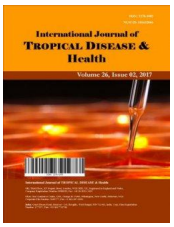

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Factors Affecting Compliance with Standard Precautions among Healthcare Workers in Public Hospitals Abuja, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. Author IE designed the study, wrote the protocol, and wrote the first draft of the manuscript. Authors CO and AG managed the analyses of the study. Author CO managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Background: Health care workers are at risk of various occupational hazards such as blood borne and other pathogens infections in the hospital in the course of carrying out their duties. This study aims to assess the factors affecting compliance with standard precautions (SP)s among Health care workers in primary, secondary and tertiary hospitals in Nigeria
Methods: A cross-sectional survey of 332 health care workers involved in clinical practices from 19 Government health facilities in North central Nigeria. A multi-staged sampling technique was used and data collected using a semi-structured self-administered questionnaire and analysed using Epi-info 7 and associations tested using chi square test and logistic regression. Level of significance was set at 5%.

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Results: Of 332 participants interviewed, knowledge was above average in 274 (82.6%) of the respondents out of which 141 (42.5%) had good knowledge and 133 (40.1%) had fair knowledge. Majority of the respondents (76.2%) were compliant with SPs. Factors significantly affecting health care worker's compliance type of health facility (p=0.022) and years of practice (p=0.044).
Conclusion: Health care workers in primary health facilities were less likely to be compliant with standard precautions than those in tertiary health facilities. Training on infection prevention and control, was recommended.

Keywords: Standard Precautions; compliance; healthcare workers.

1. INTRODUCTION

Nosocomial Infections (NIs) or Hospital-Acquired Infections (HAIs) are a major public health complication. Health care-acquired infections (HAI) are those infections acquired in hospitals or healthcare service units, that first appear 48 hours or more after hospital admission or within 30 days after discharge following an in-patient care, they are unrelated to the original illness that brings patients to the hospital and neither present nor incubating as at the time of admission [1]. According to WHO, hospital acquired infections are the most frequent adverse event in health-care delivery worldwide as hundreds of millions of patients are affected by it worldwide each year, leading to significant mortality and financial losses for health systems [2]. Out of every 100 hospitalized patients at any given time, 7 in developed and 10 in developing countries will acquire at least one HAI [2]. In developed countries, HAI affects from 5% to 15% of hospitalized patients in regular wards and as many as 50% or more of patients in intensive care units (ICUs) [3]. The US Center for Disease Control and Prevention identifies that nearly 1.7 million hospitalized patients annually acquire HCAIs while being treated for other health issues and that more than 98,000 patients (one in 17) die due to these [4]. In developing countries, the magnitude of the problem remains underestimated or even unknown largely because HAI diagnosis is complex and surveillance activities to guide interventions require expertise and resources [2,5]. However in a meta-analysis to assess the burden of HAI in developing country, it was found that Prevalence of HAI was much higher (15·5 per 100 patients) than proportions reported from Europe and the USA [6].

In order to reduce the occurrence of blood borne pathogens infections among health care workers and patients, the US Centre for Disease Control (CDC) in 1983 published a document that recommended that health care worker should take precautions when dealing with blood and body fluid in a patient who was known or suspected to be infected with blood borne pathogens and in 1987, later came up with the concept of Universal Precautions (UPs) whereby regardless of patient's infection status, the precautions must be consistently used.[5] UPs include a set of precautions devised to prevent transmission of all known blood borne pathogens including HIV, HBV, and HCV to and or from health care workers when providing care to all patients regardless of patient's infection status [7,8]. In 1996, the CDC included the universal precautions in a new prevention concept called standard precautions.

