.

By substitution into equation (1), $= \frac{1.96^2 * 0.868 * (0.132)}{(0.05)^2}$

$n = 176$

Assuming a response rate of 80% [non-response rate is 30% which is 0.3], the minimum required sample size with the non-response factor was determined with as sample size

$$(SZn_r) = \frac{n}{1-NR} -$$ – equation (2)

Where NR = non-response rate.

The minimum required sample size (SZn_r) is $= \frac{176}{1-0.3}$ = 251.

The number of participants was increased to 280 and selected through a proportionate allocation.

The proportion of participants drawn from each stratum was obtained from the formula given as = (total number

of HCWs in a subgroup * minimum sample size)/total number of HCWs in all the subgroups.

Number of participants from each subgroup

$$= \frac{total\ number\ in\ the\ respective\ sub-group * 280}{1684}.$$

After calculating the allocation for each stratum, the final participants were identified and recruited through a systematic random sampling technique. The list of all nurses, porters, and health attendants was obtained from the director of nursing services. The list of all doctors and laboratory scientists were obtained from the director of clinical services, while the non-clinical staff list was obtained from the hospital registry.

The systematic random sampling technique was carried out as follows. Sampling fraction obtained using the formula, total number of HCWs in the selected subgroups divided by the number allocated by proportionate sampling for the same subgroup of HCWs. Using the sampling fraction, every 6th HCW in each subgroup was selected from the sampling frame (subgroup total) in the list of the HCWS in the given subgroup till the minimum allocated number was selected. The first HCW in each subgroup was selected by balloting between the first to sixth eligible participant on the list. After that, every 6thconsenting HCW was picked for the study. The study instrument was a pre-tested, semi-structured, interviewer-administered questionnaire to assess the respondents' sociodemographic and knowledge of hepatitis B vaccination.

The knowledge score of the hepatitis B vaccine was based on nine (9) questions (table 3). Each correct answer was scored one, and incorrect answer(s) scored zero (0). The knowledge score was further graded and dichotomized into good (a score of at least mid-mark, that is, ≥ 50% correct answers) and poor (<50% correct answers). The level of significance – alpha (α) was set at 5%. All p-values were two-tailed and considered as statistically significant if < 0.05. The bivariate data were analysed using the Chi-square test with respective odds ratios and 95% confidence intervals computed where appropriate.

Ethical approval for this study was obtained from the Research and Ethical Committee (HREC) of ISTH, Irrua. Written informed consent was obtained from all study participants following a thorough explanation of the purposes and dealings of the study, and the benefits were also explained to them. The researchers-maintained confidentiality from the inception of the study to the end by ensuring that the administered questionnaires were anonymous and all other means of personal identification were avoided at all times.

RESULTS

The mean age of HCWs in this study was 34.9(±9.46) years, and a modal age group was 20-39 years with a frequency of 54.3%. More than one-half of the respondents were aged between 20 and 39 years. No respondent was a teenager, and only two (0.7%) respondents were above 60 years. The different occupational groups were 104(37.1%) nurses, 65(23.2%) doctors, 18(6.4%) health attendants, 14(5%) laboratory scientists/technologists, and 49(17.5%) accountants and administrators. Additionally, 20 (7.1%), six (2.1%), and four (1.4%) were porters, pharmacists, and scientific officers, respectively. Those in the clinically related work were 231(82.5%), while 49 (17.5%) were non-clinical related HCWs (Table 2).

Most of the respondents gave the correct answers regarding the appropriate anatomical site of the hepatitis B vaccine injection. Many of the respondents, 186(66.4%), 182(65.0%), and 170(60.7%), answered that post-HB vaccination titre test is necessary, the effectiveness of HB vaccine is as high as 95%, and HB vaccine can be given at any age, respectively. However, the majority could not respond correctly the appropriate route of administering the hepatitis B vaccine or when the post hepatitis B vaccine antibody titre should be checked (Table 3).

About half, 146 (52.1%) healthcare workers had a good knowledge of hepatitis B vaccination, while 134 (47.9%) HCWs had poor knowledge of hepatitis B vaccination. The data shows that clinically related HCWs were four times more likely than non-clinically related HCWs to have a good knowledge of the hepatitis B vaccination process OR (95%CI); p = 4.2 (2.112-8.591); <0.001.

