Journal of Epidemiology and Global Health
Vol. **9**(**3**); September (2019), *pp.* 204–209
DOI: https://doi.org/10.2991/jegh.k.190518.001; ISSN 2210-6006; eISSN 2210-6014
https://www.atlantis-press.com/journals/jegh

Research Article

Awareness and Practice of Vaccination of Chronic Hemodialysis Patients by Specialist Nephrology Practitioners in Nigeria: A Cross-Sectional Survey

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ARTICLE INFO

Article History

Received 01 March 2019
Accepted 16 May 2019

Keywords

Vaccination
awareness
practice
hemodialysis
healthcare workers
Nigeria

ABSTRACT

Vaccination of hemodialysis (HD) patients reduces mortality and infection transmission in dialysis units, but its practice is perceivably poor in Nigeria with no study quantifying the level of awareness and practice to date. A questionnaire-based, cross-sectional study on nephrologists was designed. Average group performance scores were calculated for each professional group. Data were analyzed using Statistical Package for the Social Sciences version 20.0 software. The mean age of a total of 142 respondents was 40.7 ± 8.4 years. The average group performance scores for consultants, senior registrars, medical officers, dialysis nurses, and general nurses were 63.4, 63.4, 50.3, 43.4, and 43.4, respectively. Six facilities (11.1%) had active vaccination protocol against hepatitis B virus infection (HBV) alone. These comprised 4/8 (50%) private facilities and 2/46 (4.3%) public hospitals. One public tertiary hospital (2.2%) had an active vaccination protocol against *Streptococcus pneumoniae*. Awareness and practice of vaccination of HD patients by nephrologists is low. Practice of vaccination of HD patients is better in the private sector.

1. INTRODUCTION

The "Kidney Disease: Improving Global Outcomes (KDIGO)" Work Group recommends that all adults at a high risk of progression of Chronic Kidney Disease (CKD) (GFR categories G4–G5) should be immunized against hepatitis B virus (HBV) and those at a high risk of pneumococcal infection (e.g., nephrotic syndrome, diabetes, or those receiving immunosuppression) should receive the pneumococcal polyvalent vaccine unless contraindicated with a rider that all persons aged ≥6 months (including all CKD patients) should be vaccinated against influenza annually Table 1 [1]. This is in line with the guidelines by the Advisory Committee on Immunization Practice (APIC) and is supported by clinical evidences that have shown significant reduction in hospitalization rates and risk of mortality among CKD patients who received vaccination when compared with their counterparts [2–5].

Vaccines have been found to be effective in terms of immunogenicity and protection when delivered according to standard protocols. For instance, repeated booster doses of pneumococcal vaccine were found to reduce infection rates among dialysis patients within 2 years, whereas doubling the dosage of hepatitis B vaccine has seen improvements in immunization response against HBV infection [6–8]. Vaccination of CKD patients is far advanced in the developed countries with only minor differences in practice and attainment of recommended targets among them [9].

However, the same cannot be said for nephrology practice in Nigeria and many other countries in Sub-Saharan Africa as their dismal performance in this aspect of CKD care is mirrored by a lack of data or research on the subject. Our literature search did reveal a study by Adejumo et al. [10], wherein none of the 202 CKD subjects had been vaccinated against HBV.

We therefore planned to assess and describe the awareness and practice of vaccination of hemodialysis (HD) patients in Nigerian dialysis centers among specialist nephrologists attending a national conference.

2. METHODOLOGY

This was a descriptive, cross-sectional study conducted during the 29th edition of the Nigerian Association of Nephrology Conference (NANCONF), which was held at the Obafemi Awolowo University Teaching Hospital, Ile Ife, Nigeria, in February 2017. The conference is an annual gathering of nephrology specialists such as consultants (adult and pediatric) nephrologists, senior registrars in nephrology, registrars, dialysis nurses, renal dietitians, pharmacists, dialysis technologists, general nurses, and medical officers from the government and private hospitals with an average attendance of 300. The conference also receives endorsement and partnership of the International Society of Nephrology and European Renal Association with their fellows participating as resource persons.

