

Original Article

Hospital Acquired Infection in Obafemi Awolowo University Teaching Hospital, Ile-Ife, Southwest, Nigeria: A Ten Year Review (2000-2009)

Afolabi Olusegun T^{1*}, Onipede Anthony O², Omotayo Sunday K¹, Oluyede Christiana O³,
Olajide Folakemi O¹, Oyelese Adesola O² and Olawande Oluwatoyosi¹

¹Department of Community Health; ²Medical Microbiology & Parasitology, ³Infection Control Unit, Department of Microbiology & Parasitology College of Health Sciences, Obafemi Awolowo University, Ile-Ife, Osun State, Nigeria

ABSTRACT

Surveillance and proper hygiene have been identified as key components in the fight against HAIs and antimicrobial resistance in hospital setting. This study assesses the pattern of hospital acquired infections (HAIs) and state of hygiene in a tertiary hospital in southwest, Nigeria. Data collected routinely between January 2000 and December 2009 by the infection control committee on HAI and primary data generated on hygiene in the wards were analysed using appropriate statistical techniques. A total of 37,957 patients were admitted during the period under review and 1129 cases (3.0%) of HAI were reported. The highest prevalence of 9.0% was reported in 2006. The Intensive Care Unit (ICU) had the highest period prevalence of 14.7% followed by Orthopaedics ward (7.7%). Surgical ward contributed the highest number of cases with 433. Gram negative organisms were the most implicated (78%) of which *Klebsiella* species was 38% while *Staphylococcus aureus* was the only Gram positive organism identified (28%). Hand washing was practised universally by health workers but facilities for proper hand washing were inadequate. The pattern of HAI has not changed significantly in the past 10 years and *Klebsiella* was the most implicated organism in HAIs and ICU. Facilities for proper hand washing are suboptimal. We recommend the introduction of hand washing policy for the hospital and the provision of an environment conducive for its implementation by the hospital management as well as adequate support for the infection control committee in the discharge of her duties.

Keywords: Hand washing, Hospital-acquired, Hygiene, Infection control

Received 11 June 2011/ Accepted 07 August 2011

INTRODUCTION

Hospital Acquired Infections (HAIs) otherwise called nosocomial infection (NI) are cross infections that appear during hospitalisation up to 72 hours post discharge in patients who were not incubating the infection on admission (WHO, 2003). It could be from patients, health officials, and/or hospital equipments. It is a major consequence of the failure/inadequacies of Infection Control Programme of a hospital. Hospital acquired infections, though largely preventable, progress rapidly and the organisms are frequently resistant to antibiotics. Antimicrobial resistance remains a

major public issue all over the world. Some of the identified factors responsible for antimicrobial resistance are lack of infection control, weak surveillance and poor commitment (WHO, 2009).

A Study on the Efficacy of Nosocomial Infection Control (SENIC) found that hospitals that had a programme of surveillance and fed results back to clinical staff had considerably lower (32%) infection rates than others (Haley *et al.*, 1985). French (1996) demonstrated the effectiveness of repeated prevalence surveys and the US National Nosocomial Infections Surveillance (NNIS) system

*Corresponding author: Tel: +234 8033885447; E-mail: temitopesegun@yahoo.com

has shown a significant reduction of nosocomial infection rates nationally in the US (Ramirez Barba *et al.*, 2006), sequel to surveillance strategies put in place in the country on hospital acquired infections. Unfortunately, due to inadequate resources and commitment to establish and nurture structures on HAI surveillance and Infection Control in most of the hospitals in developing countries including Nigeria, the experience over the years in this region is quite disheartening. The cost goes beyond economic losses to tragic loss of life. The purpose of surveillance of nosocomial infections is to reduce the incidence of HAI and thus to reduce the associated morbidity, mortality, and costs (David and Famurewa, 2010).

Studies have shown significant impacts of the implementation of reports made available by the International Infection Control Consortium (INICC) surveillance study from 2002 through 2005 in 57 Intensive Care Units in Argentina, Brazil, Colombia, Turkey, India and Mexico (Rosenthal *et al.*, 2005; Salomao *et al.*, 2005; Villamil *et al.*, 2005; Chakravarthy *et al.*, 2006; Koksall *et al.*, 2006). A previous study in Obafemi Awolowo University Teaching Hospital investigated the course and prevalence of nosocomial infections over a period of 5 years in the teaching hospital. The study found a period prevalence of HAI to be 2.6%. It also concluded that infection control infrastructure and adherence to infection control practices was weak (Onipede *et al.*, 2004). It is the aim of this study to determine the course of HAIs in OAUTHC over the succeeding 10 years and to assess the state of infrastructure and practice that still place their patients at risk of acquiring these infections.

