Original Article

Knowledge and practice of infection control of doctors in different medical specialities of a tertiary hospital in South-South Nigeria

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Abstract

Background: Hospitals in Nigeria are increasingly becoming epicentres of epidemic diseases in addition to the usual nosocomial infections. Infection control measures have been identified as capable of preventing these hospital-acquired infections, but studies indicate that the knowledge of the measures, even among doctors are poor, and practice of them is even poorer, due to a multiplicity of factors. This study examined possible differences in the knowledge and practice of the infection control measures among doctors in four different medical specialities at the University of Port Harcourt Teaching Hospital, south-south Nigeria.

Methods: A cross-sectional study design was used, with data collected using a structured questionnaire and observational checklist. The questionnaire was administered to the doctors in the clinical departments, while the checklist was used to assess the compliance of the doctors and their practice environment to the infection control guidelines.

Results: The respondents had a mean age of 36.03 ± 6.81 years and 74.00% of them had a working experience of five or more years. Most of the respondents were resident doctors. The respondents had very good knowledge of the infection control measures, with a mean knowledge score of 9.19 ± 0.946. There is a statistically significant difference in the knowledge score of the different cadres of respondents ($P = 0.0001$), but not among those in the different clinical departments ($P = 0.208$). The practice of the infection control measures was poor among 92.5% of the respondents, with a mean practice score of 7.48 ± 2.599 especially among the junior doctors ($P = 0.0001$) and doctors with less working experience ($P = 0.0001$).

Conclusion: The knowledge of infection control measures among the respondents is high; however, the practice is very poor. Efforts are therefore needed to encourage practice, to help reduce the incidence of hospital-acquired infections.

Keywords: Adherence, infection control measures, knowledge, Nigeria, Port Harcourt, practice

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INTRODUCTION

Hospital-centered epidemics are increasingly being reported in Nigeria.[1,2] The 2014 Ebola epidemic in Nigeria that made international headlines took place in a hospital setting,[1] as well as many of the outbreaks of Lassa fever that constantly flare up in hospitals throughout Nigeria, claiming the lives of patients and healthcare workers.[2]

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According to the records of the WHO, 273 cases of Lassa fever were reported from 23 states in Nigeria, between August 2015 and 17th May 2016, out of whom 149 died including four health workers that were infected in the course of their occupational activities.[3] These epidemic diseases are in addition to highly infectious diseases such as HIV/AIDS and hepatitis-B, and the usual nosocomial infections that are reported in higher frequency and with greater morbidity and mortality in Nigeria and other developing countries. The World Health Organization[4] reports that three million health workers are exposed to bloodborne pathogens each year, resulting in 70,000 cases of hepatitis B, 15,000 cases of hepatitis C and 5,000 cases of HIV infections. Studies also indicate that surgical site infection (SSI), a subset of hospital-acquired infection complicates up to 5% of all the surgical operations carried out in developed countries; and has been shown to add up to ten extra days to the stay of the patient in hospital,[5] requires a daily $94.31 worth of antibiotic for treatment,[6] capable of increasing the hospital bill by £1780;[7] and able to increase the mortality of patients by more than 177%.[8]

Infection control measures have been identified as capable of preventing these hospital-acquired infections.[9-11] The measures were first developed in 1987, by the US Centre for Disease Control and Prevention, in response to the HIV/AIDS pandemic[12] but have now been expanded to include all possible hospital-acquired infections.[13,14] The measures include hand hygiene, use of personal protective equipment, needle safety, safe handling of potentially contaminated equipment or surfaces in the patient environment, respiratory hygiene (cough etiquette) and proper disposal of sharps, body fluids and other clinical waste.[15] The measures also include practices such as the training and retaining of healthcare workers on the infection control measures, immunisation of healthcare workers against the more prevalent, more fatal infections and the surveillance of the infectious diseases in the healthcare facility.[9-11]

