Comparative Evaluation of the Act of Infection Control practices Among Health-Care-Workersin Edo State, Nigeria

ABSTRACT

Healthcare workers are frequently exposed to blood and body fluids during their regular and daily patient care. These practices tend to expose them topreventable infectious diseases such as Human immunodeficiency virus, Hepatitis B and C viruses. Preventing these exposures through adherence to standard precautionsis the most important strategy for minimizing the transmission of infectious diseases in healthcaresettings.

Objectives: To evaluate the degree to which healthcare professionals at the primary, secondary, and tertiary levels of health care delivery observe and adhere to established precautionary measures and infection control procedures.

Methods: The cross-sectionaland observational studywas conducted amongst HCWs working at three levels of health care settings in Edo state, Nigeria

Results: Only less than one–third of the health care workers (HCWs) across all the levels of care had good standard precautions' practices. Personal protective equipments (hand gloves) were worn all the time during patient care by one hundred and sixty six (66.9%) of the HCWs in the Primary Health Care (PHC) compared to 22(51.2%) and 131(65.2%) reported at the Secondary Health Care (SHC) and Tertiary Health Care (THC) respectively.

Conclusion: Generally, there was poor adherence to standard precautions among HCWs at the three levels of health care. These poor practices are a clear indication of regular training on standard precautions and infection control in all healthcare settings.Similarly, For the purpose of examining the availability of infection control supplies and the adherence of healthcare staff to standard procedures, the government must establish an infection control audit committee.

Keywords: Standard precautions, Knowledge, practices,Healthcare Workers,Edo State-Nigeria

INTRODUCTION

Globally, resource-constrained countries account for the highest proportion of HIV-infected patients in the world; coincidently, they also accountfor the highest rate of accidental exposure to needle-stick injuries, as 90% of these exposures occur in these countries (developing).[1-4]The World Health Organization estimates that about 2.5% of HIV cases and 40% of HBV and HCV cases amongHCWs worldwide are as a result of this exposures.[5]

Standard precautions are minimum infection control practices, and it involve: hand hygiene; use of personal protective equipment; safe injection practices; safe handling of potential contaminated surfaces or equipment; respiratory hygiene/etiquette.[6-8]However, in spite of detailed guidelines given by CDC on how to prevent contact with infected patient blood, the knowledge and practice of safety precautions even in developed country is inadequate.[9] Similarly, in developing countries (like Nigeria) -knowledge of occupational safety practices and adherence to standard precautions is worse when compared to what is obtainable in developed countries.[10-11]

In health care setting, it is sad to note that, despite the strategic role of standard precautions in preventing and reducing the occupational exposures blood borne pathogens, the practice or compliance to standard precautions is still very poor especially in developing countries, where there are high prevalence of HIV and lack of personal protective equipments. [12-14]

In March-August 2010, a survey was conducted among Primary Health Workers in Mobbar, Gubio and Guzamala Local Government Areas of Borno, with a view of assessing HCWs awareness and compliance to universal precautions.[1] The practice of standard precaution was

poor as only 55.5% of the HCWs were in the habit of using PPEs, while only38.7% reported washing their hands before and after patient care. Similar studies conducted in India and London showed poor compliance to standard precautions, as a high prevalence of needle stick recapping and poor hand hygiene practices was recorded among the health care workers.[15-16]

To the best of the authors' knowledge, thereare few published literatures or articles on the status of adherence to standard precautions, particularly among health care workers at three level of health care.There is a conspicuous dearth of data to compare the levels of care in the research area with regard to precautionary adherence. Therefore, the findings of this study are crucial for improving patient outcomes, influencing legislation, and boosting healthcare safety. Similarly, observation of the study sites during work and anecdotal review also exposed inadequate infection control procedures.This study was carried out to observe and determine primary, secondary and tertiary health care workers adherence to standard precaution.

MATERIAL AND METHODS

The study was conducted in the three local government areas of Edo State. The state is located in the South –south geopolitical zone of Nigeria. The study involved health care workers working at the primary, secondary and tertiary health care level of Edo State. The study was carried out for a period of six month.

