

Original Article

Knowledge and Practice of Airborne and Droplet Precautions within the Emergency Departments of Selected Hospitals in Osun State, Nigeria

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Abstract

Background: Transmission of diseases through infectious aerosols and droplets within the emergency departments is real, yet had received little attention in the developing world. The study was therefore carried out to evaluate the knowledge and practice of airborne and droplet precautions within the emergency departments of selected hospitals in Osun State.

Methodology: A descriptive, cross-sectional study design involving 2-phase data collection techniques was used. The first phase involves a non-participatory observation of practice of airborne and droplet precautions while the second phase is a self-administered questionnaire. One hundred and ten respondents participated in the study. Data on respondents' sociodemographic variables, knowledge and practice of airborne and droplet precautions were gathered with semi-structured questionnaire, using a 50-point dichotomous knowledge scale and 38-point observational checklist respectively. Knowledge and practice scores were summed up, computed into percentage and graded as excellent, good and poor with corresponding scores of $\geq 70\%$, $50 - 69\%$ and $\leq 49\%$ respectively. Independent t-test, Pearson's correlation, and Chi-square analyses were done with SPSS at 0.05 level of significance.

Results: Majority (67.2%) of the respondents had good knowledge of airborne and droplet precautions. Practice was rated poor in all the aspects of the precautions. The practice of gloving was however fair among Healthcare workers in tertiary healthcare settings. A negative correlation was observed between respondents years of working experience and practice ($r = -0.184$; $p = 0.054$). There was a significance difference in practice between health care workers in secondary and tertiary hospitals ($t = 0.400$; $df = 108$; $p = 0.001$).

Conclusion: Respondents knowledge did not translate to practice in clinical situations.

Keywords: Airborne precautions; Droplet precautions; Healthcare workers; Emergency departments.

Introduction

In recent times, the world have witnessed major outbreaks of respiratory infectious diseases ranging from SARS (Severe Acute Respiratory Syndrome) in Europe and the Americas, Avian Influenza in Asia as well as tuberculosis and hemorrhagic fevers in Africa, most of which reached epidemic proportions. Infectious particles can be propagated through airborne and

droplets means: Particulates with diameter less than $5\mu\text{m}$ often are propagated over long distance as aerosols and suspended in the air for prolonged period, while particulates size more than $5\mu\text{m}$ will be deposited on surfaces, usually less than 1 meter from the source of propagation as infectious droplets (Ortega & Mensa, 2009). Exposure to these infectious particulates remains an important occupational hazard for all

healthcare workers and the resultant illnesses represent the second most common cause of health care associated infections (Allegranzi, Nejad, Combescure, et al. 2011; Quach, McArthur, McGeer, et al. 2012). The risk in the emergency department is high because it receives patients during the highly infectious stage of the disease process, often in a critical state of health that will require intensive care modalities which are often invasive, life saving but aerosol/ droplet – propagating (Loeb, McGeer, Henry, et al, 2004).

Healthcare workers within the emergency departments of hospitals in the developing world are particularly vulnerable because of factors such as overcrowding (Fusco & Puro, 2012) due to faulty architectural designs (Lateef, 2009), coupled with a considerably long patient waiting period (Ortega & Mensa, 2009) delayed laboratory confirmation of diagnosis of suspected cases (Permegiani, Abbate, Marinelli & Angelillio, 2009), poor hygiene and waste management (Borg, 2010). Furthermore, poor implementation or a lack of policies guiding practice of transmission – based precautions within these settings, often due to lack of funding, lack or poor distribution of infection control equipment, health care staff shortage, lack of diagnostic facilities (Borg, 2010) as well as inadequate or lack of staff training in the application of basic principles of infection control and poor motivation (Raka, 2010) have contributed to high morbidity and mortality recorded among healthcare workers especially during outbreaks of such diseases, such as that in Nigeria (Federal Ministry of Health Nigeria, 2012).

In Nigeria, much is known about healthcare workers' vulnerability to various pathogens due to breeches of standard precautions, such as hand washing and injection safety. However, a gap in the literature exists relative to the practice of airborne and droplet precautions within emergency departments of hospitals in Osun state, which may be experiencing emergence and re-emergence of tuberculosis (an anecdotal observation of the researcher).