Studies, however, indicate that complete adherence to the infection control measures is vital to the prevention of the hospital-acquired infections.[9-12] The adherence to the policy has been shown to be influenced by factors that are not only related to the knowledge and attitude of health workers but also to health facility-related factors such as the provision of the needed medical consumables,[16] the presence of an infection control policy and committee, as well as the seriousness with which the policy is enforced in the health facility.[17]

In recent years, several studies have been carried out in Nigeria on these factors that influence adherence to the infection control measures.[16-18] Most of these studies assessed the knowledge, attitude and practice of the infection control measures of health workers;[19,20] some compared one category of health workers with the other;[16,19,20] others compared one health facility with the other[17] but none examined the differences among the same practitioners in the different specialities of medicine, especially as there are indications of such differences.[20-22] We, therefore, hypothesised that the knowledge, attitude and practice of the infection control measures would be influenced by the type of medical speciality, especially the type and nature of patients that are predominantly seen in the medical speciality. We tested this hypothesis by assessing the knowledge and adherence to the infection control measures of medical doctors in the four main clinical departments in a tertiary health care facility in Port Harcourt, south-south Nigeria.

METHODS

Study area

This study was carried out in June 2016, in the University of Port Harcourt Teaching Hospital, one of the two multispeciality tertiary healthcare institutions in Port Harcourt, the capital of Rivers State, Nigeria. Although located in Port Harcourt, the hospital constantly draws patients from the neighbouring States of the Niger delta region; a catchment population that can be conservatively put at ten million people. The hospital is an 800-bed multispecialist teaching hospital that offers not only tertiary healthcare services but also secondary and primary health care, due to the near collapse of the other facilities in the state and region. The clinical departments of the hospital that see the most patients are the departments of surgery, internal medicine, paediatrics and obstetrics and gynaecology. These departments have about 330 medical doctors, consisting of consultants, resident doctors and house officers that see an average of 500 outpatients a day, have an average bed occupancy rate of more than 90% and see up to a 100 emergency patients a day.

Study design

A cross-sectional study design was used, with the data collected using a semi-structured interviewer-administered questionnaire and an observational checklist. The questionnaire was administered to all eligible medical doctors of the four main clinical departments of the hospital. The doctors were considered eligible for the study when they had a minimum of 6 months working experience in the department and were not on leave or outside posting at the time of the study. The observational checklist was used to assess the compliance of the doctors

as well as their practice environment to the infection control guidelines.

Sample size estimation

The study was designed to detect a 5% difference in adherence among the doctors in the different medical specialities, with an alpha error of 5%, acceptable beta error of 20%, statistical power of 80% and the adherence of 50.8%.[16] Using the usual formula for sample size determination for estimating proportions in descriptive studies in populations <10, 000, the minimum required sample size was thus determined to be 178 but was made up to 200, to take care of non-responses.

Data collection

The respondents for the questionnaire from the four clinical departments were chosen using a two-stage sampling method. First, the number of respondents from each of the departments was determined using the proportionate sampling method. Consequently, 47 respondents were selected from the department of paediatrics, 51 from internal medicine, 55 from surgery and 47 from obstetrics and gynaecology. The respondents from each of these departments were then chosen using the simple random sampling technique, with the official staff list as the sampling frame.

The questionnaire was adopted and adapted from the assessment tool developed by USAID[23] and those used by (Ogoina *et al.*[16] and Brisibe *et al.*[18] in their respective studies; and pre-tested in a comparable tertiary hospital in Port Harcourt. The questionnaire was used to collect information on the socio-demographic characteristics of the respondents, their knowledge of the infection control guidelines and the level of their adherence to the guidelines. The observational checklist was used to assess the compliance of the doctors and their practice environment to the infection control guidelines in four thematic areas of infection control manual, hand hygiene, personal protective equipment and needle/injection safety. The checklist assessed the availability of infection control materials and resources in a total of five clinics and inpatient wards, in each of the five clinical departments, as they relate to the four thematic areas. It was also used to assess the adherence of the doctors to the guidelines, as they deliver care in the clinics and inpatient wards.