The study was a comparative cross-sectional study and participants for the study were selected using a multistage sampling technique. Fist stage: Three local government regions were chosen by balloting using a simple random procedure. After the LGAs were chosen, a table of random numbers was used to choose the medical facilities from a list of medical facilities in each LGA. It's also crucial to remember that the sole tertiary hospital In one of the LGAs was specifically chosen since it employs about 70% of the medical staff in the senatorial district(Second stage). Third stage: Regarding the respondents' selection, this was accomplished by grouping the respondents according to their cadre (physicians, nurses, lab personnel, and ward aides).The proportionate allocation formula was used to choose the study's participants from among the medical staff at these sites. Fourth stage: To identify research subjects at the three levels of

healthcare. A systematic sampling strategy was used to enroll participants and a population survey was conducted in regions of the research where there was a shortage of personnel, particularly in the Primary and Secondary Health Care.

An interviewer-administered semi-structured questionnaire and observational checklists were used to collect information from four hundred and ninety two health care workers at the primary, secondary and tertiary health care levels. This data collection instrument was used in collecting information on socio-demographic data, exposure to blood and body fluids (BBFs), type of exposures, number of exposure and they were used to observe the heath care workers as they perform their duties etc.

During the study period, four hundred and seventy two events or opportunities for applying standard precautions were observed, which include, one hundred and forty one events that required performance of hand hygiene, one hundred and seventy five events that required use of PPEs. In addition, one hundred and fifty six events related to injection safety practices were also observed. All the events observed were activities with potential for exposure to blood and body fluids and these observations were done at the tertiary, secondary and primary health care level respectively.

The second section of the checklist was used to objectively assess the availability of standard precautions' tools. This was filled by the researcher or research assistants alongside the senior health care workers on duty to assess the availability of standard precaution tools in all the health care centres/wards visited. The head of the facility or the most senior HCW available was asked about the availability of standard precautions tools and also direct observation was done to assess the availability of such materials. Additionally, the environment was assessed to ensure that health centre adhered to standard precautions practice (eg. Needles seen outside the safety box).

A total of 54 wards or rooms (33, 8, and 13 wards in the PHC, SHC and THC respectively) were observed.

Data analysis

Statistical data analysis was done using SPSS software version 21. [17]Data wassummarized in form of proportions and frequency tables for categorical variables. Continuousvariables were summarized using ranges, median and inter-quartile ranges (IQR). A univariate and bivariate analysis was used to determine measure of association (odds ratio).

RESULTS

Table 1: **Socio-demographic variables of the health care workers**

Variable	Frequency(n=492)	Percent(100%)
Age group		
20-29	131	26.6
30-39	240	48.8
40-49	90	18.3
50-59	31	6.3
Marital status		
Single	173	35.2
Married	307	62.4
Divorced	2	0.4
Widowed	10	2.0
Sex		
Males	147	29.0
Females	345	71.0
Level of education		
Primary	50	10.2
Secondary	99	20.1

Tertiary	343	69.7
Job category		
Doctor	79	16.1
Nurse	193	39.2
Health Assistants	186	37.8
Laboratory Workers	34	6.9
Duration of practice(years)		
0-5	372	75.6
>5	120	24.4

Significant proportion (48.8%) of the HCWs were between the ages of thirty and thirty nine while only 6.1% of the them were between the ages 50 -59. One hundred and forty seven

(29.0%) of the HCWs studied,were males and 345(71%) were females respectively. Majority of the HCWs (69.7%) had tertiary level of education while a large proportion of the participants were married.Majority (39.2%) of the health care workers studied were nurses while only 6.9% were doctors (Table 1).

Table 2: HBV Vaccination coverage among HCWs in the health facilities (n=492)

Health facility	Yes	No	Test	p-value
PHC	154(62.1%)	94(37.9%)		
SHC	18(41.9%)	25 (58.1%)	X^2=21.120	0.0001
THC	83 (41.3%	118 (58.7%)		

One hundred and fifty four (62.1%) of the health care workers in the PHC had received HBV vaccination compared to the 18(41.9%) and 83 (41.3%) of the health care workers at SHC and THC . Hepatitis vaccination coverage was significantly different across the levels of health care (Table 2).

