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Relationship between Aseptic Procedures Observed by Health Care Personnels and Transmission of Hospital Acquired Infections (HAIs) within National Ear Centre, Kaduna, Nigeria

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ABSTRACT

Hospital acquired infections (HAIs) are a major problem faced by hospitals all over the world. This research was carried out to analyse the knowledge and practice of aseptic procedures observed by health care personnel in curtailing spread of hospital acquired infectious. This survey study was carried out amongst staff of the National Ear Care Centre, Kaduna. The sample population was selected through random sampling. The data collection instrument was a research based questionnaire, titled "relationship between aseptic procedures observed by healthcare personnel and transmission of HAIs". The results obtained showed that 83.3 % of the health workers had good knowledge of HAIs, while 16.7 % did not. There was a relationship between profession and an understanding of what HAI's meant. This work also showed shoes as a major source of spread of HAIs, and the poor awareness of this by 83.3 % of the hospital staff. Training on prevention/control of HAIs would help inspire better awareness of HAIs amongst hospital staff. Selective media like MacConkey agar, Cetrimide agar and Mannitol agar were used to isolate pathogens like *Escherichia coli* (20%), *Pseudomonas aeruginosa* (20%) and *Staphylococcus aureus* (60%) respectively from various hospital fomites like chairs, tables, door handles, bed and surfaces of infusion bottles.

INTRODUCTION

Hospital acquired infection is an infection that occurs between 48-72 hours of admittance to a health facility and/or 3-10 days after dismissal from the facility. Such patients must not present with obvious/ incubatory infections on arrival at the hospital (Dalessandro *et al.*, 2014). These infections are transmitted by hospital staff, inadequately sterilized instruments, aerosol droplets from other ill patients, food and water provided at hospitals

Most hospital staff have acceptable knowledge about infections and hygiene, use of gloves and taking appropriate action after being injured by a sharp object, but they have poor knowledge about use of sanitizing gel and disinfecting procedures (Hinkin and Culter, 2014). Many HAIs display antimicrobial resistance which can complicate treatment, increase the severity of a patient's illness, compromises his /her health and length of stay in the hospital.

In the United States, an estimated 2.5 million HAIs from all types of microorganisms and these infections are associated with 90,000 preventable deaths of patients and financial cost in excess of $4.5 billion each year (Korniewicz and El-Masri, 2010). A retrospective survey of the records from the infection control unit of the University College Hospital Ibadan between 2005-2009 using 22,941 patients revealed that 2.6% of the patients contracted HAIs (Ige et al., 2011). Deaths due to HAIs are usually attributed to suboptimal practice by health workers, particularly poor hand hygiene (Wang-Huei *et al.*, 2007). For every incident of nocosomical infection, the integrity of the healthcare sector is being compromised, the ugly trend, if not checked, can lead to higher incidences of morbidity and mortality in patients, hospital workers and health caregivers.

MATERIALS AND METHODS

Study Area

This study was carried out in Kaduna; a large city in Nigeria's North-western region. Most national institutes and research centres are located here. Hence people from all works of life reside in Kaduna.

Ethical Consideration and Informed Consent

Ethical clearance for this study was granted by the research and ethics committee of the National ear care hospital, Kaduna. Informed consent was also obtained from prospective respondents (mostly health workers of the hospital).

Administration of questionnaires.

The sample population was selected by simple random sampling. All cadres of the hospital healthcare personnel were involved, except for those who declined to be included. Data was collected using questionnaires. The first part of the questionnaire was demographic, on work specification of participants. The second part was on knowledge of HAIs and practice of aseptic procedures to prevent HAIs, this part was rated on 3 scales: Yes- regularly, Yes-not regularly and No.

Collection of Samples

Specimens were collected from general out patient's department (GOPD) chairs and surfaces of infusion bags from NEC, Kaduna, by swabbing with sterile swabs sticks. The samples were placed into tubes of sterile nutrient broth and incubated for 12 hours at 32^0c.