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Table 1 | Immunization schedule for vaccine-preventable diseases [1,2]

Vaccine	Age	Dose	Vaccination schedule/route of administration	Booster dose
Hepatitis B (Engerix B)	≥20 years	40 mcg	0, 1, 2, and 6 months/IM	Yes, when anti-HBsAb <10 IU/L
	<20 years	10 mcg	0, 1, and 6 months/IM	Yes, when anti-HBsAb <10 IU/L
Influenza	3–8 years	15 mcg	Annually/IM	No
	9–12 years	15 mcg	Annually/IM	No
	>12 years	15 mcg	Annually/IM	No
Pneumococcal				No
Vaccine naive	6–18 years	1 dose of PCV13 stat		
Completed PCV	6–18 years	-	Administer 1 dose of PPSV23 at age ≥2 years and ≥8 weeks after last indicated dose of PCV13	Administer 1 dose of PPSV23 after 5 years
Vaccine naive	19–64 years	1 dose of PCV13 stat	Administer 1 dose of PPSV23 ≥8 weeks later	Administer 1 dose of PPSV23 at ≥5 years
Prior vaccination	≥65 years	1 dose of PCV13 stat	Administer 1 dose of PPSV23 ≥8 weeks later but must be ≥5 years after the last dose of PPSV23	No

HBsAg, Hepatitis B surface antigen; IM, intramuscular; PCV, pneumococcal vaccine; PPSV, pneumococcal polysaccharide vaccine.

Self-administered questionnaires on vaccine-preventable disease (VPDs: HBV, *Streptococcus pneumoniae*, and influenza virus) were filled by consenting participants during one of the sessions at the conference. The questionnaire was administered in two parts. Part A assessed the following awareness domains: counselling and screening protocol for VPDs (seven domains), vaccine dosage (three domains), and regimen against VPDs (four domains), amounting to a total of 14 domains.

The average group performance score, defined as the overall performance of each professional group (consultants/senior registrars/medical officers/dialysis nurses/general nurses) was calculated using the following formula:

$$\frac{\text{Sum total of group percentage scores}}{1400} \times 100\%$$

Part B assessed the practice of vaccination. Their responses were retrieved before the end of the session to avoid bias. A verification exercise by way of a telephonic interview and/or email was conducted with senior officers at randomly selected renal centers whose participants ticked 'yes' on the questionnaire to the practice of vaccination.

2.1. Definitions

2.1.1. Consultant

A medical doctor with certified specialist training in nephrology from the Nigerian Postgraduate Medical College of Physicians and/or West African College of Physicians, or its equivalent from abroad.

2.1.2. Senior registrar

A post-part one registrar subspecializing in nephrology under the auspices of the Nigerian Postgraduate Medical College of Physicians and/or West African College of Physicians, or its equivalent from abroad.

2.1.3. Medical officer

A medical doctor with a basic degree of MBBS or MBChB from a recognized institution in Nigeria or its equivalent abroad.

2.1.4. Dialysis nurse

A registered nursing officer with certified post-basic nephrology training from a recognized degree awarding institution in Nigeria or its equivalent abroad.

2.1.5. General nurse

A registered nursing officer with no formal post-basic nephrology training, but has received hands-on training to work in the dialysis unit.

2.2. Data Analysis

Data were analysed using the Statistical Package for the Social Sciences version 20.0 software (SPSS Inc., Chicago, IL, USA). Descriptive variables such as age, gender, and years of practice were presented as frequencies, percentage, mean (interquartile range), and means (±standard deviation).

3. RESULTS

One hundred and forty two respondents who received the questionnaires returned them. This gave a response rate of 88.8% (142/160). There were 69 (48.6%) males and 73 (51.4%) females with a mean age of 40.7 ± 8.4 years.

They comprised 32 (22.5%) consultant nephrologists, 34 (23.9%) senior registrars, seven (4.9%) medical officers, 44 (31%) dialysis nurses, and 25 (17.7%) general nurses. They were drawn from 46 government secondary and tertiary hospitals, and eight private

dialysis centers (85.2% vs. 14.8%). Majority (79.6%) of the respondents were from Southern Nigeria Tables 2 and 3.