Data analysis

The collected data were cleaned and entered into a database and then analysed using the IBM's SPSS statistical package, Version 20. Summary measures were calculated for each outcome of interest; and bivariate analyses were carried out to explore the various relationships between the speciality of the respondents and their knowledge and adherence to the infection control guidelines. The test of significance was conducted using Chi-square and *F*-test at 95% confidence interval, with $P = 0.05$ or less considered statistically significant. The knowledge of the respondents was assessed with a set of ten questions, and respondents were scored one point for each question that was correctly answered. The respondents were rated to have excellent knowledge of the infection control measures when they correctly answered at least 80% of the questions, rated to have good knowledge if had a score of between 60% and 79%, moderate knowledge with a score of 50% to 59% and poor knowledge with a score of <50%. The adherence of the respondents was assessed with a set of 20 questions, which was complemented with a 16-item checklist. The respondents were scored two points for each question that was correctly answered, but were scored five points for each of the items they were observed to have correctly carried out. The respondents were rated to have a good practice if they obtained at least 60% of the score and rated to have a poor practice if their score is <60%.

Ethical consideration

The approval to undertake the study was sought and obtained from the Ethical Committee of the University of Port Harcourt, Port Harcourt, while informed consent was sought and obtained from all the study participants.

RESULTS

A total of 200 questionnaires were administered on the respondents and all were retrieved and were sufficiently completed for analysis. The characteristics of the respondents are presented in Table 1. The respondents had a mean age of 36.03 ± 6.81 years and 148 (74.00%) had a working experience of five or more years. House officers made up 33 (16.5%) of the respondents, 64 (32.0%) were

Table 1: The characteristics of the respondents

Characteristic	Frequency (*n*=200), *n* (%)
Medical speciality	
Internal medicine	51 (25.5)
Paediatrics	47 (23.5)
Surgery	55 (27.5)
Obstetrics and gynaecology	47 (23.5)
Designation (professional cadre)	
House officer	33 (16.5)
Registrar	64 (32.0)
Senior registrar	65 (32.5)
Consultant	38 (19.0)
Working experience (years)	
1	29 (14.5)
1-<5	23 (11.5)
5-9	58 (29.0)
>9	90 (45.0)

junior residents, 65 (32.5%) were senior residents, while 38 (19.0%) of the respondents were of the consultant cadre.

The knowledge of the respondents of the infection control measures are summarised in Table 2. Most of them 187 (93.5%) had excellent knowledge of the measures while the remaining 13 (6.5%) were rated to have good knowledge. The respondents had a mean knowledge score of 9.19 ± 0.946. The respondents in the paediatrics department had the highest knowledge score of 9.34 ± 0.94, while those in obstetrics and gynaecology had the lowest knowledge score of 9.00 ± 0.94. The differences in the knowledge score of the respondents in the various departments were, however, not statistically significant (P = 0.208). There is, however, a statistically significant difference in the knowledge score of the different cadres of respondents (P = 0.0001), with the consultants having the highest score and junior residents the least score, a score lower than that of house officers. Respondents with more than 9-year experience had the highest knowledge score, while those with between 1–5 years' experience had the least score, lower than those with <1 year experience. These differences are, however, not statistically significant (P = 0.055).

The practice of the respondents of the infection control measures is presented in Table 3. Most of the respondents 185 (92.5%) had poor practice of the infection control measures, with a mean practice score of 7.48 ± 2.599. There are statistically significant differences in the practice scores of the respondents of different designations (P = 0.0001) and those of different years of working experience (P = 0.0001), but not among those of different medical specialities (P = 0.059). The respondents in the department of paediatrics had the highest practice score (8.26 ± 2.77), while the respondents in internal medicine had the least score (6.90 ± 2.73). The house officers had the poorest practice score (5.30 ± 1.91), while the consultants had the highest score (8.79 ± 2.29). The respondents with more than 9 years of working experience had the highest score, while those with <1 year experience had the lowest score (4.79 ± 1.26). The poor level of practice was linked to poor staff orientation 182 (91.0), training and retraining on the infection control measures 172 (86.0), poor hand washing practices 175 (87.5), non-availability of key consumables such as alcohol-based handrubs, gloves and auto disposable syringes 198 (99.0) and poor policy implementation 185 (92.5).

