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Standard Precautions and Hepatitis B Virus Vaccination among Doctors and Clinical Students in a Nigerian Tertiary Hospital: Data from a Pre-Covid Era

Précautions Standard et Vaccination Contre le Virus de l'Hépatite B Chez les Médecins et les Etudiants Cliniques dans un Hôpital Tertiaire Nigérian: Données d'une Ère Pré-COVID

¹E. A. Akaji, ²V. C. Nwiyi, ³U. Otakhoigbogie, ¹V. K. Nnaji

ABSTRACT

BACKGROUND: Adherence to standard precautions in hospitals is vital to control the spread of hospital-acquired infections (HAIs).

OBJECTIVE: To determine the level of compliance to standard precautionary measures by clinical students and doctors in a Nigerian tertiary hospital to curb spread of infectious diseases, with focus on uptake of Hepatitis B Virus (HBV) vaccine.

METHODS: This study which involved 228 participants used self-administered questionnaire to obtain data on respondents' biodata, history of exposure to patient's body fluids (PBF) in the last six months, HBV vaccination status, use and recapping of needles, hand-washing, and use of Personal Protective Equipment (PPE). Data analysis was done using SPSS version 18; associations were tested with Chi-square statistics, and $p \leq 0.05$ was considered significant.

RESULTS: Of the 228 respondents, 113 (49.6%) were clinical students and 115 (50.4%) doctors with mean age of 27.61 ± 7.48 years. A total of 140 (61.4%) respondents had been exposed to PBF: [89 (63.6%) doctors, 51 (36.4%) students]. Age, student/doctor category, and number of years of practice all affected exposure to PBF ($p < 0.05$). Recapping of needles was practiced by 167 (73.2%); hand-washing by 225 (98.7%), and lack of running water was the commonest reason for non-compliance. Also, 218 (95.6%) and 123 (53.9%) wore hand-gloves and face-masks respectively when attending to patients while 111 (48.7%) received at least a dose of HBV vaccine: [72 (64.9%) doctors, 39 (35.1%) students; $p < 0.05$] but only 60.3% completed their doses.

CONCLUSION: Majority had good hand-washing practice, but only about half wore face-masks while working, and recapping of needles was prominent. Doctors had more occupational exposure to PBF but received more HBV vaccine although many were yet to complete their doses. With COVID-19 added to existing list of HAIs, there is need to scale-up compliance to infection control practices through sustained training programs and better health policies which would also drive vaccine coverage in this population. **WAJM 2022; 39(4): 388–393.**

Keywords: Standard precautions, Occupational exposure; Hospital acquired infections; HBV Vaccine.

RÉSUMÉ

CONTEXTE: Le respect des précautions standard dans les hôpitaux est essentiel pour contrôler la propagation des infections nosocomiales (IHA).

OBJECTIF: Déterminer le niveau de conformité aux mesures de précaution standard par les étudiants cliniques et les médecins d'un hôpital tertiaire nigérian pour limiter la propagation des maladies infectieuses, en mettant l'accent sur l'absorption du vaccin contre le virus de l'hépatite B (VHB).

MÉTHODES: Cette étude qui a impliqué 228 participants a utilisé un questionnaire auto-administré pour obtenir des données sur les biodonnées des répondants, les antécédents d'exposition aux fluides corporels (PBF) du patient au cours des six derniers mois, le statut de vaccination contre le VHB, l'utilisation et le récapitulatif des aiguilles, le lavage des mains et l'utilisation de l'équipement de protection individuelle (EPI). L'analyse des données a été effectuée à l'aide de SPSS version 18; les associations ont été testées avec des statistiques sur le chi carré et $p < 0,05$ a été considéré comme significatif.

RÉSULTATS: Sur les 228 répondants, 113 (49.6%) étaient des étudiants cliniques et 115 (50.4%) des médecins avec un âge moyen de 27.61 ± 7.48 ans. Au total, 140 (61.4%) répondants avaient été exposés à la FPB: [89 (63.6%) médecins, 51 (36.4%) étudiants]. Âge, catégorie étudiant / médecin et nombre d'années de pratique, toutes les expositions au FPB ($p < 0.05$) ont été affectées. Le récapitulatif des aiguilles a été pratiqué par 167 (73.2%); lavage des mains par 225 (98.7%), et le manque d'eau courante était la raison la plus courante de non-conformité. De plus, 218 (95.6%) et 123 (53.9%) portaient des gants et des masques pour le visage respectivement lorsqu'ils s'occupaient de patients tandis que 111 (48.7%) recevaient au moins une dose de vaccin contre le VHB: [72 (64.9%) médecins, 39 (35.1%) étudiants].