Research Questions

1) Are the health workers knowledgeable about airborne and droplet precautions?

2) What is their practice of airborne and droplet precautions? and

3) What is the relationship between their knowledge and practice of airborne and droplet precautions within the emergency departments

Methodology

Study Design: A descriptive, cross sectional design was used for the study.

Sample and Settings: Respondents were nurses and medical doctors working within the emergency departments of selected hospitals. The study excluded those visiting the emergency departments for special assignments. The total population of the respondents in all the research settings was 113 out of which 110 agreed to participate in the study. The study was conducted in adult emergency departments of two tertiary and two secondary hospitals in Osun state. Selection of the settings was based on their capacity to attend to a wide range of emergency conditions and admit patients within their facilities for the first 48 hours before transfer to other areas of management within the hospital. Osun state is in the southwestern part of Nigeria, proximal to and shares close interactions with Kwara, Ogun, Oyo, Lagos Edo and Delta states.

Human Subject Protection: Ethical approvals for the study were obtained from the ethics and research committee of Obafemi Awolowo University teaching hospitals complex, Ile-Ife and Ladoko Akintola University of Technology teaching hospital, Osogbo, Osun state, Nigeria with protocol numbers ERC/2015/04/02 and LTH/EC/2015/09/223 respectively.

Permission for observation was sought relevant authorities of the hospitals. The participants were voluntarily recruited for the study after giving a written informed consent.

Procedures: the study was conducted in two-phases within one month in each facility.

First phase was an anonymous, non-participatory observation of the respondents' practice; this was done within the first two weeks in each facility by the researcher and one nursing student, who was trained twice before the actual data collection. One hundred and ten observations were made within all sections of the emergency room, during morning, afternoon and night shifts.

The second phase was a descriptive cross sectional study which was conducted over the next two weeks within each facility. This included distributing questionnaire to the respondents.

Measures: Data were collected with two instruments. First instrument was a 38-item observational scale which measured practice in the areas of hand washing, gloving practice, and the use of aprons, face shields and face masks. Second instrument was a literature derived, semi-structured questionnaire comprising of two sections;

The first assessed the respondents' sociodemographic variables while the second was a dichotomous 50-item knowledge scale, which tested respondent's knowledge in the areas of general knowledge about airborne and droplet precautions, use of barrier protective equipment, cough etiquette, practices within patients waiting areas, ward and admission policy, visitor's and visiting policy, as well as environmental control measures of airborne and droplet infections.

Reliability of the instruments was determined using a test – retest approach. Cronbach's alpha coefficients of the measures of knowledge and practice of airborne precautions were 0.851 and 0.673 respectively. All the instruments returned were thoroughly vetted by the researcher to ensure completeness and accuracy.

Data analysis procedures: Data were analyzed with SPSS software (SPSS Inc, Chicago, IL). The *p* value for statistical significance was set at ≤ 0.05 . Descriptive data were presented with frequency distribution and percentages. Data on knowledge were graded as one point for correct response and zero point for wrong response, with an expected maximum score of 50.

The total score obtained by each respondent was computed into percentage and set as excellent, good and poor knowledge for corresponding scores of $\geq 70\%$, 50 – 69% and $\leq 49\%$ respectively. Data on practice were graded as one and zero points for actual and no practice respectively.

Total score of each respondent was computed to percentage and judged as good, fair and poor practices with corresponding scores of $\geq 70\%$, 50 – 69% and $\leq 49\%$ respectively. Inferential statistical procedures performed were

independent t-test, Pearson's correlation, and Chi-square analyses.

Results

One hundred and ten healthcare workers participated in the study. Respondent's characteristics were presented in table 1. Majority of the respondents (64.5%) were from tertiary healthcare facilities.

Nearly three-quarters (71.8%) of the participants were female. The respondents mean age was 33.35 years (SD= 6.29 years). Nearly half of the respondents (44.5%) have between 1 to 5 years of working experience in the emergency department. Most of the respondents (52.7%) were nurses.