Testing for presence of pathogens

Three selective media, Cetrimide agar, MacConkey agar and Mannitol salt agar were prepared according to Manufacturers instruction and poured into petri dishes to gel. To each of these were added 0.1ml of the specimen broth and spread evenly. All plates were incubated at 32^0c for 24 hours.

Gram staining and other Biochemical tests which include Oxidase, Coagulase, Indole, catalase and Voges Proskauer test were carried out for confirmation of pathogens selectively isolated (Cheesbrough, 2006).

RESULTS

Table 1: Showing respondents who have heard of Hospital Acquired Infections (HAIs)?

RESPONSE	Number /Percentage of respondents										
	Pharmacists	Attendants	Doctors	E.H.O	Nurses	C.H.W	L.S	L.T	L.A	L.At	TOTAL
National Ear Centre, Kaduna	N=3	N=2	N=5	N=1	N=2	N=1	N=3	N=1	N=0	N=0	N=18
Yes	3(100)	0(0)	5(100)	0(0)	2(100)	1(100)	3(100)	1(100)	0(0)	0(0)	15(83.3)
No	0(0)	2(100)	0(0)	1(100)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	3(16.7)

KEY:

E.H.O- Environmental Health Officers; C.H.W- Community Health Workers; L.S- Laboratory Scientists; L.T- Laboratory Technicians; L.A- Laboratory Assistance; L.At- Laboratory Attendant

Table 2: What do you think is the common source of hospital acquired infections?

RESPONSE	Number /Percentage of respondents										
	Pharmacists	Attendants	Doctors	E.H.O	Nurses	C.H.W	L.S	L.T	L.A	L.At	TOTAL
National Ear Centre, Kaduna	N=3	N=2	N=5	N=1	N=2	N=1	N=3	N=1	N=0	N=0	N=18
The Environment	0(0)	0(0)	3(60)	0(0)	0(0)	0(0)	2(66.7)	1(100)	0(0)	0(0)	6(33.3)
Patients	3(100)	0(0)	2(40)	1(100)	2(100)	1(100)	0(0)	0(0)	0(0)	0(0)	9(50.0)
Medical Devices	0(0)	1(50)	0(0)	0(0)	0(0)	0(0)	1(33.3)	0(0)	0(0)	0(0)	2(11.1)
Healthcare Workers	0(0)	1(50)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	1(5.6)

Table 3: Do you have direct contact with Patients?

RESPONSE	Number /Percentage of respondents										
	Pharmacists	**Attendants**	**Doctors**	**E.H.O**	**Nurses**	**C.H.W**	**L.S**	**L.T**	**L.A**	**L.At**	**TOTAL**
National Ear Centre, Kaduna	**N=3**	**N=2**	**N=5**	**N=1**	**N=2**	**N=1**	**N=4**	**N=1**	**N=0**	**N=0**	**N=19**
Yes, Regularly	3(100)	1(50)	5(100)	1(100)	2(100)	1(100)	2(50)	1(100)	0(0)	0(0)	16(84.2)
Yes, Not Regularly	0(0)	1(50)	0(0)	0(0)	0(0)	0(0)	2(50)	0(0)	0(0)	0(0)	3(15.8)
No	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)

Table 4: Do you have direct contacts with body fluids such as blood, urine, sputum, faeces, formites, etc.?