METHODOLOGY

This study is a 10 year review using secondary data collected from 2000 to 2009 at the Obafemi Awolowo University Teaching Hospital Complex Ile-Ife. Monthly summary sheets from 2000 to 2009 were collected from the infectious control unit of the hospital. This data was obtained from surveillance forms modelled after the Centre for Disease Control protocol (Starling *et al.*, 1997) which contained essential identifying data like age, sex, hospital identification number, wards or location within the hospital, service and date of admission. Others are date of infection, site of infection and the organism(s) isolated from specimen and anti microbial susceptibility pattern

of isolates. The following were considered essential: service unit, site of infection and causative agent(s). Detailed description of methods has been previously provided by Onipede *et al.* (2004). These are further analysed at the end of every year to generate data for the overall frequency and distribution pattern of Hospital Acquired Infections in our hospital which is the basis of the present report. An observational check list was also designed to assess the level of hygiene in different wards of the hospital and among health care workers looking at availability of water, state of the sink, hand washing practices, the use of anti septic soap, use of clean towel, reusable or disposable, use of clean beddings and cleanliness of floors. Data analysis was done using the SPSS version 16. The consent of the Infection Control Committee (ICC) of the hospital was obtained.

RESULTS

A total of 37,957 patients were on admission for various ailments or disease conditions during the period January 2000 to December 2009. Of these, 1129 cases of infection were recorded while on admission, giving a 10 year period prevalence of 3.0%. Figure 1 shows the summary of the prevalence of HAIs for individual years from 2000 to 2009. The highest rate was recorded in 2006 (9.0%) and the lowest was 2009 (0.6%). The distribution of HAIs across the wards over this period is shown in Table 1.

Table 1: Prevalence of HAIs by Wards in Obafemi Awolowo University Teaching Hospital Over the Ten Year Review Period (2000-2009)

Ward	Number discharged	Number of infections (%)
Surgery	8902	433(4.9)
Orthopaedics	2048	157(7.7)
Obstetrics and Gynaecology	10472	153(1.5)
Medicine	6937	208(3.0)
Paediatrics	6272	57(0.9)
Neonatal ward	2832	49(1.7)
Intensive care unit	489	72(14.7)
Total	37957	1129(3.0)

The highest rate was observed in Intensive Care Unit (14.7%), followed by the Orthopaedic ward (7.7%) while the Paediatrics and Obstetrics and Gynaecology wards recorded relatively lower figures (0.9% and 1.5%) respectively. Of the 1129 cases of HAI during the period of review, surgical ward contributed 433 representing 38% while the ICU contributed the least with 72 representing 6.4% as shown in Table 2.

Table 2: Distribution of HAIs across the Different Wards of OAUTHC over the ten year Period (2000-2009)

Wards	Number of Infection	Percentages
Surgery	433	38.3
Orthopaedics	157	13.9
Obstetrics and Gynaecology	153	13.6
Medicine	208	18.4
Paediatrics	57	5.0
Neonatal	49	4.3
Intensive Care Unit	72	6.4
Total	1129	100

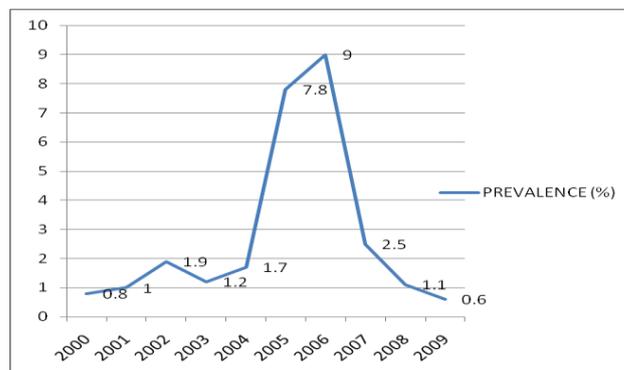


Figure 1: Prevalence of HAIs in Obafemi Awolowo University Teaching Hospital, 2000-2009