CONCLUSION: la majorité avait une bonne pratique de lavage des mains, mais seulement environ la moitié portait des masques faciaux pendant le travail, et le récapitulatif des aiguilles était important. Les médecins étaient plus exposés au PBF mais ont reçu plus de vaccin contre le VHB, bien que beaucoup n'aient pas encore terminé leurs doses. Avec COVID-19 ajouté à la liste existante des HAI, il est nécessaire d'augmenter la conformité aux pratiques de contrôle des infections grâce à des programmes de formation soutenus et à de meilleures politiques de santé qui favoriseraient également la couverture vaccinale dans cette population. **WAJM 2022; 39(4): 388–393.**

Mots clés: précautions standard, exposition professionnelle; Infections nosocomiales; Vaccin contre le VHB.

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Abbreviations: COVID, Corona Virus Disease; HAI, Hospital-Acquired Infections; HBV, Hepatitis B Virus; HIV, Human Immunodeficiency Virus; PBF, Patient's Body Fluids; PPE, Personal Protective Equipment; SP, Standard Precautions.

INTRODUCTION

Infectious diseases can be transmitted from one person to another either directly or indirectly especially in a health care facility.¹ The work practices required for infection prevention and control at a basic level are termed Standard Precautions (SP). They define all steps that should be taken to prevent infection from spreading from person to person or from contaminated environmental surfaces and healthcare items when there is an anticipated contact with blood; body fluids; secretions; excretions such as urine and feces (excluding sweat) whether or not they contain visible blood; non-intact skin, (such as in open wounds); or mucous membranes, such as the oral cavity.² Hand hygiene, environmental cleaning and disinfection, injection and medication safety, risk assessment with the use of personal protective equipment (gloves, gowns, face masks) based on activities performed, minimizing potential exposures (e.g. respiratory hygiene and cough etiquette), and reprocessing of reusable medical equipment between each patient and when soiled are all components of SP.³ The importance of following conventional precautions in a hospital setting cannot be overstated when it comes to preventing hospital-acquired infections (HAIs) such as the human immunodeficiency virus (HIV) and hepatitis B virus (HBV).⁴ According to the World Health Organisation, deviations from SP norms caused 50 to 100 times more HBV infections among health workers than HIV infections, indicating that HBV is more contagious than HIV.⁵ Hepatitis B virus, a hepadnavirus, is made up of an exterior lipid envelope and an icosahedral nucleocapsid core that encases the viral DNA and a reverse transcriptase-active DNA polymerase.⁶ Apart from mother-to-child transmission, occupational transmission is common via medical, surgical, and dental procedures, tattooing, use of razors and other objects contaminated with infected blood, as well as other occupational injuries that make health workers more vulnerable to blood-borne pathogens.^{7,8} The hepatitis B virus may live outside the body for at least 7 days and can remain infectious on environmental surfaces for long period

of time.⁹ As a result, if it enters the body of a vulnerable individual who is not protected by the HBV vaccine given in three doses – [at zero, one and six months (for adults)], it is transmissible even without visible blood.¹⁰

Although, there is an abundance of global data on hepatitis B and infection control practices from several countries including Nigeria, majority focuses on doctors and other healthcare workers. Medical and dental students in health facilities are also at risk of contracting HAIs during their clinical placements; hence, determining infection control methods among this population in a hospital context is critical. The aim of this study was to determine the level of adherence to standard precautionary measures by clinical students and doctors in a Nigerian tertiary healthcare centre to curb the spread of infections with special focus on uptake of HBV vaccine.

The specific objectives were:

- To determine the level and means of exposure of clinical students and doctors to patients' body fluids.
- To assess the participants' hepatitis B virus vaccination status.
- To determine their level of compliance to other infection control measures and barriers / reasons for otherwise.

METHODS

This cross-sectional study was conducted among medical and dental practitioners as well as clinical medical and dental students at the University of Nigeria Teaching Hospital [UNTH] in Enugu, South-East Nigeria. There were about 413 medical and 51 dentistry clinical students at the time of data collection in May 2018 (pre-COVID-19 era). Then, UNTH had roughly 250 resident doctors, 130 house officers, and 200 consultants, according to verbal information obtained from the Association of Resident Doctors. Using the standard formula,¹¹ a minimal sample size of 212 was calculated at 95% confidence level with 5% margin of error. The Health Research Ethics Committee of UNTH issued an ethical clearance certificate with the reference number NHREC/05/01/2008B-FWA00002458-1RB00002323, and the respondents gave their informed