These are the minimum infection prevention practices that apply to all patient care, regardless of suspected or confirmed infection status of the patient in any setting where healthcare is delivered [9]. These precautions are designed to protect the health care workers, patient and their relations from transmission of infections to one another. It is thus important for every health care workers to observe these precautions when caring for all patients as part of a routine strategy for infection control in healthcare settings [10]. Standard Precautions require that health care workers assume that the blood and body substances of all patients are potential sources of infection, regardless of the diagnosis, or presumed infectious status [11]. The different components of SPs include hand hygiene, use of personal protective equipment (e.g., gloves, gowns, masks), safe injection practices, safe handling of potentially contaminated equipment or surfaces in the patient environment, appropriate waste disposal and respiratory hygiene/cough etiquette [12].

Compliance with SPs by health care workers has been recognized as an efficient means to prevent and control blood borne pathogens infections and HAIs in the patients and Health Workers [13,14,15]. Several studies have been done on knowledge, attitude and compliance with SPs in

both developed and developing countries [7,12,16,17–21]. In spite of the studies carried out in the developed countries showing various factors affecting health care worker's compliance with SPs, in Nigeria most studies have also looked at knowledge attitude and practice/ compliance and few has sought to find out the factors affecting compliance with SPs also studies done in Nigeria had focused on tertiary [22] or secondary [23] HF ignoring the primary HF which is the first contact with healthcare in Nigeria. This study aims to assess the factors affecting compliance with SPs among Health care workers in primary, secondary and tertiary hospitals in Nigeria. The result of the study this will help in designing educational programs for hospital staff and in making policies that will improve healthcare workers compliance with SP there reducing the burden of HAI [16].

2. METHODOLOGY

2.1 Study Area

The study was conducted in Abuja, the capital city of Nigeria. Abuja has a close proximity to the north central states of Niger, Kaduna, Nasarawa and Kogi with a total population of 1,405,201 (2006 Census).

There are six area councils with 62 political ward each with 738 hospitals made up of 2 Tertiary health facilities, 14 Secondary health facilities, 179 Primary health Centres, 5 Private Tertiary health facilities, 79 Private Secondary health facilities and 459 Private Primary health facilities in the six Area Councils.

2.2 Study Design

The study was a cross sectional descriptive study.

2.3 Study Population

The study population for this study comprises Health care workers (Doctors, Nurses/CHEWs and medical laboratory scientists/technicians) in primary, secondary and tertiary hospitals. There was a total of 2,404 health professionals (which is made up of 887 males and 1,517 females). Nurses/midwives constituted the highest number (1,176), followed by the medical officers (350), pharmacists (138), Community Health Extension Workers (CHEWs) (135), medcal laboratory scientists (121) and the medical record assistants (110) [24].

2.4 Sample Size Determination

The sample size was calculated using the sample size formula for descriptive studies [25].

$n = \frac{(Z_{\alpha})^2 \times p\ (1-p)}{}$ and a value of 302.8 was gotten.

Considering a non-response rate of 10%

Therefore, total sample size = 335 ≈ 340

2.5 Sampling Technique

Multi-stage sampling method was employed to recruit subjects into the study. The health facilities were stratified into primary, secondary and tertiary health facilities. Stratified sampling via proportionate allocation was used to select 12 primary health facilities, 6 secondary health facilities, and 1 tertiary health facility from a list of 193 government facilities situated in Abuja, using a ratio of 12:6:1, respectively. Health care workers were stratified based on professional cadre into three; doctors, nurses/chews and laboratory scientists/technicians. Proportionate sample size allocation was then used to determine the number required from each of the professional groups from the selected health facilities. A sampling frame was drawn from the list of the staffs in the selected professional groups obtained from the health facility and simple random sampling was employed in selection of the respondents.

2.6 Study Instruments

A semi structured self-administered questionnaire was administered to the respondents based on the selected health facility. The questionnaire was adapted from Luo et al and has four sections including socio-demography, knowledge, compliance and factors affecting health care workers with Standard Precaution, it was modified to suit the study objectives. The questionnaire was pretested prior to commencement of the study among health care workers in another secondary health facility in Abuja

2.7 Data Management

Data was entered into a Microsoft excel spread sheet, cleaned and analysed using the statistical package EPI info version 7. The Socio-demographic and other variables were presented in tables and graphs. Means and standard deviation for the quantitative variables was

calculated while the qualitative variables were expressed as frequencies and proportions. Chi square test was used to compare proportions. Multivariate analysis using binary logistic regression was used to identify determinants of compliance with SPs and the level of statistical significance was set at $p<0.05$.

