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Original Article **Open Access**

Knowledge, attitude and prevention practice against hospital-acquired infections among healthcare workers in National Hospital Abuja, Federal Capital Territory, Nigeria

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Abstract:

Background: Hospital-acquired infections (HAIs) pose serious challenges to safe and high-quality healthcare delivery. They are associated with prolonged hospital stays, disability, economic burden, and mortality, and are usually consequences of poor infection prevention and control practices. The objective of this study was to assess the level of knowledge, attitude and practice of healthcare workers on infection prevention, and the determining factors at the National Hospital Abuja, Nigeria.
Methodology: This was a descriptive cross-sectional study of 300 participants selected by multi-stage and systematic random sampling techniques at the National Hospital Abuja. Data on knowledge of HAIs, attitude toward HAI prevention, and practice of HAI prevention were collected from each participant using self-administered structured questionnaires. Data were analyzed using the Statistical Package for the Social Science, version 25.0. Chi-square test was used to determine the association between categorical variables, and the level of significance was set at $p<0.05$.
Results: Of the 300 questionnaires administered, 286 were duly filled and returned, resulting in a response rate of 95.3%. One hundred and three (53.0%) respondents were within the age group 31-40 years, over half of the respondents were females (58.7%) and 57.0% had work experience of less than 5 years. Based on the cut-off scores of 15.7, 32.2 and 8.5 that characterized respondents' knowledge, attitude and practice of infection prevention respectively as good or poor, 50.4% of the respondents had good knowledge of HAIs, 71.0% had good attitude towards HAIs prevention and 55.5% had good infection prevention practices. However, good knowledge of HAIs was significantly associated with poor infection prevention practices ($p=0.002$). Female gender ($p=0.029$), work experience of less than 5 years ($p=0.036$), laboratory scientist profession ($p=0.010$), and no previous training on HAIs ($p=0.005$) were factors significantly associated with good infection prevention practices among the respondents.
Conclusion: In this study, good knowledge of HAIs, and infection prevention practices among the respondents were average, although good attitude towards HAIs prevention was high. These findings highlight the need to continue intensive and in-service trainings of healthcare workers toward HAIs prevention, including behavioral change, using innovative approaches.

Keywords: Hospital-acquired infection, health care workers, knowledge, attitude, practice

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Connaissances, attitudes et pratiques de prévention contre les infections nosocomiales chez les agents de santé de l'hôpital National d'Abuja, Territoire de la Capitale Fédérale, Nigéria

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Résumé:

Contexte: Les infections nosocomiales (IN) posent de sérieux problèmes pour la prestation de soins de santé sûrs et de qualité. Elles sont associées à des séjours hospitaliers prolongés, à l'invalidité, à un fardeau économique et à la mortalité, et sont généralement les conséquences de mauvaises pratiques de prévention et de contrôle des infections. L'objectif de cette étude était d'évaluer le niveau de connaissances, l'attitude et la pratique des professionnels de santé en matière de prévention des infections, ainsi que les facteurs déterminants à l'hôpital national d'Abuja, au Nigéria.
Méthodologie: Il s'agissait d'une étude transversale descriptive portant sur 300 participants sélectionnés par des techniques d'échantillonnage aléatoire systématique à plusieurs degrés à l'hôpital national d'Abuja. Les données sur la connaissance des IN, l'attitude envers la prévention des IN et la pratique de la prévention des IN ont été collectées auprès de chaque participant à l'aide de questionnaires structurés auto-administrés. Les données ont été analysées à l'aide du progiciel statistique pour les sciences sociales, version 25.0. Le test du chi carré a été utilisé pour déterminer l'association entre les variables catégorielles, et le niveau de signification a été fixé à $p<0,05$.
Résultats: Sur les 300 questionnaires administrés, 286 ont été dûment remplis et renvoyés, ce qui donne un taux de réponse de 95,3%. Français Cent trois (53,0%) répondants étaient dans la tranche d'âge de 31 à 40 ans, plus de la moitié des répondants étaient des femmes (58,7%) et 57,0% avaient une expérience professionnelle de moins de 5 ans. Sur la base des scores limites de 15,7, 32,2 et 8,5 qui caractérisaient respectivement les connaissances, l'attitude et la pratique des répondants en matière de prévention des infections comme bonnes ou mauvaises, 50,4% des répondants avaient une bonne connaissance des IASS, 71,0% avaient une bonne attitude à l'égard de la prévention des IASS et 55,5% avaient de bonnes pratiques de prévention des infections. Cependant, une bonne connaissance des IASS était significativement associée à de mauvaises pratiques de prévention des infections (p=0,002). Le sexe féminin (p=0,029), une expérience professionnelle de moins de 5 ans (p=0,036), la profession de scientifique de laboratoire (p=0,010) et l'absence de formation antérieure sur les IASS (p=0,005) étaient des facteurs significativement associés à de bonnes pratiques de prévention des infections parmi les répondants.
Conclusion: Dans cette étude, la bonne connaissance des IAS et les pratiques de prévention des infections parmi les répondants étaient moyennes, bien que la bonne attitude envers la prévention des IAS soit élevée. Ces résultats soulignent la nécessité de poursuivre les formations intensives et continues des agents de santé en matière de prévention des IAS, y compris le changement de comportement, en utilisant des approches innovantes.