consent. Data was acquired using a self-administered questionnaire (with 4 sections) that was pretested on 20 non-participating health personnel. Section A comprised respondents' biodata, whereas Section B gathered information on previous blood exposure and other patients' bodily fluids in the last six months. Section C dealt with HBV vaccination status, while Section D dealt with other infection control methods such as needle reuse and recapping, hand washing, and the use of Personal Protective Equipment (PPE) like hand gloves, face shields, and protective eyewear for clinical and surgical procedures. Data analysis was carried out using Statistical Package for Social Sciences [SPSS] version 18. A descriptive analysis was conducted to provide socio-demographic information of respondents; Chi-square statistic was used to test for association across groups, a p-value of less than or equal to 0.05 was considered statistically significant.

RESULTS

A total of 228 of the 240 questionnaires distributed were retrieved and correctly completed, resulting in a 95% response rate. This comprised 139 (61%) females and 89 (39%) males with a mean age of 27.61 ± 7.48 years; 113 (49.6%) were clinical students and 115 (50.4%) doctors. (Table 1). In the last 6 months, 140 (61.4%) participants had been exposed to PBF; more doctors than students: 63.5% vs. 36.4% ($p=0.000$) were involved. Exposure to PBF was significantly affected by age and number of years of practice ($p<0.05$). Ninety-nine of the 140 affected persons had no idea about their patient's hepatitis B status before the incident (Figure 1).

One hundred and sixty-seven respondents (73.2 percent) recapped needles, with 159/167 (95.2 percent) using the one-hand scoop method (Table 2). Also, 225 (98.7%) washed their hands on a regular basis; lack of running water from taps was cited by the majority 189, (82.9%), as the most common reason for non compliance. With regards to PPE, 218 (95.6%) and 123 (53.9%) utilized gloves and face-masks, respectively, when attending to patients, (Table 3). For hepatitis B virus vaccine, 111 (48.7%) received at least one dose, 67 of them (60.3%) completed the three doses while

Table 1: Socio-demographic Details and Exposure to Patients' Body Fluids (PBF)

	Number of Respondents N (%)	Number Exposed to PBF N (%)	χ^2 ; P value
Gender			
Male	89 (39.0)	51(36.4)	1.036; p=0.309
Female	139(61.0)	89 (63.6)	
Age (in years)			
≤24	84 (36.8)	41 (29.3)	14.757; p=0.005
25–34	107 (46.9)	68 (48.6)	
35–44	34 (14.9)	29 (20.7)	
≥45	3 (1.3)	2 (1.4)	
Mean age: 27.61±7.48			
Category			
Students	113 (49.6)	51 (36.4)	24.56; p=0.000
Doctors	115(50.4)	89 (63.6)	
Field of study			
Dentistry	39 (17.1)	20 (14.3)	2.034; p=0.154
Medicine	189 (82.9)	120 (85.7)	
Years of Practice (Post-qualification)			
1 – 5	63 (27.6)	46 (32.9)	26.505; p=0.000
6 – 10	29 (12.7)	24 (17.2)	
11 – 15	17 (7.5)	14 (10.0)	
16 – 20	4 (1.8)	3 (2.1)	
≥21	2(0.8)	2 (1.4)	
None (Students)	113 (49.6)	51 (36.4)	
Total	228	228	

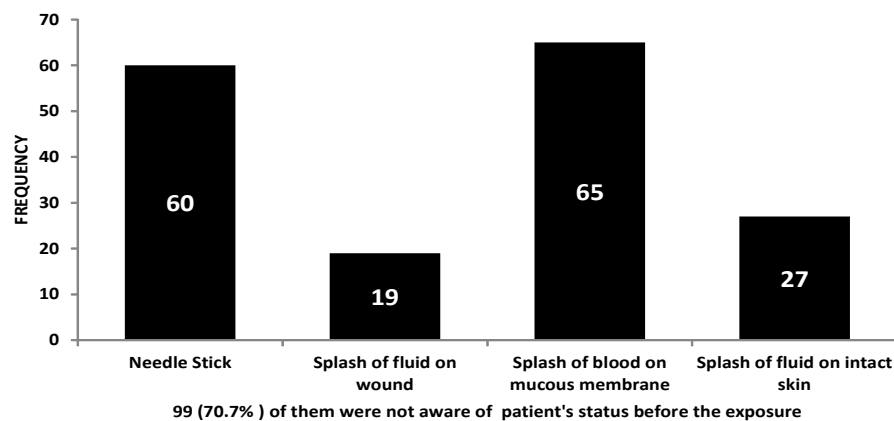


Fig. 1: Routes by which Respondents were Exposed to Patients' Body Fluids

84/111 (75.7%) underwent a screening test prior to vaccination (Table 4).