Table 3: Respondents adherence to Standard precautions at the three level of health care

Variable	Health facility	Always	Sometimes	Never	Test	p-value
Gloves	PHC	166(66.9%)	81(32.7%)	1(0.4%)	Fisher's exact test=5.591	0.414
	SHC	22(51.2%)	21(48.8%)	0(0.0%)		
	THC	131(65.2%)	69(34.3%)	1(0.5%)		
Use facemasks	PHC	45(18.1%)	145(58.5%)	58(23.4%)	X^2=20.270	0.0001*
	SHC	9(20.9%)	14(32.6%)	20(46.5%)		
	THC	48(23.9%)	119(59.2%)	34(16.9%)		
Use goggles	PHC	39(15.7%)	91(36.7%)	118(47.6%)	X^2=28.658	0.0001*
	SHC	10(23.3%)	9(20.9%)	24(55.8%)		
	THC	63(12.8%)	211(42.9%)	218(44.3%)		

*Statistically significant

Gloves were always being used by one hundred and sixty six (66.9%) of the HCWs in the PHC compared to 22(51.2%) and 131(65.2%) at the SHC and THC respectively. Forty five (18.1%) respondents in the PHC always use facemask while 9(20.9%) and 48(23.9%) in the SHC and THC levels always use facemask while attending to patients. The use of goggles were also low in all the health facilities, being 39(15.7%) in the PHC, 10 (23.3%) in the SHC as well as 63 (12.8%) in the THC .Thee level of practice of adherence to PPEs (use of facemask, goggles) was significantly associated with the level of health care (P=0.0001; 0.0001).Table 3

Table 4: Respondents adherence to Standard precautions/injection safety practices at the three level of health care

Variable	Health facility	Always	Sometimes	Never	Test	p-value
Use apron	PHC	55(22.2%)	117(47.2%)	76(30.6%)	X^2=10.999	0.028*
	SHC	12(27.9%)	19(44.2%)	12(27.9%)		
	THC	25(12.4%)	117(58.2%)	59 (29.4%)		
Recap needles	PHC	39(15.7%)	61(24.6%)	148(59.7%)		
	SHC	12(27.9%)	6(14.0%)	25(58.1%)	X^2=35.477	0.0001*
	THC	39(19.4%)	90(44.8%)	72(35.8%)		
Hand washing	PHC	63(25.4%)	154(62.1%)	31(12.5%)		
	SHC	9(20.9%)	23(53.50%)	11(25.6%)	X^2=34.850	0.00001*
	THC	78(38.8%)	119(59.2%)	4(2%)		

*Statistically significant

Table 4 further shows that Twenty five (12.4%) and 117 (58.2%) of respondents in the THC level reported that they always and sometimes use apron for indicated clinical activities, however, 59(29.4%) of respondents reported that they never used apron. In addition, 39(15.7%), 12(27.9%) and 39 (19.4%) of the respondents at the three level of health care reported that they always recapped needles. Surprisingly, more than fifty percent of the respondents in the PHC and SHC reported that they never recap needles after use compared to the THC where only a little more than one-third never recapped needles, this relationship was

found to be statistically significant. Also, the level of practice of adherence to PPEs, the use of apron, was significantly associated with the level of health care (0.028). In terms of hand washing, sixty three (25.4%) of the respondents in the PHC always washed their hands or other surface upon exposure to BBFs compared to 9(20.9%) and 78 (38.8%) in the SHC and THC. The association between hand washing and level of health care was found to be statistically significant across the tiers of health care (Table 4).