Mots clés: infection nosocomiale, agents de santé, connaissances, attitude, pratique

Introduction:

According to the World Health Organization (WHO), hospital-acquired infections (HAIs), also known as nosocomial infections, are defined as infections occurring in patients during the process of care within a healthcare facility that was not present or incubating at the time of admission (1–4). HAIs are a major public health challenge globally and the incidence is increasing despite efforts at hospital infection control measure, and this contributes significantly to morbidity and mortality (5,6).

HAIs are the most frequent adverse events in healthcare facilities worldwide, and impose major detrimental effects on the quality of clinical services (1). The prevalence of HAIs ranging from 25% to 40% is high globally (4) and varies between countries and within healthcare facilities. However, according to the estimates from the WHO, hundreds of millions of patients are affected yearly by HAIs worldwide with significant proportion of these occurring in the low-and-middle-income-countries (4,7,8). In Europe, HAIs account for 16 million additional hospital stays with estimated total costs of €7 billion. HAIs also cost the United States healthcare system an estimated $30-45 million (9).

The risk of contracting HAIs has been reported to be up to 20 times more in developing compared with the developed countries (10). Thus, the spread of infection serves as a major source of worry for healthcare practice, particularly in the developing countries where the healthcare system is already overstrained. In this regard, HAIs affect patients, healthcare workers (HCWs), support staff, medical students, and patient attendants (9). HCWs are especially at increased risk of acquiring HAIs through occupational exposure (4).

It has been widely reported in the literature that there are variations in healthcare workers' knowledge, attitude, and practice regarding prevention of HAIs. Different studies have shown that most healthcare providers have good knowledge of HAIs with percentages ranging from 45.5% to 94.1% (10–15). The attitude of HCWs toward prevention of HAIs reported from different countries varies, with 55.6% in Ethiopia (9,16), 33.0% in Iran (17), and 82.9% in Nigeria (18). Several studies conducted in different parts of the world on HCWs practices of HAI prevention reported good practice, ranging from 50.8% to 84.6% (5,11,12,14,18,19). Age, gender, work experience, and previous training on infection prevention measures are some of the estab-

lished factors influencing HCWs knowledge and practice concerning HAIs (12,20). The objectives of this study are to assess HCWs knowledge, attitude, and prevention practices and determine factors affecting these parameters at the National Hospital, Abuja, Nigeria.

Materials and method:

Study area:

The study was conducted at the National Hospital, Abuja, Nigeria. Abuja is the Federal Capital Territory (FCT) which came into existence in 1976. It spreads over a land mass area of approximately 7,315 km^2, of which the definite city occupies 275.3 km^2. The population of Abuja is estimated to be approximately 2 million. The National Hospital Abuja (NHA) is one of the tertiary hospitals in the FCT and is a 450-bed tertiary public hospital located in the cosmopolitan city of Abuja.