The data presented in table 3 indicate that all the porters 20 (100%) and all the pharmacists 6 (100%) had poor knowledge, while about three-quarters of health attendants 14 (77.8%) and administrative officers 37(75.5%) had poor knowledge of the Hepatitis B vaccination process. There was a significant relationship between the category of HCW and their knowledge of Hepatitis B. However, there seems to be an inverse relationship between the duration of work experience of HCWs and knowledge of Hepatitis B vaccination but was not statistically significant (p=0.104) (Table 4).

Table 1: The Total Number of HCWs in each Subgroup and their allocated Proportion of Participants.

Subgroup of HCWs	Total number	Minimum Allocated Participants by Proportion
Doctors	389	65
Nurses	624	104
Laboratory Personnel	84	14
Scientific officers	24	4
Pharmacists/pharmacy technicians	39	6
Porters	119	20
Health Attendants	110	18
Non-clinical staff	295	49
Total	**1684**	**280**

Table 2: Sociodemographic Characteristics of Respondents (n = 280)

Variable	Frequency	Percent
Age (years)		
20-39	152	54.3
40-59	126	45.0
60-69	2	0.7
Mean ± SD	34.90±9.46years	
Sex		
Male	104	37.1
Female	176	62.9
Job Category		
Nurses	104	37.1
Medical doctors	65	23.2
Administrators, Auditors, and Account officers	49	17.5
Porters	20	7.1
Health Attendants	18	6.4
Laboratory Scientist/Technologists	14	5.0
Pharmacists	6	2.1
Scientific Officers	4	1.4
Work Type		
Clinical Related	231	82.5
Non-clinical Related	49	17.5
Duration of Work Experience(years)		
<1	15	5.4
1-5	82	29.3
6-10	103	36.8
11-15	18	6.4
16-35	62	22.1
Mean ± SD	9.64±8.26years	

Table 3: Participants' Responses to Hepatitis B Vaccine Knowledge Items.

Hepatitis B (HB) Vaccine knowledge related questions	Appropriate answer	Frequency (n)	Percent (%)
The anatomical site for hepatitis B vaccine administration	Shoulder	198	70.7
Post-HB vaccination titre test necessary	Yes	186	66.4
The effectiveness of the HB vaccine as high as 95%	Yes	182	65.0
HB vaccine be given at any age	Yes	170	60.7
Post-vaccination anti-HB serum titre necessary for HCWs	Yes	148	52.9
A booster dose of the HB vaccine recommended for Health care workers	Yes	132	47.1
HB vaccine safe in pregnancy	Yes	59	21.1
The preferred route of HB vaccine administration	Subcutaneous	53	18.9
Appropriate time for post-HB vaccine antibody titre	1-2 months	18	6.4

Table 4: Work-related Characteristics of Respondents and Knowledge of Hepatitis B Vaccination

Variable	Hepatitis B Vaccine knowledge, n (%)				
	Good n=146	Poor n=134	χ^2	p-value	OR (95%CI)
Work Type					
Clinical Related	134 (58.0)	97 (42.0)	18.201	<0.001*	4.2 (2.112-8.591)
Non-clinical related	12 (24.4)	37 (75.5)			
Categories of HCWs					
Administrative officers and Accounts	12 (24.5)	37 (75.5)	75.705†	<0.001*	
Health attendants	4 (22.2)	14 (77.8)			
Laboratory scientists/technologists	10 (71.4)	4 (28.6)			
Medical doctors	53 (81.5)	12 (18.5)			
Nurses	65 (62.5)	39 (37.5)			
Pharmacists	0 (0.0)	6 (100.0)			
Porters	0 (0.0)	20 (100.0)			
Scientific Officer	2 (50.0)	2 (50.0)			
Duration of work experience (years)					
<1	10 (66.7)	5 (33.3)	7.672	0.104	
1-5	50 (61.0)	32 (39.0)			
6-10	51 (49.5)	52 (50.5)			
11-15	10 (55.6)	8 (44.4)			
16-35	25 (40.3)	37 (59.7)			