The facilitators and barriers to the observance of the infection control measures are presented in Table 4. Of the 15 respondents that were rated to have good practice of the infection control measures, most 12 (80.00%) did that mainly to avoid infecting themselves, 8 (53.33%) were

Table 2: Knowledge of infection control measures

Work-related characteristics	Knowledge score (%), mean±SD
Medical speciality	
Internal medicine	9.31±1.00
Paediatrics	9.34±0.94
Surgery	9.09±0.91
Obstetrics and gynaecology	9.00±0.94
F-test, *P*	1.530, 0.208
Designation	
House officer	9.18±1.10
Registrar	8.83±1.00
Senior registrar	9.23±0.84
Consultant	9.74±0.55
F-test, *P*	8.161, 0.0001*
Years of working experience (years)	
1	9.14±1.16
1-<5	8.83±1.08
5-9	9.07±0.93
>9	9.37±0.81
F-test; *P*	2.584, 0.055

Table 3: Practice of infection control measures

Work-related characteristics	Practice score (%), mean±SD
Medical speciality	
Internal medicine	6.90±2.73
Paediatrics	8.26±2.77
Surgery	7.22±2.23
Obstetrics and gynaecology	7.62±2.55
F-test, *P*	2.522, 0.059
Designation	
House officer	5.30±1.91
Registrar	7.02±2.44
Senior registrar	8.26±2.44
Consultant	8.79±2.29
F-test, *P*	16.813, 0.0001*
Years of working experience (years)	
1	4.79±1.26
1-<5	7.83±2.53
5-9	6.78±2.29
>9	8.70±2.33
F-test, *P*	25.271, 0.0001*

Table 4: Barriers to the practice of the infection control measures

Barriers for standard pre-caution	Good, *n* (%)	Poor, *n* (%)	Total, *n* (%)
Inadequate knowledge	10 (8.8)	104 (91.2)	114 (100.0)
Lack of appropriate resources	15 (8.7)	158 (91.3)	173 (100.0)
Lack of regular training	10 (7.7)	120 (92.3)	130 (100.0)
Lack of written guidelines/manual	12 (10.4)	103 (89.6)	115 (100.0)
Lack of time	0 (0.0)	6 (100.0)	6 (100.0)
Excess work load	6 (15.4)	33 (84.6)	39 (100.0)
Forgetfulness	2 (15.4)	11 (84.6)	13 (100.0)
Lack of infection control materials	14 (7.2)	180 (92.8)	194 (100.0)
Patient's perceived health condition	2 (11.8)	15 (88.2)	17 (100.0)

afraid of cross infection, while 1 (6.67%) were afraid of infecting the patient. The barriers to observing the infection control measures, as identified by the respondents ranged from lack of infection control materials (97%) to excess work load (19.5%), forgetfulness (6.5%) and the lack of time to apply the measures (3%).

The level of adherence to elements of standard precautions in the practice areas of the clinical departments are presented in Table 5. No infection control manual was found in any of the practice sites and only about 60% of the practice sites had wash hand basins. Nearly, all the practice sites had soap for the hand washing; however, alcohol-based handrub was only found in the internal medicine department. The doctors in all the practice sites did not wash their hands before carrying out aseptic procedures, none washed their hands before attending to patient, but all washed their hands after attending to the patient. All the doctors were observed with their protective ward coats, and nearly, all used fresh gloves for every patient. However, nearly all, except 40% of the doctors observed in internal medicine used face masks as required. No auto disable syringes and puncture-resistant containers were observed in the practice sites, and no segregation of waste was carried out at the sites. Single use of syringes was practised at most times in all the sites; however, the manipulation of used needles and syringes were noticed in most of the sites especially in the Department of paediatrics.

DISCUSSION

This study found a high level of knowledge of the infection control measures among the respondents, but a very low level of practice especially among the house officers and doctors in the Department of internal medicine, which were attributed to poor staff orientation, poor risk perception and lack of the needed consumables.