Study design and participants:

The study is a descriptive cross-sectional survey carried out on healthcare workers at the National Hospital, Abuja. The study participants are consenting healthcare workers who have worked for a minimum of one year and are potentially at high risk of HAIs. Health care workers on any form of leave were excluded from the study.

Ethical consideration:

Ethical approval was obtained from the Ethical Review Board of the National Hospital, Abuja. Informed consent was obtained from the respondents after the objective of the study was duly explained to them.

Sample size calculation:

The Leslie Fisher's formula was used to calculate the sample size which gave a calculated sample size of 248, which was adjusted for 10% non-response rate, to give adjusted sample size of 273. However, a total of 300 questionnaires were distributed to increase the power of the study.

Sampling techniques:

The multistage and systematic random sampling techniques were employed in the selection of the 300 respondents. Healthcare workers were stratified into different cadres such as nurses, doctors, laboratory scientists and others. The list of different cadres was generated, and respondents were selected by systematic random sampling method based on proportional allocation of number of staffs per cadre. Sampling continued until the desired sample size of 300 was obtained.

Data collection instrument and administration:

A semi-structured interviewer administered questionnaire was administered to the participants to collect information on their knowledge of nosocomial infection, attitude toward nosocomial infection prevention and practice of nosocomial infection prevention. The questionnaire was adapted from previous studies. The procedure for filling the questionnaire was explained to the participants by trained research assistants and were manually collected after being successfully filled.

Data analysis:

The questionnaires were checked for completeness and clarity. The data were analysed using IBM Statistical Packages for Social Sciences (SPSS) Version 25.0. Frequency distributions, percentages, and mean scores of variables were computed. Chi-square test was used for bivariate analysis of categorical variables at 5% level of significance.

Results:

Socio-demographic characteristics of respondents:

Of the 300 questionnaires administerred, 286 were duly filled and returned, given a response rate of 95.3%. Table 1 presents the socio-demographic characteristics of the respondents. The largest number of the respondents were in the age group 31-40 years (36.0%, n=103), females (58.7%, n=168), and first-degree holder (67.5%, n=193). More respondents (57%, n=163) had less than 5 years of work experience.

Table 1: Sociodemographic characteristics of the respondents at the National Hospital, Abuja, Nigeria

Characteristics	Frequency	Percentage
Age group (years)		
<20	4	1.4
21-30	93	32.5
31-40	103	36.0
41-50	60	21.0
51-60	24	8.4
>61	2	0.7
Gender		
Male	118	41.3
Female	168	58.7
Tribe		
Yoruba	85	29.7
Igbo	123	43.0
Hausa	78	27.3
Religion		
Christianity	202	70.6
Islam	82	28.7
Traditionalist	2	0.7
Education		
Diploma	33	11.5
Bachelor degree	193	67.5
Master degree	60	21.0
Length of work experience		
<5years	163	57.0
>5years	123	43.0
Profession		
Medical doctor	32	11.2
Dentist	19	6.6
CHEW	79	27.6
Nurse	49	17.1
Radiographers	14	4.9
Pharmacist	15	5.2
Laboratory Scientist technician	30	10.5
Optometrist	12	4.2
Others	36	12.6
Any seminar/training on nosocomial infection		
Yes	161	56.3
No	125	43.7

CHEW: community health extension worker

Table 2: Knowledge of hospital-acquired infections among the respondents at National Hospital, Abuja, Nigeria

Variables	Frequency	Percentage
Definition of nosocomial infection		
Right answer	270	94.5
Wrong answer	16	5.5
Source of information**		
Television	128	44.8
Training and seminar	170	59.4
Family and friends	21	7.3
Others	26	9.1
Source of nosocomial infection**		
Hospital	240	83.9
Patients bring from home	12	4.2
Could either be from hospital or home	41	14.3
Ways of preventing nosocomial infection**		
Face mask use by patient	240	84.2
Good waste management	269	94.4
Aseptic care of puncture wound	145	50.9
Segregation of clinical and non- clinical waste	280	98.6
Blood-stained linen should be thrown in red linen bag	268	94.0
Use of surgical face mask by health worker	282	98.9
Regular hand washing	283	99.3
Wearing of apron and gown to prevent splash	280	98.2