3. RESULTS

A total of 332 health care workers participated in this study, 129 respondents from the primary health facilities, 123 and 80 respondents from the secondary and tertiary health facilities respectively. Out of 340 questionnaires distributed to respondents, 332 responded giving a response rate of 97.6%.

Mean age of respondents was 37.2 ± 8.28 years and most of them were females 223(67.2%). Most of the respondents were nurses and majority of the respondents had not worked for up to 10 years in their current health facilities.

Table 3 shows that Knowledge of standard precaution was good in 141 (42.5%) of the respondents and fair in133 (40.1%) of them

Most of the respondents (83.4%) knew about hand hygiene, less than half knew about safe handling of potentially contaminated surface (46.1%) and respiratory hygiene (36.1%)

Most of the respondents (61.4%) had average level of compliance with SPs and very few of the respondents had very low level of compliance with SPs. The mean compliance score of all the respondents was 2.89 (SD=0.54)

Compliance with Standard Precautions is not associated with age (p value=0.139), sex (p value=0.401), marital status (0.384) and (p value= 0.813)

Compliance with Standard Precautions is not associated with IPC training (0.167), availability of PPE (0.563), organisational policy (0.872), availability of water, soap and hand sanitizers (0.836), skin irritation (0.526), interference with work (0.295) and knowledge of SPs (0.176)

Table 1. Socio-demographic characteristics of respondents

Socio-demographic variables	Frequency (n=332)	Percent (%)
Age categories (years)		
21-30	84	25.3
31-40	137	41.3
41-50	84	25.3
51-60	27	8.1
Mean age (SD)	37.2 ± 8.28	
Sex		
Female	223	67.2
Male	109	32.8
Marital Status		
Single	71	21.4
Married	254	76.5
Separated/Divorced	7	2.1
Occupation		
Laboratory scientist/technician	76	22.9
Nurses	204	61.4
Medical doctors	52	15.7
Years of practice of profession		
≤10 years	293	88.2
>10 years	39	11.7
Mean (SD)	6.0 ± 5.28	
Type of Health facility		
Primary	129	38.9
Secondary	123	37.0
Tertiary	80	24.1

Table 2. Knowledge of various components of SPs among health care workers

Level of knowledge	Frequency (n=332)	Percent (%)
SPS components	**Knowledge of standard precaution**	
	Yes n (%)	**No n (%)**
Hand hygiene	277 (83.4)	55 (16.6)
PPE	197 (59.3)	135 (40.7)
Safe injection	175 (52.7)	157 (47.3)
Safe handling of potentially contaminated surface	153 (46.1)	179 (53.9)
Respiratory hygiene	120 (36.1)	212 (63.9)

Table 3. Knowledge of SPs among health care workers in Public Hospitals in Abuja

Level of knowledge	Freq. (n=332)	Percent (%)
Good (>75%)	141	42.5
Fair (51-75%)	133	40.1
Poor (≤50%)	58	17.5

Table 4. Knowledge of SPs among health care workers in the different level of health facilities

Type of health facility	Knowledge on SP		
	Adequate n (%)	**Not adequate n (%)**	**Total n (%)**
Primary	91 (70.5)	38 (29.5)	129 (100.0)
Secondary	111 (90.2)	12 (9.8)	123 (100.0)
Tertiary	72 (90.0)	8 (10.0)	80 (100.0)