All the respondents in this study had the level of knowledge of the infection control measures that was rated to be very good. This is consistent with the findings of a multicentre study by Ogoina *et al.*[16] in Amassoma and Jos and that of Abubakar[24] at the Amino Kano Teaching Hospital, Kano. It is, however, higher than the study carried out by Brisibe *et al.*[18] and a 2013 study carried out by Amoran and Onwube[20] among healthcare providers in Nasarawa State. The differences in the knowledge were recorded in these studies can be attributed to the increased educational activities on the infection control measures by the hospitals, government agencies and ministries and multilateral organisations because of the increasing outbreaks of Lassa fever in Nigeria.[2,3]

The low knowledge score was recorded in this study, among the junior residents, can be attributed to the waning of the knowledge acquired in the medical school and the relative lack of training opportunities,[18] a problem that needs to be better addressed by the Continuing Medical Education programme of the Medical and Dental Council of Nigeria. The knowledge score we recorded in this study is, however, consistent with several other studies,[16,25,26] in which it was noted that the knowledge of the infection control measures is highest among the consultants and senior residents, but is contrary to the findings of the studies by Azodo *et al.*[27] in Benin, Nigeria, and Yassi *et al.*[28] in Canada that noted

Table 5: Assessment of the level of adherence to elements of standard precautions in practice areas of the clinical departments

Elements of standard pre-caution	Internal medicine (*n*=5)	Surgery (*n*=5)	Paediatrics (*n*=5)	Obstetrics and gynaecology (*n*=5)
Infection control manual				
Availability of infection control manual	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Hand hygiene				
Availability of wash hand sink	3 (60.0)	3 (60.0)	3 (60.0)	3 (60.0)
Availability of hand washing soap	3 (60.0)	5 (100.0)	5 (100.0)	5 (100.0)
Availability of alcohol-based handrub	1 (20.0)	0 (0.0)	0 (0.0)	0 (0.0)
Hand washing before attending to patient	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Hand washing after attending to patients	5 (100.0)	5 (100.0)	5 (100.0)	5 (100.0)
Hand washing before aseptic procedure	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
PPE				
Appropriate use of PPE	4 (80.0)	5 (100.0)	4 (80.0)	5 (100.0)
Fresh pair of gloves for each patient	3 (60.0)	5 (100.0)	5 (100.0)	5 (100.0)
Face mask when required	2 (40.0)	0 (0.0)	0 (0.0)	0 (0.0)
Use of ward coat/protective clothing	5 (100.0)	5 (100.0)	5 (100.0)	5 (100.0)
Needle/injection safety				
Availability of auto-disable syringes	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Single usage of needle/syringe	4 (80.0)	5 (100.0)	5 (100.0)	5 (100.0)
Manipulation of needles after use	3 (60.0)	4 (80.0)	5 (100.0)	2 (40.0)
Use of puncture-proof container	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Waste segregation	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

PPE: Personal protective equipment

a higher knowledge score among very experienced junior dentists and healthcare workers. These findings of a higher knowledge score among junior doctors with long years of practical experience is, however, consistent with our finding of a relationship between experience and higher knowledge score, which can be attributed to the greater opportunity of the doctors to learn about the infection control measures, in the course of their practice.[24,26] The greater opportunity to learn also translates into practice, as reflected in the higher practice scores recorded among the consultants and senior residents and among doctors with longer practice experience, which are also consistent with the findings of other studies.[21,25,26]

The differences in the knowledge score recorded in the four clinical departments were not statistically significant; however, they point to a likely difference in emphasis on the infection control measures by the different departments. Gogia and Das[29] in Delhi, India, had recorded a higher level of knowledge among healthcare workers in the Intensive Care Unit and Special Care Baby Unit (SCBU), units in a hospital with very vulnerable patients that demand greater adherence to infection control measures. The lower knowledge score recorded in the departments of surgery and obstetrics and gynaecology probably points to complacency, which should not be allowed in any clinical department in Nigeria, considering the manner of presentation of hospital-acquired epidemic diseases such as Ebola and Lassa fever.[1,2,18]