Respondents Knowledge about airborne and droplet precautions

The actual scores of respondents' knowledge were presented in table 2. More than half of all the respondents (67.2%) had good knowledge; however, there was no significant knowledge difference among respondents in the tertiary and secondary hospitals ($\chi^2 = 2.04$, *df* = 2, *p* = 0.35).

Practice of Airborne and droplet precautions

The scores of respondents' actual practice were presented in table 3. Healthcare workers in all the facilities scored less than 50% in all of the aspects of airborne and droplet precautions observed; however, respondents in the tertiary hospitals scored 51.6% in gloving practice. Respondents in all the settings scored zero percent (0%) in the use aprons (*p*= 0.000) and facemasks (*p*= 0.000).

The relationship between the mean scores of respondents years of experience in the emergency departments and practice of airborne and droplet precautions revealed a significant negative correlation (*r* = 0.184; *df* = 108; *p* = 0.05). There was, however, no significant difference in the mean scores of practice observed among medical doctors and nurses (*t* = 1.53; *df* = 108; *p* = 0.21).

The mean scores of practice among healthcare workers in tertiary and secondary hospitals were significantly different (*t* = 0.400; *df* = 108; *p* = 0.01). Furthermore, the relationship between the mean scores of the respondents knowledge and practice of airborne and droplet precautions was

a statistically significant negative correlation ($r = -0.960$; $df = 108$; $p = 0.005$).

Table 1: Sociodemographic distributions of the respondents

Variables	Frequency (N=110)	Percentage (%)
Sex distributions of the respondents		
Male	31	28.2
Female	79	71.8
Age distributions of the respondents		
20-30	43	39.1
31-40	52	47.3
41-50	12	10.9
51 and above	3	2.7
Years of experience of the respondents in the emergency department		
1-5 years	49	44.5
6-10 years	41	37.3
11 and above	20	18.2
Disciplines of the respondents		
Medicine	52	47.3
Nursing	58	52.7

Table 2: Knowledge of Healthcare Workers on Airborne and Droplet Precaution

Research Settings	Respondents level of knowledge			
	Poor	Good	Excellent	Total
Tertiary hospitals	14 (21.1%)	47 (63.4%)	10 (15.5%)	71 (100%)
Secondary hospitals	4 (7.7%)	27 (74.4%)	8 (17.9%)	39(100.0%)
Total	18 (16.4%)	74 (67.2%)	18 (16.4%)	110 (100.0%)

Table 3: Practice of Airborne and droplet precautions

Variables	Assessment scores (%) / Ratings		p
	Tertiary Hospitals (N = 71)	Secondary Hospitals (N= 39)	
	Scores (%)	Scores (%)	
Hand hygiene	171 (24.1)	151 (38.7%)	0.000
Gloving	330 (51.6)	136 (38.7%)	0.092
Aprons & face – shields	88 (13.8)	0 (0%)	0.000
Face masks	66 (9.3)	0 (0%)	0.000

Discussion

The study evaluated the knowledge and practice of airborne and droplet precautions among respondents in the adult emergency departments of selected hospitals in Osun State. Majority (67.2%) of the respondents across all the settings had good knowledge about the different aspects of airborne and droplet precautions investigated. Related studies in the literature elicited a high level of knowledge of standard precautions amongst health care workers across all levels of healthcare settings (Permegiani, Abbate, Marinelli & Angelillio, 2009; Harris & Nicolai, 2010; Yamini, Jain, Mandeli & Jayaram 2012). The high level of knowledge among the respondents in this study may be due increase awareness about the epidemic of Ebola viral disease in West – Africa with a constant threat of importing the disease into Nigeria and particularly Osun state at the time of the study. The threat of imminent outbreak of an infectious disease does not always account for a high level of knowledge about protective behaviours among healthcare workers. This was the case in a related study, during an epidemic outbreak of severe acute respiratory syndrome (SARS), which reported low knowledge about standard and isolation precautions among healthcare workers (Thu, QuocAnhu, QuyChau & Hung, 2012).