Table 5. Health care worker's compliance with the various components of SPs

Variables	Compliant n (%)	Noncompliant n (%)
Wash hands before and after patient care	258 (77.7)	74 (22.3)
Wash hands before and after using gloves	225 (67.8)	107 (32.2)
Wash hands when you touch blood /body fluids /excretion	317 (95.5)	15 (4.5)
Wear gloves before touching mucous membrane non intact skin	304 (91.6)	28 (8.4)
Wear a gown to protect when carrying out procedures	224 (73.5)	88 (26.5)
Wear goggles to protect the eyes during procedures	146 (44.0)	186 (56.0)
Wear facemask to protect nose/mouth during procedures	191 (57.5)	141 (42.5)
Bend needles before disposal	61 (18.4)	271(81.6)
Practice safe respiratory hygiene/cough etiquette	231 (69.6)	101 (30.4)

Table 6. Level of compliance with SPS among health care workers in public health facilities in Abuja

Compliance category	Frequency (n=332)	Percent (%)
High (3.51-4.00)	49	14.8
Average (2.51-3.50)	204	61.4
Low (1.51-2.50)	77	23.2
Very low (0.0-1.50)	2	0.6

At 5% level of significance, compliance was found to be significantly associated with health care worker's years of working experience (0.040) and type of health facility (0.022). Hence health care workers with more than 10 years working experience had significantly higher proportion (85.5%) of compliance with SPs than those with 10 years or less working experience.

4. DISCUSSION

In this study the proportion of healthcare workers with good knowledge of SPs was 42.5% and those with fair knowledge was 40,1%, hence approximately 82.6% of the health care workers had above average of SPs as shown in Table 3. The finding in this study is similar to what was reported in a study carried out in Northern

Nigeria to assess practice of SPs among health care workers where knowledge was reported to be 87.3% [26]. It is also comparable with another study carried out among student nurses in the Philippine where knowledge of SPs was 89.7% [27]. However another study done to assess the knowledge and practice of SPs amongst health care workers in secondary Health facilities in Abuja health care worker's knowledge of SPs was poor 16.6% [23]. This wide discrepancy seen in this study despite the fact that they were carried out in the same locality could be because the latter study looked at only a level of Health care (secondary health facilities) which could be misleading. This study however looked at knowledge of SPs among Health care workers across board (primary, secondary and tertiary health facilities) in order to have an unbiased representation of the Health care workers.

Health care worker's with more than average knowledge of SPs in this study does not appear to translate to appropriate compliance with SPs. The overall level of compliance with standard precautions in this study was found to be above average in 76.2% (by adding high and average compliance) of the participants despite recording a good level of knowledge of SPs among the respondents as shown in table 4. The findings in this study was similar to what was found in a study carried out to assess hand hygiene compliance among physicians in selected health facilities in Israel where compliance was found to be 77%, [28] it is also similar to what was found in another study carried out among Health care workers in northern Nigeria, where compliance was 72.7% [26]. There is however a high level of compliance seen in some studies, in a study carried out among student nurses in the Philippine a total of 89.7% of them were found to be compliant with SPS [27]. In a comparative study carried out in Texas among resident doctors and students, compliance with universal precautions was also high 89%, although it was better among students (96%) than among residents (88%) [30]. The high level of compliance with SPs among student nurses in Philippine was thought to be due to inclusion of the concepts of standard precautions in the Philippine nursing curriculum [27]. In the study carried out in Texas despite the high compliance to SPs found in the study respondents still argued that they could be more compliant if there were no time constraints and limitations [30].

Compliance with various aspects of SPs also differs among Health care workers, in this study it was found that compliance to hand washing before and after patient care was 77.7%, hand washing before and after glove use was 67.8%, wearing gloves when touching blood/body fluids 95.5%, gloves before touching mucous membrane and non-intact skin 91.6%, wearing gown/apron to protect when carrying out procedures 73.5%,

Table 7. Effect of socio-demographic factors on health care worker's compliance with standard precautions