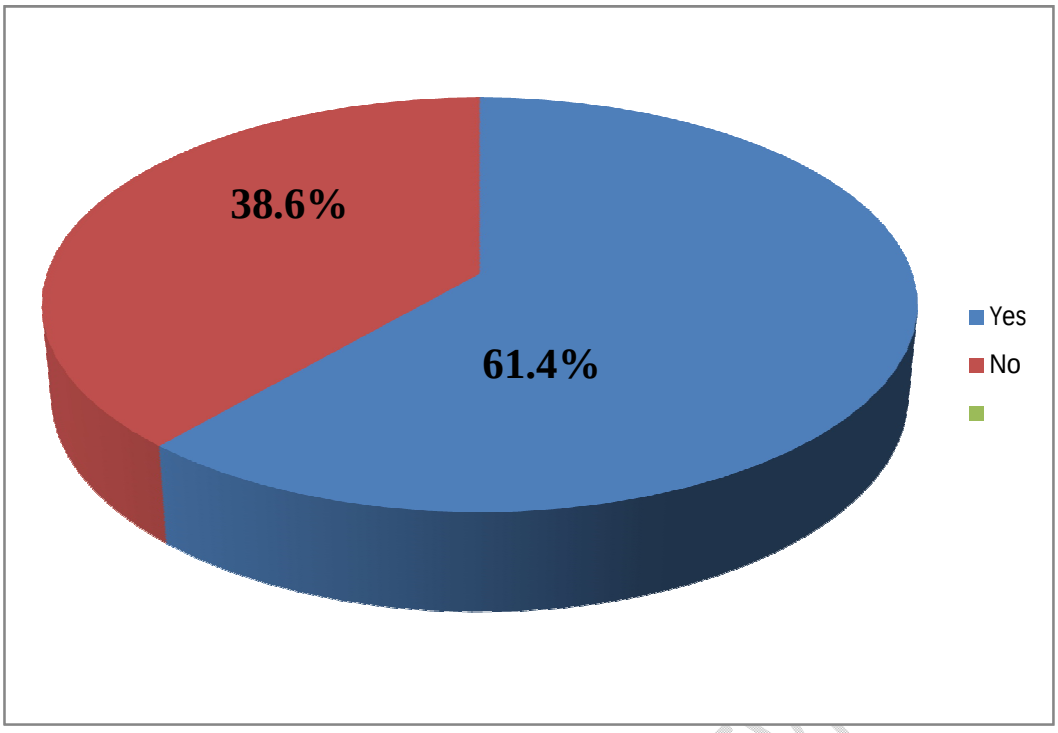

Figure 1: Proportion of respondents who received training on Standard precautions

About 61.4% of the HCWs reported that they had received training on standard precautions while over one third (38.6%) of the HCWs reported not having any training on standard precautions

Table 5: Respondents level of adherence to standard precautions

Practice	Frequency(n=492)	Percent (%)
Poor practice	66	13.4
Fair practice	264	53.7
Good practice	162	32.9

Two hundred and sixty four (53.7%), of the HCWs only had fair level of standard precaution practices, while about one third (32.9%) and 13.4% had good and poor levels of practice of standard precautions respectively.