** Multiple responses allowed.

Respondents' knowledge of nosocomial infection:

Table 2 shows that almost all the respondents (94.5%, n=270) were correct about the definition of nosocomial infection. The main source of respondents' information on nosocomial infection was from training and seminars (59.4%). Most of the respondents (83.5%) believe that nosocomial infections are contracted from the hospital with most implycated organisms are from urinary tract infection (72.4%) followed by hepatitis C virus infection (58.0%).

Respondents' attitude towards nosocomial infection prevention:

Tables 3 shows that almost all the respondents agreed to the categorizing of hospital waste before disposal (93.3%, n=264), that health worker's hand is a potential source of infection (93.3%, n=264), that washing of hands after removing gloves is helpful (96.5 %, n=276) and that antiseptic is necessary (94.0% n=266). About 67.5% (n=191) of the respondents agreed that changing mask before moving to another patient is helpful, 86.6% (n= 245) responded that invasive procedures are risk factors for multidrug resistant (MDR) infections and 87.2% (n=246) responded that patient's history determines their use of personal protective equipment (PPE).

Respondents' practice of nosocomial infection prevention and control:

Table 4 shows that more than two third (66.8%, n=189) of respondents always perform hand washing before starting work while almost all (92.2%, n=261) perform hand washing before handling new patients. Almost all the respondents change gloves before handling new patients (92.9%, n=263), wear masks while handling TB-suspected patients (93.6%, n=264) and disinfect infectious materials or leftover samples (91.1%, n=257).

Table 3: Attitude of respondents towards prevention of hospital-acquired infections in National Hospital, Abuja, Nigeria

Variables	Frequency	Percentage
Categorizing hospital waste before disposal		
Agree	264	93.3
Indifferent	14	4.9
Disagree	8	1.8
Health care workers' hand is a potential source of infection		
Agree	264	93.3
Indifferent	12	4.2
Disagree	10	2.5
Changing mask before moving to another patient is helpful		
Agree	191	67.5
Indifferent	80	28.3
Disagree	15	4.2
Invasive procedure is a risk factor for multidrug resistance		
Agree	245	86.6
Indifferent	35	12.4
Disagree	6	1.1
Washing of hands after removing glove is helpful		
Agree	276	96.5
Indifferent	7	2.4
Disagree	3	1.1
Patient's history determines my use of PPE		
Agree	246	87.2
Indifferent	22	7.8
Disagree	18	5.0
Antiseptic is necessary		
Agree	266	94.0
Indifferent	14	4.9
Disagree	6	1.1

Table 4: Respondents prevention practices towards hospital-acquired infections in National Hospital, Abuja, Nigeria

Variables	Frequency	Percentage
Hand washing before starting work		
Always	189	66.8
Often	76	26.9
Sometimes	12	4.2
Not at all	9	2.1
Hand washing before handling new patient		
Always	261	92.2
Often	16	5.7
Not at all	9	2.1
Changing gloves before start handling new patients		
Always	263	92.9
Often	13	4.6
Sometimes	1	0.4
Not at all	9	2.1
Wearing mask during handling TB suspected patient		
Always	264	93.6
Often	10	3.5
Sometimes	2	0.7
Not at all	6	2.1
Disinfection of infectious materials and left over sample		
Always	257	91.1
Often	15	5.3
Sometimes	4	1.4
Not at all	6	2.1

Cut-off scores for respondents' knowledge, attitude and practice:

The cut-off scores that characterized respondents' knowledge of nosocomial infection, attitude towards infection prevention, and practice of prevention measures as good or poor, were 15.7, 32.2 and 8.5 respectively. Based on these scores, half of respondents (50.4%, n=144) have good knowledge of nosocomial infection, more than two third (71%, n=204) have good attitude towards prevention of nosocomial infection, and just over half (55.5%, n=158) practice preventive measures effectively (Table 5).