The average group performance scores for consultants, senior registrars, medical officers, dialysis nurses, and general nurses were 63.4, 63.4, 50.3, 43.4, and 43.4, respectively. Twenty-eight (87.5%) consultants, 27 (79.4%) senior registrars, six (85.7%) medical officers, 26 (59.1%) dialysis nurses, and 17 (68%) general nurses were aware that counseling on vaccination should begin immediately once the diagnosis of CKD is made Table 4.

Six (6.8%) of the dialysis nurses admitted that they did not know when to commence counseling, whereas 14 (32%) of them felt it should commence only when dialysis becomes inevitable. Two (6.7%) consultants and three (8.8%) senior registrars would wait till HD became inevitable.

All consultants, senior registrars, and dialysis nurses were aware that CKD patients should be screened for HBV and hepatitis C virus (HCV) before commencing dialysis with the least score of 92% and 76% among general nurses, respectively. Knowledge of pre-dialysis

Table 2 | General characteristics of respondents

Parameters	Consultants	Senior registrars	Medical officers	Dialysis nurses	General nurses
Male (%)	24 (75.0)	29 (85.3)	4 (57.1)	5 (88.6)	7 (28)
Female (%)	8 (25.0)	5 (14.7)	3 (42.9)	39 (11.4)	18 (72.0)
Median age (in years)	44.5 (36–65)	35 (29–43)	32 (28–50)	42 (27–57)	40 (25–63)
Years of practice (median)	17 (11–39)	8 (4–17)	8 (3–22)	14 (1–31)	10 (1–35)

Table 3 | Distribution of respondents by hospitals and geopolitical zones

Geopolitical zones	No. of specialists (%)	Public hospital (%)	Private hospital (%)	Total no. of hospitals (%)
South west	71 (50.0)	17 (37.0)	6 (75.0)	23 (42.6)
South–South	30 (21.1)	8 (17.4)	1 (12.5)	9 (16.7)
South east	12 (8.5)	7 (15.2)	0	7 (13.0)
North central	8 (5.6)	3 (6.5)	0	3 (5.6)
North east	4 (2.8)	3 (6.5)	0	3 (5.6)
North west	7 (4.9)	4 (8.7)	0	4 (7.4)
FCT Abuja	10 (7.0)	4 (8.7)	1 (12.5)	5 (9.3)
Total	142 (100)	46 (100)	8 (100)	54 (100)

FCT, Federal Capital Territory.

Table 4 | Awareness of vaccination against vaccine-preventable diseases by respondents

Awareness domains assessed	Number and frequency of correct responses				
	Consultants (*N* = 32)	Sr registrars (*N* = 34)	Medical officers (*N* = 7)	Dialysis nurses (*N* = 44)	General nurses (*N* = 25)
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)
1. Ideal time to counsel CKD patients on vaccination against VPDs	28 (87.5)	27 (79.4)	6 (85.7)	26 (59.1)	17 (68.0)
2. Pre-dialysis screening for infections					
Hepatitis B virus	32 (100)	34 (100)	7 (100)	43 (97.7)	23 (92.0)
Hepatitis C virus	32 (100)	34 (100)	7 (100)	38 (86.4)	19 (76.0)
3. Exclude pre-dialysis screening for infections					
Pneumococcus	25 (78.1)	26 (76.5)	4 (57.1)	22 (50.0)	12 (48.0)
Influenza	25 (78.1)	26 (76.5)	4 (57.1)	23 (52.3)	13 (52.0)
4. Rescreening for hepatitis B virus	26 (81.3)	25 (73.5)	4 (57.1)	28 (63.6)	17 (68.0)
5. Interval of rescreening for hepatitis B virus	13 (40.6)	17 (50.0)	1 (14.3)	18 (40.9)	11 (44.0)
6. CKD patients should receive vaccines against					
Hepatitis B virus	32 (100)	31 (91.2)	6 (85.7)	36 (81.8)	24 (96.0)
Pneumococcus	22 (68.8)	22 (4.7)	2 (28.6)	5 (11.4)	3 (12.0)
Influenza	19 (59.4)	18 (52.9)	2 (28.6)	6 (13.6)	2 (8.0)
7. Correct number of vaccine doses					
Hepatitis B virus (three-doses regimen)	23 (71.9)	24 (70.6)	5 (71.4)	25 (56.8)	10 (40.0)
Hepatitis B virus (four-doses regimen)	3 (9.4)	5 (14.7)	0 (-)	2 (4.5)	0 (-)
Pneumococcus	1 (3.1)	8 (23.5)	1 (14.3)	1 (2.3)	1 (4.0)
Influenza	3 (9.4)	5 (14.7)	(14.3)	0 (-)	0 (-)
Average group performance rating[a]	63.4	63.4	50.3	44.3	43.4