* Statistically significant, †Fisher Exact

DISCUSSION

Findings of this study provide critical data to assess the factors influencing knowledge of HBV vaccination amongst the health workforce in Nigeria. Majority of the health workers in this study were in the younger age group, specifically in the age range of 20 – 39. This age group epitomizes the majority of the people in LMICs like Nigeria. In a similar study in Uyo Metropolis, South-South, Nigeria, the predominant respondents were in the older age group.[17] The mean age of the respondents in this study was however higher and similar to the study findings in Usmanu Danfodiyo University Teaching Hospital (UDUTH) Sokoto in Northwest Nigeria.[18] A relatively young workforce in the health sector provides an opportunity for the in-service training of these HCWs which would be of immense benefit to the health sector as they still have long years in active and productive healthcare services deliveries.[19] There were no teenagers of legally employable ages (18 and 19) in this study. This may have further buttressed the fact that the staff engagement process in the formal sector in Nigeria is not usually frequent and steady, even in the essential services sectors like health. This finding is similar to findings from similar surveys among HCWs in lower levels public health facilities in Edo State.[20,21]

Regarding the respective questions on which the knowledge of the hepatitis B vaccine, more than half of the respondents gave appropriate answers for the anatomical site of the vaccine administration, necessity of post-HB titre testing, the effectiveness, age of administration of the vaccine, and the necessity of anti-HB serum titre for HCWs. On the contrary, most of the respondents could not answer appropriately whether the vaccine was safe during pregnancy and the route of administration. Almost all the respondents were not aware of the appropriate timing for conducting post-HB antibody titre. However, the knowledge of the hepatitis B vaccine was determined to be good based on the respondent's ability to correctly answer at least half of the questions (aggregate knowledge score of >50%). In a similar study at Old Mutare Hospital (OMH), Mutasa District, Zimbabwe, respondents also showed poor knowledge of HBV and HCV and other infection prevention practices.[22] Although the respondents' knowledge of the hepatitis B vaccine was generally poor, good scores were recorded for the anatomical site of the vaccine administration, necessity of post-HB titre testing, the effectiveness, age of administration of the vaccine, and the necessity of anti-HB serum titre for HCWs. The fact that respondents scored

poorly regarding whether the vaccine was safe during pregnancy and the route of administration suggests that health workers should pay greater attention to educating pregnant women on Hepatitis B vaccination.

The public health implications of poor knowledge of HBV vaccination among health care providers can be considered from various dimensions: firstly, it corroborates findings from previous researches of poor uptake of hepatitis vaccine in Nigeria, a demonstration of an ongoing challenge in the health system that requires prompt attention; secondly it may be an indirect pointer to the poor practice of infection prevention and control (IPC) as seen amongst HCWs in a developing country like Nigeria..[20,23] Thirdly, it demonstrates the risk faced by Nigeria in meeting the 2030 WHO target for elimination of viral hepatitis.

Regarding the two broad groups of HCWs examined in this study - clinical and non-clinical groups, the clinical workgroup expectedly had a better knowledge of hepatitis B vaccination than their non-clinical related workgroup counterpart, and the difference was statistically significant. This is likely because the clinically related workgroup comprises more skilled core health professionals. They may have had some level of education in infection prevention and control (IPC) in their schools/colleges. On the other hand, the non-clinical related HCWs like the administrators, auditors, and accountants mainly had no formal educational training in health sciences related courses during their professional training in the Universities and Colleges. Many were not trained with the intention of working in a healthcare-related setting. However, the unfortunate thing is that some of these HCWs in the non-clinical areas in the hospital are occasionally posted to (or mixed up with others in) areas of higher risk of exposure to healthcare-associated blood-borne infections like hepatitis B without the requisite knowledge of what it entails to work in such areas.