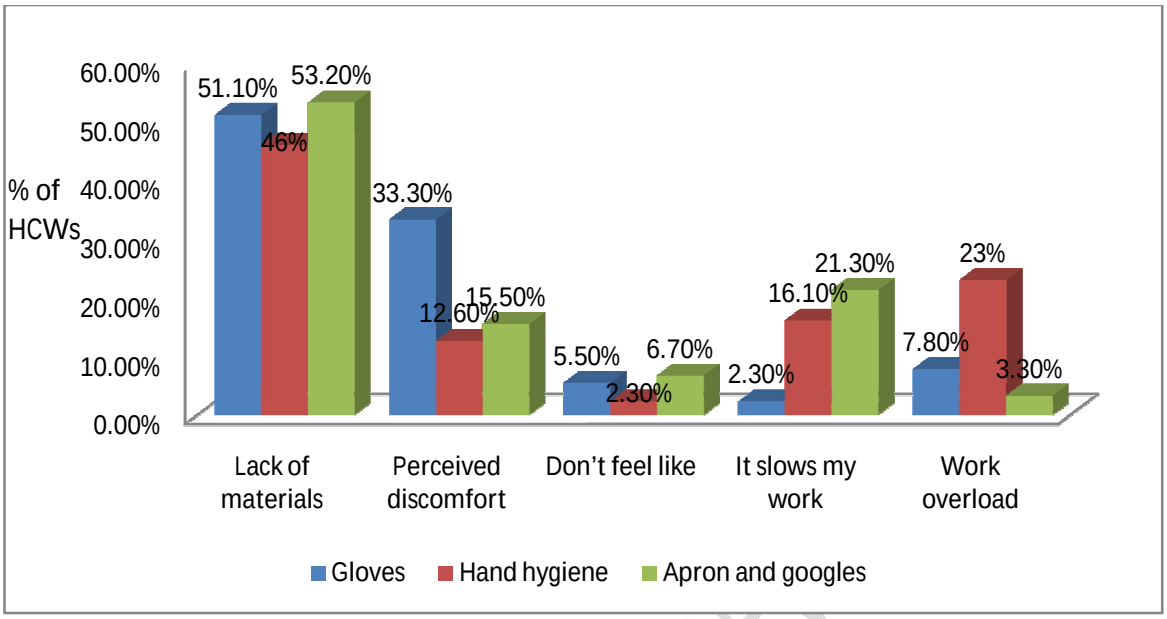

Figure 2: Reasons for non-compliance with standard precautions

Almost 51% and 53.2% of the health care workers reported not using gloves and apron/googles respectively, because of lack of materials. Also, 46% of the HCWs reported not practicing hand hygiene because of lack of materials. Thirty three percent, 12.6% and 15.5% of the HCWs failed to adhere to standard precautions (use of gloves, apron/ mask and hand hygiene) because of their perceived discomfort of the practice.

Table 6: Level of adherence to standard precautions' practices among HCWs at the three level of health care

Health facility/job category	Poor	Fair	Good	P-value
PHC				Fishers exact =0.169
Doctors	1(14.3%)	4(57.1%)	2(28.6%)	
Nurses	12(10.6%)	65(57.5%)	36(31.9%)	
HA	28(23.3%)	60(50.0%)	32(26.7%)	
LW	1(12.5%)	3(37.5%)	4(50.0%)	
SHC				Fishers exact =0.084
Doctors	4(40.0%)	2(20.0%)	4(40.0%)	
Nurses	7(70.0%)	1(10.0%)	2(20.0%)	
HA	4(36.4%)	6(54.5%)	1(9.1%)	
LW	2(16.7%)	4(33.3%)	6(50.0%)	
THC				Fishers exact =0.001*
Doctors	1(1.6%)	28(45.2%)	33(53.2%)	
Nurses	4(5.7%)	36(51.4%)	30(42.9%)	
HA	2(3.6%)	41(74.5%)	12(21.8%)	
LW	0(0.0%)	14(100.0%)	0(0.0%)	

***Statistically significant**

In the PHC, majority of nurses (57.5%) and doctors (57.1%) had fair standard precaution practices. However, majority of the HCWs who are LW(50%) had better practice of standard precautions compared to other categories of HCWs. In the SHC, forty percent of doctor had good standard precaution practice. However, in the THC a large proportion of the doctors (53.2%) had good standard precaution practices compared to other categories of HCWs. However, there was statistically significant relationship between adherence to standard precautions and level of category of the HCWs at the THC, $p<0.001$.

Variables	Always	Intermittent	Rarely	Never	p -value
Gloves					
PHC	28(84.8%)	3(9.1%)	1(3.0%)	1(3.0%)	Fishers exact = 0.049*
SHC	4(50.0%)	2(25.0%)	1(12.5%)	1(12.5%)	
THC	10(76.9%)	0.0%	0.0%	3(23.1%)	

Table 7: Availability of standard precautions (SP) tools in the wards

Facemasks						
PHC	10(30.3%)	6(18.2%)	7(21.2%)	10(30.3%)		
SHC	3(37.5%)	1(12.5%)	3(37.5%)	1(12.5%)	0.907	
THC	4(30.8%)	1(7.7%)	4(30.8%)	4(30.8%)		
Variables	**Yes**		**No**		**Test**	**p-value**
Safety boxes						
PHC	28(84.8%)		5(15.2%)		fishers exact	0.043*
SHC	4(50.0%)		4(50.0%)		test =5.370	
THC	12(92.3%)		1(7.7%)			
Gowns						
PHC	12(36.4%)	4(12.1%)	8(24.2%)	9(27.3%)		
SHC	2(25%)	2(25%)	1(12.5%)	3(37.5%)	0.946	
THC	5(38.5%)	2(15.3%)	3(23.1%)	3(23.1%)		
Needle seen outside Boxes						

***Statistically significant**

As shown in table 7, majority of the heads of facilities interviewed at the PHC, SHC and THC claimed that hand gloves were always available for day to day activities in the following order of frequency- 84.8%, 50.0%, and 76.9% respectively. Facemasks and gowns were reported to be available less than fifty percent of the time in all the health care facilities visited. There was statistically significant association between availability of hand gloves and the level of health care.