RESPONSE	Number /Percentage of respondents										
	Pharmacists	**Attendants**	**Doctors**	**E.H.O**	**Nurses**	**C.H.W**	**L.S**	**L.T**	**L.A**	**L.At**	**TOTAL**
National Ear Centre, Kaduna	**N=3**	**N=2**	**N=5**	**N=1**	**N=2**	**N=1**	**N=3**	**N=1**	**N=0**	**N=0**	**18**
Yes, Regularly	0(0)	1(50)	0	0(0)	1(50)	0(0)	2(66.7)	1(100)	0(0)	0(0)	5(27.8)
Yes, Not Regularly	0(0)	1(50)	2	0(0)	1(50)	0(0)	0(0)	0(0)	0(0)	0(0)	4(22.2)
No	3(100)	0(0)	3	1(100)	0(0)	1(100)	1(33.3)	0(0)	0(0)	0(0)	9((50)

Table 5: Do you disinfect your hands and working environment like: work bench, floors, etc before you start work and after work?

RESPONSE	Number /Percentage of respondents										
	Pharmacists	**Attendants**	**Doctors**	**E.H.O**	**Nurses**	**C.H.W**	**L.S**	**L.T**	**L.A**	**L.At**	**TOTAL**
National Ear Centre, Kaduna	**N=3**	**N=2**	**N=5**	**N=1**	**N=2**	**N=1**	**N=3**	**N=1**	**N=0**	**N=0**	**N=18**
Yes, Regularly	1(33.3)	2(100)	2(40)	1(100)	2(100)	0(0)	2(66.7)	1(100)	0(0)	0(0)	11(61.1)
Yes, Not Regularly	2(66.7)	0(0)	3(60)	0(0)	0(0)	1(100)	1(33.3)	0(0)	0(0)	0(0)	7(38.9)
No	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)

Table 6: Do you disinfect your hands after seeing every patient?

RESPONSE	Number /(Percentage of respondents)										
	Pharmacist	Attendants	Doctors	EHO	Nurses	CHW	L.S	L.T	L.A	L.At	TOTAL
National Ear Centre, Kaduna	**N=3**	**N=2**	**N=5**	**N=1**	**N=2**	**N=1**	**N=3**	**N=1**	**N=0**	**N=0**	**N=18**
Yes, Regularly	1(33.3)	2(100)	2(40)	1(100)	2(100)	1(100)	0(0.0)	1(100)	0(0)	0(0)	10(55.6)
Yes, Not Regularly	2(66.7)	0(0)	2(40)	0(0)	0(0)	0(0)	2(66.7)	0(0)	0(0)	0(0)	6(33.3)
No	0(0.0)	0(0)	1(20)	0(0)	0(0)	0(0)	1(33.3)	0(0)	0(0)	0(0)	2(11.1)

Table 7: Do you wear protective coverings such as laboratory coats, hand gloves, and face masks while working?

RESPONSE	Number /Percentage of respondents										
	Pharmacist	Attendants	Doctors	E.H.O	Nurses	C.H.W	L.S	L.T	L.A	L.At	TOTAL
National Ear Centre, Kaduna	**N=3**	**N=2**	**N=5**	**N=1**	**N=2**	**N=1**	**N=3**	**N=1**	**N=0**	**N=0**	**N=18**
Yes, Regularly	0(0)	1(50)	3(60)	0(0)	2(100)	1(100)	0(0)	0(0)	0(0)	0(0)	7(38.8)
Yes, Not Regularly	3(100)	1(50)	2(40)	1(100)	0(0)	0(0)	2(66.7)	1(100)	0(0)	0(0)	10(55.5)
No	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	1(33.3)	0(0)	0(0)	0(0)	1(5.5)

Table 8: FOR DOCTORS, LABORATORY SCIENTISTS, AND NURSES ONLY: Do you swap patient's skin with disinfectant before taking vital signs, injecting, setting IV line, or taking blood samples?

RESPONSE	Number /Percentage of respondents					
	Doctors	Nurses	L.S	L.T	L.A	TOTAL
National Ear Centre, Kaduna	**N=5**	**N=2**	**N=3**	**N=1**	**N=0**	**N=11**
Yes, Regularly	5(100)	2(100)	2(66.7)	1(100)	0(0)	10(90.9)
Yes, Not Regularly	0(0)	0(0)	1(33.3)	0(0)	0(0)	1(9.1)
No	0(0)	0(0)	0(0.0)	0(0)	0(0)	0(0)

Table 9: FOR ATTENDANTS/ CLEANERS ONLY: Do you use different mop sticks for different wards and fomites?