A further breakdown of the various distinct groups among the clinically related group reveals a statistically significant relationship between the various subgroups and their hepatitis B vaccination knowledge level. Generally, medical doctors and nurses demonstrated a better knowledge of the hepatitis B vaccine than other professional groups. It is not surprising, though, as these HCWs are highly professional and undergo much training in infection prevention and control-related courses during their professional development. The finding that porters had poor knowledge of the hepatitis B vaccine, was not surprising since workers in this group (sometimes referred to as Nurse Aide, Health Assistant, or cleaners) are not professionals and may not receive formal training in clinical areas. They are thus ill-equipped as regards knowledge and materials for the practice of IPC in the delivery of their job description in the healthcare delivery chain in Africa.[22,24] In contrast to the above findings, the Tanzania study reveals that nearly all respondents (347, 99.3%) were knowledgeable about the hepatitis B viral vaccine.[25] This finding may require a further probe to identify the enabling factors.

The scientific officers and their laboratory scientists/ technologists' counterparts did not show any directional relationship with the knowledge of hepatitis B vaccine as equal proportions of these categories of HCWs were found to have poor and good knowledge of hepatitis B vaccine. This contrasts with the findings on their knowledge of HBV and HCV, as both demonstrated good knowledge of HBV and HCV in a similar study in the same setting.[19] The findings from this study may be because these categories of HCWs laboratory scientists/technologists and scientific officers are yet to consider hepatitis B vaccination as a practical way of preventing hepatitis B infection except for infection prevention and control (IPC) practice other aspects of HBV infection.

Another remarkable discovery in this study is the abysmally poor knowledge of the hepatitis B vaccine amongst the pharmacists. Indeed, such a discovery is not a good reflection of the highly skilled nature of the pharmacy profession in the healthcare delivery industry. However, the content of their curriculum on IPC was beyond the scope of this study, and a gap may exist. Also, given the limited number of pharmacists surveyed in this study, it might be inappropriate to conclude on this group of HCWs regarding the knowledge of hepatitis B vaccination. A survey with a larger number of participants across different facilities and regions with a possible emphasis on the different professional groups in the clinically related areas of the healthcare industry could be more revealing, better for comparison and inference.

There was no statistically significant association between the length of work and the respondents' knowledge of hepatitis B vaccination. Although knowledge of the hepatitis B vaccine seems to be inversely related to the duration of work by the HCWs in this study, this might be because the older HCWs

tend to forget some of the general job orientation courses they had during the assumption of duty. The senior HCWs in different professional groups require continuous professional development (CPD) to continue their professional registrations, and practice may not be paying necessary attention to these courses. In some cases, the continuous professional development (CPD) providers are usually selected from senior practitioners who may only concentrate on their lectures from their area of sub-specialization and may be given the benefit of attendance for other lectures held along with theirs. The need to make sure all HCWs, irrespective of their cadre and specialty/sub-specialization, are encouraged as a policy statement to routinely partake in general health care safety and infection control subjects for their annual licensure and staff appraisal cannot be overemphasized.

CONCLUSION

In this survey, approximately half of the HCWs had poor knowledge of Hepatitis B vaccination. Work type and category of HCW were significantly associated with knowledge of Hepatitis B vaccination amongst HCWs. The clinically oriented HCWs were four times more likely to have a good knowledge of hepatitis B vaccination. A greater public health attention to the training and retraining of health care workers on the prevention of viral hepatitis and HBV vaccination is critical if Nigeria is to attain the WHO ambitious goal to eliminate viral hepatitis in 2030.

It is recommended that increased awareness through workplace reminders (with posters, fact sheets), radio and television, seminars, periodic SMS or e-mails from designated professionals in the hospital/supervising ministry of health focused on training all HCWs about HBV and hepatitis B vaccination be given high priority. The porters and health attendants, who might be at increased risk of exposure to healthcare waste and Health care associated infection, should be targeted with a specific intervention to improve their knowledge and, where necessary, their uptake of hepatitis B vaccination.

Acknowledgments

The authors acknowledge all the data collectors and the study location - Irrua Specialist Teaching Hospital, Irrua, Nigeria. Our special appreciation to the Department of Community Medicine staff, Irrua Specialist Teaching Hospital, Irrua, Nigeria.