Bivariate analysis of respondents' knowledge and practice of nosocomial infection prevention with socio-demographic characteristics:

Table 6 shows the associations between socio-demographic characteristics of the respondents with knowledge and practice of infection prevention. Knowledge of nosocomial infection was statistically associated with prevention practices, but it was good knowledge that was significantly associated with poor prevention practices (p=0.002).

Table 7 shows that female gender (60.9%, 100/164, p=0.029), work experience of <5 years (60.9%, 98/161, p=0.036), laboratory scientist profession (60.0%, 18/30, p=0.010), and no previous training on HAIs (65.0%, 80/123, p=0.005) were factors significantly associated with good infection prevention practices among the respondents.

Table 5: Respondents knowledge, attitude and practice scores of hospital-acquired infections in National Hospital, Abuja

Parameter	Number of respondents		
	Poor (%)	Good (%)	Total (%)
Knowledge	142 (49.6)	144 (50.4)	286 (100.0)
Attitude	82 (29.0)	204 (71.0)	286 (100.0)
Practice	128 (45.5)	158 (55.5)	286(100.0)

Table 6: Bivariate analysis of respondents' knowledge of hospital-acquired infections and infection prevention practice

Variables	Practice		Total (%)	x^2 statistics	OR (95% CI)	*p* value
	Poor (%)	Good (%)				
Knowledge						
Poor (%)	49 (35.3)	90 (64.7)	139 (49.5)	9.493	0.4728 (0.2927-0.7637)	0.002*
Good (%)	66 (46.5)	76 (53.5)	142 (50.5)			
Total (%)	125 (44.5)	156 (55.5)	281 (100.0)			

OR=Odds Ratio; CI=Confidence Interval

Table 7: Bivariate analysis of sociodemographic characteristics of respondents with nosocomial infection prevention practice

Variables	Practice		Total (%)	x^2 statistics	*p* value
	Poor (%)	Good (%)			
Gender					
Male	61 (52.1)	56 (47.9)	117 (41.6)	4.754	0.029*
Female	64 (30.1)	100 (60.9)	164 (58.4)		
Tribe					
Yoruba	38 (45.2)	46 (54.8)	84 (29.9)	0.029	0.986
Igbo	54 (44. 3)	68 (55.7)	122 (43.4)		
Hausa	33 (44.0)	42 (56.0)	75 (26.7)		
Religion					
Christianity	93 (47.0)	105 (53.0)	198 (70.5)	2.911	0.233
Islam	32 (39.5)	49 (60.5)	81 (28.8)		
Traditionalist	0	2 (100.0)	2 (0.7)		
Educational status					
Diploma	13 (40.6)	19 (59.4)	32 (11.4)	2.901	0.234
Bachelor degree	80 (42.1)	110 (57.9)	190 (67.6)		
Master's degree	32 (54.2)	27 (45.8)	59 (21.0)		
Work experience					
<5 years	63 (39.1)	98 (60.9)	161 (57.3)	4.375	0.036*
>5years	62 (51.7)	58 (48.3)	120 (42.7)		
Profession					
Medical Doctor	16 (50.0)	16 (50.0)	32 (11.4)	20.176	0.010*
Dentist	9 (50.0)	9 (50.0)	18 (6.4)		
CHEWs	42 (54.5)	35 (45.5)	77 (27.4)		
Nurses	24 (50.0)	24 (50.0)	48 (17.1)		
Radiographers	6 (42.9)	8 (57.1)	14 (5.0)		
Pharmacist	7 (46.7)	8 (53.3)	15 (5.3)		
Laboratory scientist	12 (40.0)	18 (60.0)	30 (10.7)		
Optometrist	5 (41.7)	7 (58.3)	12 (4.3)		
Others	4 (11.4)	31 (88.6)	35 (12.5)		
Any training on hospital-acquired infection					
Yes	82 (51.9)	76 (48.1)	158 (56.2)	8.036	0.005*
No	43 (35.0)	80 (65.0)	123 (43.8)		