Variables	Standard precautions			Chi-square	P value
	Compliant n (%)	Non-compliant n (%)	Total n (%)		
Age (years)					
≤40	163 (73.8)	58 (26.2)	221 (100.0)	2.187	0.139
>40	90 (81.8)	21 (18.9)	111 (100.0)		
Sex					
Female	173 (77.6)	50 (22.4)	223 (100.0)	0.707	0.401
Male	80 (73.4)	29 (26.6)	109 (100.0)		
Marital status					
Single	50 (70.4)	21 (29.6)	71 (100.0)	1.915	0.384
Married	197 (77.6)	57 (22.4)	254 (100.0)		
Separated/Divorced	6 (85.7)	1 (14.3)	7 (100.0)		
Occupation					
Laboratory scientist/technician	60 (78.9)	16 (21.1)	76 (100.0)	0.414	0.813
Nurses	154 (75.5)	50 (24.5)	204 (100.0)		
Medical doctors	39 (75.0)	13 (25.0)	52 (100.0)		

Table 8. Effect of other factors on health care worker's compliance with Standard Precautions

Variables	Standard precautions compliance			Chi-square	P value
	Compliant n (%)	Non-compliant n (%)	Total n (%)		
IPC Training	218 (77.6)	63 (22.4)	281 (100.0)	1.908	0.167
Availability of PPE	206 (76.9)	62 (23.1)	268 (100.0)	0.335	0.563
Organizational policy	207 (76.4)	64 (23.6)	271 (100.0)	0.026	0.872
Availability of water, soap and hand sanitizers	195 (76.5)	60 (23.5)	255 (100.0)	0.043	0.836
Skin irritation	150 (75.0)	50 (25.0)	200 (100.0)	0.403	0.526
Interference with work	140 (74.1)	49 (25.9)	189 (100.0)	1.099	0.295
Knowledge of SPS					
Poor	39 (67.2)	19 (32.8)	58 (100.0)	3.477	0.176
Fair	106 (79.7)	27 (20.3)	133 (100.0)		
Good	108 (76.6)	33 (23.4)	141 (100.0)		

Table 9. Effect of other factors on health care worker's compliance with standard precautions (continuation)

Variables	Standard precautions compliance			Chi-Square	P value
	Compliant n (%)	Non-compliant n (%)	Total n (%)		
Not wanting to offend patient					
Yes	143 (76.1)	45 (23.9)	188 (100.0)	0.005	0.945
No	110 (76.4)	34 (23.6)	144 (100.0)		
Previous exposure to blood splashes					
Yes	187 (74.5)	64 (25.5)	251 (100.0)	1.645	0.200
No	66 (81.5)	15 (18.5)	81 (100.0)		
Time					
Yes	173 (74.9)	58 (25.1)	231 (100.0)	0.722	0.396
No	80 (79.2)	21 (20.8)	101 (100.0)		
Prior exposure to NSSIs					
Yes	169 (74.4)	58 (25.6)	227 (100.0)	1.220	0.269
No	84 (80.0)	21 (20.0)	105 (100.0)		
Inconvenience					
Yes	143 (74.1)	50 (25.9)	193(100.0)	1.133	0.287
No	110 (79.1)	29 (20.9)	139 (100.0)		
Years of practice of profession					
<10 years	206 (74.4)	71 (25.6)	277 (100.0)	6.427	0.040*
>10 years	47 (85.5)	8 (14.5)	55 (100.0)		
Health facility type					
Primary	91 (70.5)	38 (29.5)	129 (100.0)	7.614	0.022*
Secondary	104 (84.6)	19 (15.4)	123 (100.0)		
Tertiary	58 (72.5)	22 (27.5)	80 (100.0)		