References

1. World health organization. Hepatitis B. Fact Sheet No. 204. WHO Media Centre [Internet]. 2014;204. Available from: http://www.who.int/mediacentre/factsheets/fs204_Jul2014/en/
2. Canadian Centre for Occupational Health & Safety. OSH Answers Fact Sheets [Internet]. OSH Biological Hazards. Government of Canada; 2016 [cited 2018 Jul 25]. Available from: https://www.ccohs.ca/oshanswers/diseases/hepatitis_b.html#top
3. Konlan KD, Aarah-Bapuah M, Kombat JM, Wuffele GM. The level of nurses' knowledge on occupational post-exposure to hepatitis B infection in the Tamale metropolis, Ghana. BMC Health Services Research [Internet]. 2017 [cited 2021 Oct 27];17(254):1–7. Available from: chrome-extension://dagcmkpagjlhakfdhnbomgmjdpkdklff/enhanced-reader.html?openApp&pdf=https%3A%2F%2Fbmchealthservres.biomedcentral.com%2Ftrack%2Fpdf%2F10.1186%2Fs12913-017-2182-7.pdf
4. Spradling PR, Rupp L, Moorman AC, Lu M, Teshale EH, Gordon SC, et al. Hepatitis B and C Virus Infection among 1.2 million Persons with Access to Care: Factors Associated with Testing and Infection Prevalence. Oxford Journal of Clinical Infectious Disease [Internet]. 2012 [cited 2017 Oct 17];55(8):1047–55. Available from: https://doi.org/10.1093/cid/cis616
5. Zampino R, Boemio A, Sagnelli C, Alessio L, Adinolfi LE, Sagnelli E, et al. Hepatitis B virus burden in developing countries. World J Gastroenterol [Internet]. 2015 [cited 2017 Jun 15];21(42):11941–53. Available from: https://doi.org/10.3748/wjg.v21.i42.11941
6. Colvin HM, Mitchell AE. A National Strategy for Prevention and Prevention and Control of Hepatitis B and C. 2010. 1–253.
7. Musa BM, Bussell S, Borodo MM, Samaila AA, Femi OL. Prevalence of hepatitis B virus infection in Nigeria, 2000-2013: A systematic review and meta-analysis. Nigerian Journal of Clinical Practice. 2015;18(2):163–72.
8. National Population Commission and ICF International. Nigeria Demographic and Health Survey 2013 [Internet]. Abuja; 2014 [cited 2020 Jan 28]. Available from: https://dhsprogram.com/pubs/pdf/fr293/fr293.pdf. 9. Edo State Ministry of Health. Edo State Government: State strategic health development plan (2010-2015). Benin City, Nigeria.; 2010.