Table 8: Observation/ Availability of SP tools at the three level of health care

PHC	5(15.2%)	28(84.8%)	Fishers exact test	0.001*
SHC	6(75.0%)	2(25.0%)	=12.256	
THC	1(7.7%)	12(92.3%)		
Regular water supply				
PHC	19(57.6%)	14(42.4%)		
SHC	4(50.0%)	4(50.0%)	Fishers exact test	0.859
THC	8(61.5%)	5(38.5.6%)	=0.368	
Running water				
PHC	14(42.4%)	19(57.6%)		
SHC	2(25.0%)	6(75.0%)	Fishers exact test	0.429
THC	3(23.1%)	10(76.9%)	=1.794	
Waste segregation receptacles				
PHC	9(27.3%)	24(72.7%)		
SHC	1(12.5%)	7(87.5%)	Fishers exact test	0.695
THC	5(38.5%)	8(61.5%)	=0.748,	
Standard precaution posters				
PHC	9(27.3%)	24(72.7%)		
SHC	1(12.5%)	7(87.5%)	Fishers exact test	0.148
THC	7(53.8%)	6(46.2%)	=4.219	

*Statistically significant

Table 8 shows that majority of the health care workers in the THC and PHC (92.3%;84.8%) had safety boxes in place compared to fifty percent availability in the SHC. In eight of the ward observed in the SHC, needles were seen outside the safety box in 75% of the wards. Majority of the wards or unit visited in the THC had regular water compared to 57% and 50% availability of

regular water recorded in the PHC and SHC. A significant proportion of the wards had no waste segregation bins or receptacles as greater than sixty percent of all the health facilities visited had no waste segregation bins, being, 24(72.7%),7(87.5%) and 8(61.5%) for the wards observed at the PHC, SHC and THC respectively. Similarly, standard precautions (SP) poster was not seen in majority of the health facilities visited, as 72.5% and 87.5% of the wards visited in the PHC and SHC had no posters. However, only 7 (53.8%) out 13 wards observed at the THC had SP posters. Availability of safety boxes and needle seen out the safety boxes was significantly associated with level of health care (0.043; 0.001).

Table 9: Hand hygiene performed correctly among health workers (Frequency, n=141)

Period	PHC	SHC	THC	Total
Before contact with patients	38(40.0%)	10(10.5%)	47(49.5%)	95(100%)
Before exiting patient care area	37(37.8%)	12(12.2%)	49(50.0%)	98(98%)
Before performing aseptic task	34(35.4%)	21(21.9%)	41(42.7%)	96(100%)
After contact with patients	40(39.2%)	15(14.7%)	47(46.1%)	102(100%)
When hands move contaminated to clean body area	36(36.4%)	8(8.1%)	55(55.6%)	99(100%)

Health workers were observed during hand washing moments. The number of times this activity was carried out correctly was recorded. Table 9 presents the distribution of the proportion of times hand hygiene was performed correctly by health workers. Health care workers in the tertiary health care were observed to performed hand hygiene correctly more frequently

compared to the health care workers in the Primary and Secondary health care. About half(55.6%) of the participants in the THC performed hand hygiene when hands moved from contaminated area to a clean area of the patient's body compared to less than forty percent in the PHC and SHC. Also, 47(49.5%) of the HCWs in the THC performed hand hygiene before contact with patient, while 38(40%) and 10(10.5%) of the respondents observed performed hand hygiene prior to contact with patients. In relation to hand hygiene performed before aseptic task, more of the respondents, 41 (42.7%), in the THC performed hand hygiene correctly compared to 34(35.4%) and 21 (21.9%) observed in the PHC and SHC (Table 9).

Table 10: Use of PPEs by health workers (Frequency, n=175)

Practice	PHC	SHC	THC	Total
PPEs is removed prior to leaving patient room	32(24.8%)	26(20.2%)	71(55.0%)	129(100%)
Hand hygiene done after removal of PPEs	31(22.8%)	26(19.1%)	79(58.1%)	136(100%)
Use gloves before contact with patient	37(27.8%)	24(18.0%)	72(54.1%)	133(100 %)
face masks	27(29.3%)	13(14.1%)	52(56.5%)	92(100%)

Majority of the health care workers (55.0%) at the THC were observed to remove their PPEs prior to leaving the patient room unlike in the SHC and PHC where only 24.8 and 20.2% removed PPEs prior to leaving the patient's rooms. Greater than half of the participants in the

THC were observed to always wear hand gloves when performing activities with potential for exposure to BBFs, but less than thirty percent (27.8%;18.0%) of the health care workers in the PHC and SHC wore gloves when performing activities with potential for exposure BBFs. Furthermore, greater than fifty percent of the respondents in the THC and 13 (85.9%) of respondents in the SHC

were observed to always use facemask while over seventy percent of respondents at the PHC were observed not using facemask for indicated clinical activities (Table 10).