* = statistically significant at $p<0.05$

Discussion:

Nosocomial infections among health-care workers and the patients they take care more often than not, occurs from breach in the guidelines on hospital infection control. To reduce this, there is a dire need to orientate and re-orientate healthcare givers on infection control measures. To this end, it is imperative to understand the gaps in knowledge as well as practice of infection control among health-care workers. In this study, the proportion of healthcare workers who had good knowledge of HAIs is consistent with the report of the study conducted in Ethiopia (11). However, the knowledge score in our study was lower than many other studies conducted in Nigeria and some other parts of the world where the knowledge score was much higher (10,13–15). This finding could be explained by the fact that only a little above half of the respondents have had seminar on the nosocomial infection.

The finding of 71.0% of respondents with good attitude toward prevention of noso-comial infection in our study is lower than the rate reported in a study from Addis Ababa,

Ethiopia (9) but higher than those of other studies (17,18). The difference in rates might be due to differences in the experience of healthcare workers and training exposure. The level of practice of preventive measures against nosocomial infection among the health workers in our study is comparably similar to that of Asfwa et al., (11) in Ethiopia, but slightly higher than that of a previous study conducted in two tertiary hospitals in Nigeria (19). However, the score in our study is lower than those reported from similar studies in Nigeria and other parts of the world (12,18, 21). This discrepancy could be due to differences in sample size and study participants since those previous studies were conducted among only a group of professionals, while our study was conducted across many professional groups. This may also imply that efforts are needed to increase knowledge of HAIs and practice of infection prevention, that will lead to reduction in the incidence of hospital-acquired infections.

In our study, the number of laboratory scientists with good infection prevention practice was significantly higher than other group of healthcare workers. This may be explained by the fact that laboratory scientists handle microorganisms directly in the laboratories and may therefore be more conscious of infection control practices that prevent them from acquiring HAIs in the laboratories. In this study, there was a significant relationship between respondent healthcare workers knowledge of HAIs and infection prevention practices, which is similar to those of other studies that reported significant relationship between knowledge of HAIs and infection prevention practices (5,22). However, the relationship in our study was opposite, with good knowledge of HAIs significantly associated with poor infection prevention practices among the respondents (p=0.002). This is at variance with the finding of the two studies (5,22) which reported that good knowledge of HAIs is a predictor of good infection prevention practices.

With regards to sociodemographic characteristics of the respondents and infection prevention practices, there was a significant relationship between years of experience of healthcare workers and infection prevention practice (p=0.036) in our study, which agrees with those of previous studies (10,23). These previous studies showed that longer length of work experience was significantly associated with infection prevention practices, which may be attributed to increased knowledge of the use of preventive equipment and the amount of in-service training that healthcare workers may have received. However, surprisingly in our study, significantly higher number of respondent healthcare workers with less than 5-year work experience had good infection prevention practice compared to those with more than 5-year work experience, which contradicts the findings of these previous studies.

Surprisingly still, significantly higher number of respondent healthcare workers who had no training on HAIs had good infection prevention practice compared with those who have had any training on HAIs (p=0.005). This contrasts the finding of a previous study conducted in northern Nigeria which reported that HAI training contributed to improved knowledge and compliance with standard infection control precautions (21). These contrasting findings of our study may be due to over-familiarity with standard infection prevention practices among older healthcare workers and those who have had trainings on HAIs, which may lead to complacency in adhering to prevention practices. This indicates that training of healthcare workers on HAIs should, in addition to education and awareness, incorporate behavior change program and periodic monitoring and evaluation, that will ensure compliance with HAIs prevention practice among new and old healthcare workers.

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Contributions of authors:

IOR was involved in the study conceptualization, literature review, data analysis and project supervision; AUC was involved in study conceptualization, data collection, and writeup of the manuscript; OSI and AVT were involved in literature review and methodology; and ANE was involved in literature review and search. All authors approved the final manuscript submitted for publication.

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