Comparatively, the difference between the number of doctors and students washing hands was marginal, 113 (50.2%) vs. 112 (49.8%) [p>0.05]; females washed more than males 139 (61.8%) vs. 86 (38.2%) [p=0.029]. Aside from gender, no other factor was shown

to be significantly linked to hand-washing (Table 5A). On the other hand, more males 68 (61.2%) received the HBV vaccine compared with females [p = 0.929], and more doctors than students 72 (64.9%) vs. 39 (35.1%) [p=0.000]. Age and years of practice were also found to be significantly associated with vaccine uptake (Table 5B).

DISCUSSION

This study involving clinical students and doctors centered on adherence to some basic preventive measures as well as the uptake of vaccine against hepatitis B infection. In the previous six months, more doctors than students had been exposed to patient's body fluids (PBF). The percentage of those exposed to PBF in this study is close to the 72.6 percent of health-care professionals reported in a prior study in this same facility but differs from a 22 percent reported in North-western Nigeria.^{11,13} The variance could be due to differences in the populations studied and the methodology in the two studies. Splashing of patients' blood and other fluids on respondents' mucosal membranes was the most common way they were exposed to infectious agents in this study. Needle stick injuries among people that recap needles were seen in 60 percent and this is similar to a previous report.¹⁴ This practice should be discouraged. Aside from years of practice, age and doctor /student categories were significantly associated with exposure to PBF; this agrees with reports from other locations in Nigeria.^{15,16} The majority of people exposed to PBF had no knowledge what their client's HBV status was before the event, this highlights the importance of completely embracing the concept of standard precautions and treating each patient with care.^{15,17}

Hand-washing is one of the most significant methods for reducing cross-infection in hospitals.^{18,19} Almost all the respondents in the current study washed their hands at some point, with 24.4 percent doing so before putting on gloves and 69.8 percent, after. Despite the existence of hand-washing recommendations that go beyond empirical prescriptions, compliance is typically low due to obstacles such as lack or insufficient water supply, leaking sinks, and unavailability of soap.²⁰ These issues were notable in our investigation with the majority (82.9%) asserting that a lack of running water stymied hand-washing. There was a significant association between hand-washing behaviors and gender, as well as students/doctor category; however, the contrary was observed across age groups, dentistry

Table 2: Respondents' Usage and Disposal of Needles and Sharps

Variables	Frequency (n)	Percentage (%)
Recapped needles after use		
Yes	167	73.2
No	61	26.8
Bent or broke sharps after use		
Yes	16	7.0
No	212	93.0
Disposal of sharps in puncture proof containers		
Yes	187	82.0
No	41	18.0
Use of new set of sterile instruments for every patient		
Yes	212	93.0
No	16	7.0
How needles were recapped (n=167)		
Using one hand to hold the needle and syringe and the other hand to hold the cap	8	4.8
Hold the needle and syringe and then taking them to a tray to cap the needle(one- hand scoop method)	159	95.2
Reasons for recapping needles*		
Removal from Non-Disposable Syringe	22	13.2
Multiple Injections for the same patient	17	10.2
Usual practice before disposal	123	73.6
Removal from disposable syringe	24	14.4

*About 19 respondents offered more than 1 reason.

Table 3: Practice of Hand Hygiene and Use of Personal Protective Equipment (PPE)

3A. Hand-Washing	Number (%)	3B. Use of PPE	Number (%)
Do you practice hand washing	(N =228)	Forms PPE used*	
Yes	225 (98.7)	Hand-gloves	218 (95.6)
No	3(1.3)	Face Masks	123 (53.9)
		Eye goggles	23 (10.1)
When do you practice hand washing*		Gowns	92 (40.4)
Before wearing gloves	55 (24.4)	Foot wears	68 (29.8)
After removing gloves	157 (69.8)	Head covers	56 (24.6)
Before touching patient	68 (30.2)		
After touching patient	141(62.7)	Change of gloves for every patient	
Only when hands are visibly soiled	6 (2.7)	Yes	213 (93.4)
		No	15 (6.6)
Hindrances to hand washing practice*		Hindrances to the use of PPE	
No running water	189 (82.9)	Inadequate supply	210 (92.1)
Leaking/No Sinks	45 (19.8)	Uncomfortable	4 (1.8)
No Soap	14 (6.1)	Unaware of availability	3 (1.3)
Poor Soap quality	65 (28.5)	None/Not stated	11 (5.0)
Other reasons	13 (5.7)		

*Some respondents gave more than one reason.

and medical professionals, and years of practice. Our findings corroborate those of a prior study in the same region but differed with reports from Malaysia.^{13,20} In another facet of SP – the use of Personal Protective Equipment (PPE) – we found that hand-gloves were the most

commonly worn, with the majority wearing new sets for each patient. This is an improvement over data from this same center a few years ago,^{13,21} however non availability as a reason for not using PPE remains a major concern.