DISCUSSION

Health care workers adherence to standard precautions and regular training in infection control remains one of the most important strategies of controlling occupational exposure to blood and body fluids.

Hepatitis B vaccination among HCWs is however reported to be substantially lower based on studies in countries such as India, Iran and Lebanon where greater than eighty percent of the health care workers at the PHC, SHC and THC had received Hepatitis B vaccination.[18-20] The disparities in the rates of utilization of Hepatitis B vaccine likely reflects the differences in the infection control policies viz post exposure management instituted by all the studied institutions. Also, in these countries it is likely that HBV vaccination was offered as a component of occupational health service rather than as a prophylaxis for exposure to BBFs.

Furthermore, non adherence to standard precautions and erroneous practices by health care workers including, failure to use PPEs, unsafe sharp practices were more common among Primary and secondary health care workers compared to the health care workers at the tertiary health care level. This simply means that problem of non availability of standard precautions' tools which are needed to ensure safety of health care workers and prevent them from accidental exposure to BBFs remains a crucial issue that needs quick attention in Nigeria and other developing countries. The lack of manpower, particularly at the primary and secondary levels of care, the availability of standard precautionary materials, and the educational attainment of healthcare professionals may all have an impact on the variations in adherence levels observed in the study.

In the present study, only one third of the health care workers at all the level of health care had good practice of standard precautions, this figure is lower compared to the reported practice of standard precautions in other part of Southern Nigeria.[21]Also, it was noted that nurses in the primary health care level had good practice of standard precautions compared to the HCWs at the post primary health care level (SHC and THC) where majority of the health care workers who had good practices are doctors. The findings reported in the PHC were consistent with the findings amongst HCWs in a multicentre study conducted in Abeokuta metropolis, where majority of nurses had good standard precautions' practices (non recapping of needles) compared to the other HCWs.[22]

A significant proportion of the health care workers reported always using PPEs(gloves), as approximately two-third of the HCWs in the primary and tertiary health care setting reported always using PPEs compared to HCWs at the SHC, where only half of the HCWs reported always using PPEs. The findings is close with data reported among PHC and SHC HCWs in South Western Nigeria,[23]but higher than the figures recorded in other studies.[1,18,24] Generally, a significant proportion of the respondent across the three level of health care in the senatorial district were observed to always wear gloves and perform hand hygiene during patient care, though better level of adherence to standard precautions were noticed among health care workers at the THC.

Moreover, the use of other PPEs (apron, goggles) at the PHC, SHC and THC settings was substantially low. This observations were consistent with findings in other studies conducted among primary, secondary and tertiary health care workers, where the use of other PPEs (apron, facemask) were remarkably low.[1,24,25]The lower rate of use of apron, googles may be related to the types of cases managed(infectious and non infectious case) at the different study areas. By and large, the reasons for the differences in the practice of standard precautions are not

farfetched and it may include attending symposium on infection control, or differences in implementation of institutional policy regarding adherence to infection control.

STUDY LIMITATIONS

Determining the causal links between variables is challenging because this study had the drawbacks of a cross-sectional study methodology. There could have been a recollection bias among the research subjects.

CONCLUSION AND RECOMMENDATIONS

The level of adherence to standard precautions was found tobe generally poor among health care workers at three levels of health care. These poor standard precautions' practices simply depicts that more Healthcare workers will be exposed to infectious blood-borne pathogens if there is no urgent promotion of regular training on standard precautions and reorientation of the attitude of HCWs towards safety precautions.To serve as a consistent reminder of the importance of following infection control procedures, standard precautions posters must be made available by the authorities at all levels. In a similar vein, the government must set up an infection control audit committee whose job it is to inspect the availability of infection control supplies and the compliance of healthcare personnel with standard precautions.

Ethical Approval

Ethical Approval to conduct this research was obtained from Ethics and Research Committee of Irrua Specialist Teaching Hospital.

Consent

As per international standards or university standards, Participants' written consent has been collected and preserved by the author(s).

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