protecting the eyes during procedures 44%, waste disposal 18.4%, cough etiquette 69.6% and wearing of face mask during procedures was found to be 57.5% as shown in table 5. Many studies on compliance to specific aspects of standard precautions have also shown this varying degree of compliance. The findings in this study is similar to what was found in a study conducted by nurses and midwives on compliance with standard precautions in South Western Nigeria, where 96.1% of the respondents complied to hand hygiene and use of personal protective equipment (PPE), their hands after removal of gloves, 95.3% agreed they discard gloves after care of a single patient while 97.3% agreed that they wear facemask whenever there is a possibility of splash or splatter [31]. Furthermore, it was discovered that 98.6% of the respondents agreed that they disposed all used sharp objects into the sharp boxes, 96% of the respondents agree they separated all waste and disposed according to category, 95.2% treated all patients and materials as if they were infectious, while 89.9% agreed they promptly wiped up all potentially contained spills using disinfectant [31]. Another similar finding was seen in another study carried out in only secondary health facilities in the same study area as this study it was found that hand washing was practiced by 97.46%; 97.83% reported regular use of hand gloves; 88.44% use gown or plastic apron; 68.95% use masks and eye protector [23].

Various factors affecting compliance with SPs was assessed in this study and it was found that years of working experience was significantly associated with compliance with SPs whereby those healthcare workers who have worked for more than 10 years were more likely to be compliant with SPs. The findings from this study contrasts with what was found in a study carried out in Texas, USA where observed rate of compliance with universal precautions by participants indicates that individual compliance was inversely related to the years of experience [28,29]. Another factor that significantly affects compliance in this study was type of health facility that the Health care workers are working. Therefore, it can be deduced from this finding that the longer a healthcare worker spends in a health facility the more training on standard precaution he or she may have attended thus the more compliant he or she may be, seniority also means less workload and more time to comply with standard precautions. Availability of commodities/ consumables for standard precautions and the availability of resources to set up infection control committee and to hold regular training and sensitization for healthcare workers on standard precautions may be more in tertiary hospital compared to secondary and primary health facilities thereby making the healthcare workers in tertiary hospitals to be more compliant with standard precautions than those in secondary and primary. The findings in this study is similar to what was found in a study carried out in India where good compliance with SPs was associated with being in the job for a longer period, knowledge of blood borne pathogen transmission, perceiving fewer barriers to safe practice and a strong commitment to workplace safety climate [17]. Furthermore a study carried out among Health care workers in north eastern Nigeria it was found that factors such as years of practice has positive effect on healthcare workers compliance with standard precautions [32]. The logistic regression analysis of this study reveals that level of Health facility is a determinant of Compliance with SPs, health care workers working in primary health facilities were less like to be compliant with SPs than those in tertiary health facilities.

One of the limitations of this study was the likelihood to overestimate compliance due to health care workers tendency to give false information about their compliance to SPs [33]. To overcome this limitation, confidentiality was ensured. Another limitation was non-response bias due to the unwillingness of some Health care workers to participate in the study as a result of their busy schedule, however this was also minimized by arranging a convenient time when the workload of the health care workers was less.

5. CONCLUSION AND RECOMMENDATION

The level of knowledge of SPs among health care workers was good, however this did not directly translate to compliance as the level of health care worker's compliance to SPs was average. Non-availability of PPE, other equipment and lack of regular training were factors found to affect compliance. The study also revealed that the type/level of Health facility is a determinant of HCW's Compliance with SPs i.e. HCW working in

Primary health facilities were three times less like to be compliant with SPs than those in Tertiary health facilities.

In order to reduce occurrence of HAI it is important for the Federal Ministry of Health to develop country specific policies and guidelines on the importance of health care workers compliance with SPs and ensure strict implementation of these policies at all levels of health care especially primary health care. Health facilities also need to build the capacity of health workers on standard precaution through regular training and attendance of workshops, thus management of Health facilities should ensure availability of sufficient practical personal protection equipment in order to enhance compliance with SPs by health care workers and thus reduce the occurrence of hospital acquired infections among patients and also reduce the prevalence of blood borne pathogens among health care workers. Furthermore, functional infection control committees should be constituted to conduct regular training on infection prevention and control and ensure constant availability of essential commodities that will aid compliance.

CONSENT

Written informed consent was obtained from the HCWs during which their cooperation were sought. Confidentiality was assured and maintained.

ETHICAL APPROVAL

Ethical approval was obtained and permission to carry out the study was sought in each of the selected health facilities before the commencement of the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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