[a]Computed using the formula: $\frac{\text{Total group percentage score}}{1400} \times 100\%$. Sr, Senior; VPD, vaccine-preventable diseases; CKD, chronic kidney disease.

screening for pneumococcus and influenza (57.1% and 57.1%, respectively) was poor among medical officers, dialysis nurses (50% and 52.3%), and general nurses (48% and 52%). Knowledge of rescreening for VPDs was above average in all the professional groups, but only 40.6%, 50%, 14.3%, 40.9%, and 44% of the consultants, senior registrars, medical officers, dialysis nurses, and general nurses, respectively, were aware of the appropriate interval for rescreening for HBV Table 4.

Knowledge of vaccination against HBV was high among all the professional groups with a least score of 81.8% among the dialysis nurses. The awareness of vaccination against pneumococcus and influenza (28.6% and 28.6%) was poor among medical officers, dialysis nurses (11.4% and 13.6%), and general nurses (12% and 8%). Knowledge of the three-dose HBV vaccine regimen was high compared with four-dose regimen. One (3.1%) consultant, eight (23.5%) senior registrars, and one (2.3%) dialysis nurse were aware of the total dosing schedule for *S. pneumoniae*. Three (9.3%) consultants, five (14.7%) senior registrars, and one (14.3%) medical officer were aware of the doses for Influenza. No nurse was aware of the dose for influenza Table 4.

Six facilities (11.1%) had active vaccination protocol against HBV alone. These comprised 4/8 (50%) private facilities and 2/46 (4.3%) public hospitals. There was only one tertiary hospital (2.2%) with an existing vaccination protocol against *S. pneumoniae* in Southwest Nigeria.

4. DISCUSSION

The awareness level of the specialist nephrologists in Nigeria was found to be less than satisfactory. There were observed important knowledge gaps among all the professional groups in the basic areas of rescreening for HBV, vaccination against other VPDs beside HBV, and dosing schedule for all the VPDs including HBV. To the best of our knowledge, there is no study that has evaluated the knowledge of nephrologists about VPDs in Nigeria. However, some related research efforts reveal varying outcomes. Adekanle et al. [11] showed that among the healthcare personnel whose knowledge of HBV was surveyed, only doctors had a good knowledge, whereas Abiola et al. [12] showed fair knowledge but poor practice among nurses and doctors in an urban hospital in Lagos State, Nigeria.

The participants were well aware of pre-dialysis screening for HBV and HCV, but that is to be expected as healthcare professionals are generally familiar with hepatitis B and C viral and HIV screening before blood transfusion and minor and major surgical procedures in Nigeria as shown by earlier studies [11,13]. On proceeding further, the proportion of professionals who were aware of the rescreening schedule for HBV dropped drastically to very low figures. This is a cause for concern as patients on HD have been known to seroconvert to HBV positive while on dialysis treatment with consequential poor outcomes [14].

Healthcare workers have to be vigilant, especially nurses who work in high-risk departments such as HD units. The prevalence of HBV in HD centers could be as high as 6.6% and some of the contributory factors to this include sharing of equipment, failure of isolation, serological screening, and vaccination [14,15]. Awareness of the standard rescreening protocol for HBV is highly likely to improve intradialysis surveillance of HD patients through strict adherence to protocol. By so doing, early detection of apparently "infection-free" patients who seroconvert give room for immediate isolation to dedicated HD machines and thereby protect patients and medical staff from the risk of HBV infection.