10. Agbaji O, Ladep N, Agaba P, Al. E. Prevalence and characteristics of hepatitis B surface antigenaemia among HIV infected patients in Jos, Nigeria. Hungarian Med J [Internet]. 2008 [cited 2018 Jun 27];2:77-82. Available from: https://akjournals.com/view/journals/686/2/1/article-p77.xml
11. Emechebe G, Emodi I, Ikenuna A, Al. E. Hepatitis B virus infection in Nigeria-A review. Niger Med J [Internet]. 2009 [cited 2021 Oct 27];50:18–22. Available from: https://www.nigeriamedj.com/text.asp?2009/50/1/18/71932
12. Ogoina D, Pondei K, Adetunji B, Chima G, Isiche C, Gidado S, et al. Prevalence of Hepatitis B Vaccination among Health Care Workers in Nigeria in 2011–12. Int J Occup Environ Med [Internet]. 2014 [cited 2019 Oct 26];5(1):51–6. Available from: http://www.theijoem.com/ijoem/index.php/ijoem/article/view/362/454
13. Public Relations Department - ISTH Irrua. Irrua Specialist Teaching Hospital Irrua. ISTH news. ISTH news. 2012;3(3):1–3.
14. Registry Department, Irrua Specialist Teaching Hospital I. Category of Staff in ISTH. Irrua, Edo State; 2017.
15. Kesieme EB, Uwakwe K, Irekpita E, Dongo A, Bwala KJ, Alegbeleye BJ. Knowledge of Hepatitis B Vaccine among Operating Room Personnel in Nigeria and Their Vaccination Status. Hepatitis Research and Treatment [Internet]. 2011;2011(3):1–5. Available from: http://www.hindawi.com/journals/heprt/2011/157089/
16. Cochran G. Sampling Techniques. 2nd ed. New York: John Wiley and Sons, Inc.; 1963.
17. Ndako J, Onwuliri E, Adelani-Akande T, Olaolu D, Dahunsi S, Udo U. Screening for Hepatitis B Surface Antigen (HBsAg) among Health Care Workers (HCW) in an Urban Community, South-South Nigeria. Int J Bio Pharm Allied Sci. 2014;3(3):415–25.
18. Hassan M, Awosan KJ, Nasir S, Tunau K, Burodo A, Yakubu A and, et al. Knowledge, risk perception and hepatitis B vaccination status of healthcare workers in Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria. Journal of Public Health and Epidemiology [Internet]. 2016 [cited 2019 Dec 21];8(4):53–9. Available from: http://www.academicjournals.org/JPHE
19. Osagiede EF, Ozomata EA, Osagiede ET, Jumbo J, Ofanson JE, Abah SO. Assessment of Knowledge and Seroprevalence of Hepatitis B and C Viral Infection among Health Care Personnel in a Rural Teaching Hospital in South-South Nigeria. Journal of Environmental and Occupational Health [Internet]. 2020 [cited 2021 Aug 7];10(3):55–72. Available from: https://www.jenvoh.com/jenvoh-articles/assessment-of-knowledge-and-seroprevalence-of-hepatitis-b-and-c-viral-infection-among-health-care-personnel-in-a-rural-t.pdf
20. Osagiede EF, Utomi SO, Egbuta OC, Osagiede ET, Airefetalor IA, Abah SO. Knowledge and Practice of Standard Precautions for Infection Prevention and Control among Health Care Workers in Public Primary and Secondary Health Facilities in Edo State: A Reflection of the Neglect of First and Second Levels of Care in Infection Preve. Journal of BioMedical Research and Clinical Practice [Internet]. 2020 [cited 2021 Jul 15];3(4):435–43. Available from: https://jbrcp.net/index.php/jbrcp/article/view/199
21. Osagiede EF, Isah EC, Ozomata EA, Ehimen FA, Jumbo J, Dinyain VE, et al. Assessment of Knowledge and Materials Availability in the Implementation of Integrated Diseases Surveillance and Responses in Public Facilities in South-South Nigeria. New England Journal of Medicine [Internet]. 2020 [cited 2021 May 7];29(1):11–9. Available from: http://www.nigerianjournalofmedicine.com/
22. Gasaba E, Niciza J, Muhayimana D, Niyongabo E. Infection Control Measures among Healthcare Workers: Knowledge, Attitude and Practice. Open Journal of Nursing [Internet]. 2020 [cited 2021 Oct 28];10(11):1068–80. Available from: https://www.scirp.org/journal/paperinformation.aspx?paperid=104431
23. Ehimen FA, Akpan IS, Osagiede EF, Ofili AN, Okukpon PO, Airefetalor IA. Assessment of Standard Precautions' Practices among Health Care Workers in a Rural Area of South-South Nigeria. Current Journal of Applied Science and Technology [Internet]. 2020 [cited 2021 Jul 15];39(15):8–21. Available from: https://www.journalcjast.com/index.php/CJAST/article/view/30712
24. Abdulraheem IS, Amodu MO, Saka MJ, Bolarinwa OA, Uthman MMB. Knowledge, Awareness, and Compliance with Standard Precautions among Health Workers in North-Eastern Nigeria. Journal of Community Medicine & Health Education. 2012;02(03):10–4.
25. Aaron D, Nagu T, Rwegasha J, Komba E. Hepatitis B vaccination coverage among healthcare workers at the national hospital in Tanzania: How much, who and why? BMC Infectious Diseases [Internet]. 2017 [cited 2018 Jun 5];17(1):2893–8. Available from: https://bmcinfectdis.biomedcentral.com/articles/10.1186/s12879-017-2893-8.