Hospital/ Response	Frequency/ (Percentage
National Ear Centre, Kaduna	**N=2**
Yes, Regularly	2(100)
Yes, Not Regularly	0(0)
No	0(0)

TABLE 10: Do you have shoes/foot wears meant for just hospital life?

RESPONSE	Number /Percentage of respondents										
	Pharmacists	Attendants	Doctors	E.H.O	Nurses	C.H.W	L.S	L.T	L.A	L.At	TOTAL
National Ear Centre, Kaduna	N=3	N=2	N=5	N=1	N=2	N=1	N=3	N=1	N=0	N=0	N=18
Yes, and taken home	0(0.0)	0(0)	2(40)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	2(11.1)

Table 11: Showing Bacteria isolated from various fomites using selective media

	Chairs	Door handles	Bed	Other fomites	Total No Isolated (%)
Staphylococcus aureus	5	9	4	3	21(60%)
Pseudomonas aeruginosa	Nil	Nil	2	5	7(20%)
Escherichia coli	Nil	Nil	4	3	7(20%)
TOTAL	**5**	**9**	**10**	**11**	**35**

DISCUSSION

From results of this study, it was deduced that most of the health workers were aware of HAIs, as stated by 83.3 % of the respondents. Like the work carried out by Sodhi *et al.* (2013), where more than 90 % of intensive care unit staff had knowledge of infection control, Staff of National Ear Care Centre, Kaduna were also very aware of infections control, as demonstrated by all health workers wearing protective clothing, disinfecting their hands before and after work and in-between seeing patients. However, they had a poor knowledge of their role in the spread of HAIs, of the 18 respondents used in the study, 94.6% of these respondents blamed HAIs on sources other than health workers. About 50% blamed it on

patients, 33.3% blamed it on the environment and 11.1% blamed it on medical devices. This could explain why all of the health workers focused on self protection mostly. As noted by Mahmoudi and Hossani *et al.,* (2000), knowledge of infection control cannot alone reduce HAIs, it has to be backed by good implementation of these controls. Of the 18 health workers questioned, only 16.7 % of them had shoes only meant for hospital wear, 83.3 % of them use their home shoes for hospital work. The impact of shoes as a vehicle of transmitting hospital acquired infections seems to be highest from the survey questionnaires. Shoes pick up microorganisms from one area of the hospital and transfer them to other areas by human movement. Microbial pathogens like *Escherichia coli, Staphylococcus aureus* and *Pseudomonas aeruginosa* were isolated from General Out Patients Department chairs and surfaces of infusion bags. Despite its high likelihood of microbiological contamination, shoes are not often considered as vectors for infectious diseases transmission. This research has evidence that shoes are likely the highest vectors for infectious disease transmission, decontamination strategy should be used to decontaminate shoes. Chambers et al (2009) identified that pathogens on shoe bottoms could be transferred to floors, from the floor, it is plausible that air currents over the floor aerosolize the microorganisms, thus causing human infection via inhalation and cross contamination from other persons, clothing or equipment that the pathogens resettles upon. In an observational study of hospital operating room in the U.K., soles of theatre boots were sampled and discovered to be contaminated with significant numbers of bacteria (Agarawal *et al.,* 2002). Continuous training of health workers on knowledge and effective ways to prevent/ control infections will help solve the menace of HAIs in our hospitals (Askarioan *et al.,* 2005).

CONCLUSION

Most health workers of National Ear Care Centre Kaduna, had a good knowledge of hospital acquired infections but they were not very aware of their role(s) in spread of these infections, especially through personal formites like their shoes. Continuous training on infectious diseases prevention and control is suggested, to help curb the menace of HAIs.

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