Nursing staff who work most closely with the HD patients equally need to be aware of factors that adversely influence responsiveness of HD patients to hepatitis B immunization. Recent research data indicate that the dialysis staff should be alert to the presence of concomitant hepatitis C infection, hypoalbuminemia, obesity, old age, insufficient urea reduction rate and long duration of HD as risk factors for poor response to hepatitis B vaccination [16,17]. As a result, proper patient profiling assists in early identification of those who are most likely to benefit from intensive monitoring of their antibody titer, increased frequency and higher dosage of the vaccine delivery.

A high percentage of participants were aware that HD patients should be vaccinated against HBV. Majority of the respondents were aware of the three-dose regimen for HBV vaccine, but less than 10% (the senior registrars) were abreast with the relatively newer four-doses regimen. This may be a reflection of the lack of knowledge update on vaccination protocols. The relatively greater awareness demonstrated by the senior registrars may be associated with the fact that they continue to study actively as required by the nature of their professional training.

One positive outcome of this study is that the majority of our respondents were aware that patients should be counseled for vaccination against VPDs at the first diagnosis of CKD. This is significant because the KDIGO 2012 recommendations with support from various researches did indicate better seroconversion rates when vaccination is commenced early [1,18]. In fact, preemptive vaccination of specific population groups (such as diabetes mellitus) with high probability of developing CKD is now being recommended in some countries [2].

In terms of practice, a little over 10% of the centers in Nigeria were found to have an existing and active vaccination protocol against HBV with nonexistence of vaccine protocol against influenza and pneumococcus in all the centers. Many such centers with an active protocol were privately run probably because their clients were affluent and could afford to pay for services out-of-pocket unlike those attending public hospitals. The federal government of Nigeria currently only offers subsidy for the first six sessions of HD for CKD patients, but it does not include provision of medications and vaccines. Telephonic interviews of senior personnel in some of the renal centers in the public hospitals indicated that vaccination programs that existed earlier for CKD patients could not be sustained due to the inability of patients to afford the vaccines.

Unsurprisingly, the knowledge of pneumococcus and influenza was generally found to be poor. This is a further indication that these professionals were not abreast of the recommendations by KDIGO, hence were not likely to motivate patients, who were already burdened by other costs of CKD care to take up vaccination. In a study by Martinello et al. [19], we see how poor knowledge of influenza vaccination correlated with poor receipt of the vaccine by healthcare workers. In an another study among healthcare workers in the pediatrics and obstetrics departments, low recommendation of influenza vaccine was associated with their poor knowledge [20].

The other reason for their low knowledge and poor practice may be attitudinal, even though this study did not set out to assess that. For instance, studies have shown that there are healthcare workers who believe that the influenza vaccine is ineffective and harmful to health [21,22]. In a report from a London district general hospital, only 19% of HD patients were up to date with both pneumococcal and influenza vaccinations during a 5-year period. In that report, there was an apparent apathy on the part of physicians regarding monitoring of their patients, which affected the uptake of vaccines by the patients [3].

The study was limited by a lack of data on the vaccination status of the participants. Information on the practice of vaccination by the centers was restricted to that provided via responses to questionnaires and telephonic interview without on-site inspection and verification of claims.

In conclusion, awareness and practice of vaccination of CKD patients by specialist nephrologists in Nigeria fall below desirable thresholds. Vaccination of children and adolescents diagnosed to have CKD against VPDs should be incorporated into the free Expanded Program on Immunization that has been successfully implemented in Nigeria. Managers of renal centers need to organize a refresher course on the subject of vaccination against VPDs for their staff with a view to develop and sustain standard protocols. Finally, we recommend that funding of CKD care should be given priority by policy makers in Nigeria so as to enable CKD patients access to overall adequate care.

CONFLICTS OF INTEREST

The authors declare they have no conflicts of interest.

AUTHOR CONTRIBUTIONS

A.A.A. and O.A.A. designed the study, collected data, performed statistical analysis, and were involved in the final drafting of the manuscript.

FUNDING

Authors declare that no funding from any source has been received for this study.

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