Differences in the perception of risk of infection can also be responsible for the different practice scores recorded among doctors in the various departments. Although the differences are not statistically significant, the respondents in the Department of paediatrics had the highest score, followed by obstetrics and gynaecology and surgery, while the respondents in internal medicine had the least practice score. This can be explained by the fact that the paediatricians deal with the most infection susceptible patients, and therefore, need to take greater action to prevent infection;[29] while the obstetricians/gynaecologists and surgeons had to constantly take steps to prevent SSIs.[18] The internists in this study hospital mostly deal with patients with non-communicable diseases,[30] and therefore, are not in any extra pressure to prevent infection.

The respondents in this study had high knowledge, but low practice scores of the infection control measures. These are also consistent with those of other studies.[16-20] This disparity is responsible for the high prevalence of hospital-acquired infections in the hospitals, which was reported to be as high as 10.34%, among patients that had caesarean section in this study hospital.[17]

The knowledge-practice disparity is, however, mediated by several factors, including poor policy enforcement,[17] non-availability of needed consumables,[16-18] poor risk perception,[27,31,32] excess workload and pressure of work.[16-17] No infection control manual was sighted in any of the practice areas of this study hospital, and the respondents could not recall significant activity of the hospital's infection control committee. These could have affected the practice score of our respondents especially as a previous study carried out when the hospital had a more visible policy, and a more active infection control committee recorded a significantly higher practice score, compared to a comparable hospital without such policy and committee.[17] It was also given as the reason for the higher practice score recorded in Kano, Nigeria.[26] Also, Punia *et al.*[33] in their study in India had noted that the presence of the written infection control manual at the point of patient care serves as a reminder to the healthcare worker to adhere to the guidelines.

More than 90% of the respondents in this study considered lack of consumables and other resources needed for infection control as responsible for their inability to practice the measures. This has also been noted in several studies[16,18,20,24,28] and considered as one of the most important determining factors in the practice of the infection control measures in resource-poor countries. Yassi *et al.*[28] in their study had noted that 'Infection control is significantly affected by the organisation and environment where the physicians work, but not necessarily their personal beliefs or attitude', while Ogoina *et al.*[16] considered organisational commitment to managing infection control as the most paramount determining factors in the practice of infection control.

The fear of contracting infection was the reason most cited by the respondents in this study, for adhering to the infection control guidelines. This is also consistent with the findings of other Nigerian studies[27,31,32] and probably explains why most of the respondents practiced hand hygiene after contact with the patient and would not do the same before touching the patient. This is unethical and can result in a malpractice suit. This attitude also exposes the healthcare worker to danger since patients with highly infectious blood-borne infectious such as Lassa fever, HIV and hepatitis B are very difficult to distinguish from other patients. This explains why the WHO and the US Center for Disease Control and Prevention advise that the infection control measures should be applied to all patients.[10-12]

Excess workload, forgetfulness and lack of time are some of the barriers to the practice of the infection control measures cited by the respondents of this study. These are also consistent with the findings of other studies;[32] and point to the heavy workload of the doctors especially in the management of emergency cases. Heavy workload has been shown to make it more difficult for doctors to practice hand hygiene as recommended;[18] while the management of life-threatening emergency cases is one of the circumstances in which priority is given to saving the life of the patient, more than preventing infection. Some authors[31] have recommended the employment of more doctors as a way of reducing the work load; however, better operation of the two-way referral system has also been found to be very effective.

CONCLUSION

The knowledge of infection control measures among the respondents is high; however, the practice is very poor. There are also subtle differences in the knowledge and practice of the control measures among the doctors in different specialities that can be attributed to complacency and wrong risk perception. The infection control guidelines need to be vigorously enforced; doctors need to be properly oriented, trained and retrained on the infection control measures and the needed consumables should be provided, to ensure the strict adherence to the infection control guidelines at all times.

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Conflicts of interest
There are no conflicts of interest.

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