This study also pointed out poor practice in all the components of airborne and droplet precautions investigated. This was consistent with findings documented by similar studies in

the literature (Martel, Bui-Xiang, Carreau, et al, 2013; Singh, Bhaskar, Chandan, Chaudhary, Bumb & Jain. 2014). However, an earlier study reported a high compliance with the practice of isolation precautions among healthcare workers during an on-going outbreak of H1N1 influenza (Hu, Zhang, Li, et al. 2012). This positive behaviour was reported to have been motivated by positive factors such as availability of personal protective supplies and positive attitudes of the healthcare staff to their use, as well as cultural factors, especially perceived reprimand for non-compliance. Presence of positive motivating factors however do not always guarantee full compliance with infection control principles (Beam, Gibbs, Boulter, Beckerdite & Smith, 2011).

Furthermore, the study also revealed that respondents in both settings practiced hand washing and gloving more consistently, but rarely use aprons and facemasks when required. A similar study agreed with this finding (Sadoh, Fawole, Sadoh, Oladimeji & Sotiloye, 2006; Amoran & Onwube, 2013). This finding was due to a higher emphasis placed on hand washing and use of gloves as basic methods of preventing nosocomial infection spread and adequate availability of these materials. Aprons and facemasks were noticeably absent in all the facilities during the time of the study.

Contrary to the finding of another study (Askarian, Aramesh & Palenik, 2006), this study established that respondents with fewer years of working experience practiced airborne and

droplet precautions more than those with more years of working experience ($p=0.05$). Furthermore, nurses were observed to have higher practice score of airborne and droplet precautions more than the medical doctors who participated in the study. Findings in similar studies are at variance on this (Knapp, McIntyr, Sinkowitz-Cochran & Pearson, 2008; Orji, Fasuba, Onwudiegwu, Dare & Ogunniyi, 2009)

Moreover, respondents in the tertiary hospitals practiced the elements of the precautions better than their colleagues in the secondary hospitals investigated. This is in agreement with the finding in a similar study (Thu, QuocAnhau, QuyChau & Hung, 2012). A probable explanation for this may be because respondents in the tertiary hospitals were more knowledgeable about the elements of these precautions than their colleagues in secondary hospitals ($p = 0.35$). However, in a summative sense, the respondents high knowledge about these precautions did not translate to better practice ($p = 0.005$). Study findings in the literature were divergent on this fact; some supported this finding (Permegiani, Abbate, Marinelli & Angelillio, 2009; Yamini, Jain, Mandeli & Jayaram, 2012; Singh, Bhaskar, Chandan, Chaudhary, Bumb & Jain, 2014), while another was contrary (Martel, Bui-Xiang, Carreau, et al, 2013). This difference might be explained by other factors such as environmental and organizational factors, which can also influence practice. The influence of these factors on practice however was not studied in the study.

Limitations: The scope of the secondary health care facilities was limited to available two general hospitals in Osun state due to the ongoing renovation of other similar hospitals. Also, each respondent was observed once and practice was scored based on this, hence practice scores in this study were situational.

Implications for Emergency Practice

The study implies the need for emergency health practitioners to translate their wealth of knowledge about airborne and droplet precautions into the reality of practice in all situations. This will require maximal and efficient utilization of all required equipment available within reach. They are also expected to actively participate in fostering a favourable environment for the practice of these precautions; which may include formulating and

reviewing a standard policy and procedures of practice of airborne and droplet precautions within the emergency room.

Conclusion

The outcome of this study reveals the importance of such enquiry so as to promote safety of patients, visitors and emergency healthcare workers within the Emergency department. Results suggest that this area of infection control within emergency departments of hospitals in the developing world have not received much attention. The consequence of such inattention has been nosocomial spread of infectious aerosols and droplets, potentially increasing morbidity and mortality among emergency healthcare workers and patients and the potential of causing a major outbreak of airborne or droplet disease. In order to prevent such occurrence, it is imperative to improve the practice of airborne and droplet precautions by emergency healthcare workers, particularly emergency nurses and medical doctors who provide direct patient care. The influences of variables such as environmental and organizational factors on practice of these precautions within the emergency departments of hospitals in the developing world are worthy of investigation.

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