Hepatitis B infection is a major

public health issue, and because it is common in Sub-Saharan Africa, health-care workers (including medical and dental students) are particularly vulnerable.²² Almost half of the participants in this study had received at least one dose of HBV vaccination and less than a third completed the dose. More males and doctors received the HBV vaccine than females and students respectively. According to Kandi, *et al.*, doctors had greater awareness of HBV infection and vaccine than medical students and received even more than postgraduate students.²³ When compared to the successive uptake rates reported in the same institution years ago, the current vaccination status suggests an improvement among health-care personnel.^{24,25} Increasing awareness over time, proximity to the vaccine-dispensing location, and increased sensitivity to infection control methods may all have contributed to this outcome. Despite this, it is worrisome that a significant percentage of respondents were yet to be immunized or complete the vaccine regimen for reason of cost or busy schedules, consistent with encounters in other regions.^{7-9,22,23,26-28} It is strongly recommended that the call by Omotowo, *et al.*²⁵ for low or cost-free HBV screening and immunization programs for hospital staff be amplified; the strategy, as witnessed in Pretoria and Kenya, is likely to gain traction over time, particularly among students.^{5,28}

Given that information on infection control techniques and vaccine uptake were self-reported in this study, recall bias may have played a role in under- or over-estimating the data, particularly the vaccination status. A more objective technique, such as verifying immunisation records, may be a preferable option in the future. However, our findings could aid in re-strategizing when more comprehensive investigations are conducted, especially now that other emerging illnesses like COVID-19 have been added to the list of HAIs.

CONCLUSION

Doctors had more occupational exposure to patient's body fluids but received more hepatitis B vaccine

Table 4: HBV Vaccination Status of the Participants

Variables	Frequency (n)	Percentage (%)
Respondents who received HBV vaccine		
Yes	111	48.7
No	117	51.3
Total	228	100.0
Number of doses received by respondents (n=111)		
1	17	15.3
2	27	24.3
3	67	60.3
Respondents who received booster dose (n=111)		
	26	23.4
Respondents who screened for HBV before vaccination (n=111)		
	84	75.7
Respondents' reasons for not receiving HBV (n=117)		
Not Aware	10	8.5
Busy Schedule	75	64.1
Costly	18	15.4
No reason/no response	14	12.0

Table 5: Association of Hand-Washing and HBV Vaccination with Participants' Demography

Variables	5A. Practiced hand-washing (n =225)		5B. Received HBV vaccination (n=111)	
	Number (%)	χ^2 ; p value	Number (%)	χ^2 ; p value
Gender				
Males	86 (38.2)	4.748; p=0.029	68 (61.3)	0.008; p=0.929
Females	139 (61.8)		43(38.7)	
Age(in years)				
≤24	82 (36.5)	1.347; p =0.853	37 (33.3)	11.149; p=0.025
25–34	106 (47.1)		47 (42.4)	
35–44	34 (15.1)		25 (22.5)	
≥45	3 (1.3)		2 (1.8)	
Category				
Students	112 (49.8)	0.4179; p>0.05	39 (35.1)	17.693; p =0.000
Doctors	113 (50.2)		72 (64.9)	
Field of study				
Dentistry	38 (16.9)	0.565;p=0.452	23 (20.7%)	1.994; p=0.158
Medicine	187 (83.1)		88 (79.3%)	
Years of Practice				
1 – 5	62 (27.5)	0.909;P=0.989	33 (29.7)	31.205; p=0.000
6 – 10	29 (12.9)		23 (20.7)	
11 – 15	17 (7.6)		14 (12.6)	
16 – 20	4 (1.8)		2 (1.8)	
≥21	2(0.9)		1 (0.9)	
None (Students)	111 (49.3)		38 (34.2)	

although many were yet to complete their doses. Majority had good hand-washing practice, but only about half wore face-masks while working; recapping of needles was prominent. With COVID-19 added to existing list of HAIs, there is a need to scale-up compliance with infection control practices through

sustained training programmes and better health policies which would also drive vaccine coverage in this population.

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Duality of Interest

Nil for all the authors.

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