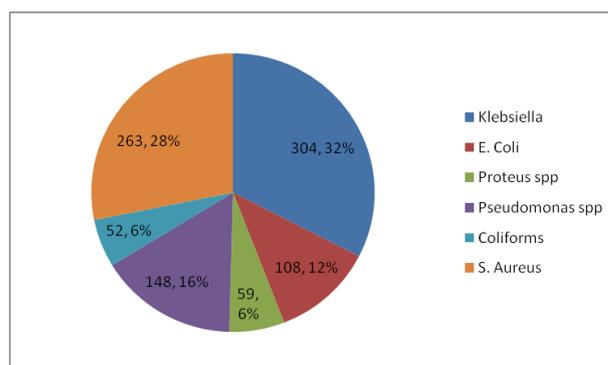


Figure 2: The Spectrum of Bacteria Implicated in HAIs in OAUTHC between 2000 and 2009

Table 3: Sanitary Facility Available in the Wards of OAUTHC and Practice of Hand-washing by the Staff

Wards	Availability of Water	Free flowing from Tap	Hand - washing	Antiseptic Soap	Clean towel	Disposable towel	Clean beddings	Clean floor	Antiseptic mopping
Male Surgical Ward	+	+	+	+	+	-	+		+
Female Surgical Ward	+	+	+	+	+	-	+	+	+
IGE ward (Surgery extension)	+	+	+	-	+		+	+	+
Paediatric Surgical Ward	+	-	+	+	-	-	+	+	-
Children Orthopaedic Ward	+	+	+	+	-	-	+	+	+
Adult Orthopaedic Ward	+	-	+	+	-	-	+	+	+
Male Medical Ward	-	-	+	+	-	-	+	+	+
Female Medical Ward	+	+	+	+	+	-	+	+	+
Renal Ward	+	-	+	-	+	-	+	+	+
Psychiatric Ward	+	+	+	+	+	-	+	+	+
Antenatal /Postnatal Ward	+	-	+	-	-	-	+	+	+
Labour Ward	+	+	+	-	-	-	+	+	+
Children's Ward I	+	+	+	+	+	-	+	+	+
Children's Ward II	+	+	+	+	-	-	+	+	+
Children Emergency Ward	+	+	+	+	-	-	+	+	+
Neonatal Ward	+	+	+	+	+	-	+	+	+
Casualty unit	+	+	+	-	+	-	+	+	+
Intensive Care Unit	+	+	+	-	+	-	+	+	+

Several organisms are implicated in HAIs, in this study gram negative rods were the most frequently isolated (72%) and gram positive was 28%. Of the gram negative organisms, the genus *Klebsiella* accounted for 33.5%, followed by the genus *Pseudomonas* 15.8%, *Escherichia coli* 11.6%, *Proteus* 6.3% successively while the least was the other coliforms 5.6%. The only gram positive bacterium implicated was the *Staphylococcus aureus* (28.2%) as depicted in Figure 2.

Table 3 shows the state of hygiene of the wards and hygienic practices of the workers. The wards were assessed to be clean as the beddings were clean generally; floors were cleaned and mopped frequently with antiseptic lotions. Of the 18 wards, only one had no water (5.6%) while 4 wards (22%) did not have free flowing water and so had to use reservoirs to store water. Antiseptic soap bars was used in 70% of the wards and in 44% of the wards, the hand towel were adjudged to be dirty. None of the wards used disposable towel. Hand washing was commonly practised in the hospital by health workers.

DISCUSSION

The ultimate objective of establishing an Infection Control Programme (ICP) in any hospital is to translate surveillance efforts into infection prevention (Wenzel, 1987). From this study, the overall prevalence of HAIs in this hospital from year 2000 to 2009 is 3.0%. This is higher than the 2.6% reported for the preceding 5 year period by Onipede *et al.* (2004), though within the range of annual prevalence of 3-15% reported for developing countries (CDC, 2000) but lower than the reported 3.78% at Lagos University Teaching Hospital (Ogunsola *et al.*, 1995). A comparison of these findings indicates that there was no improvement in the handling of risk factors for nosocomial infections in our hospital. It was also noted that there was a sharp increase in the prevalence from 1.7% in 2004 to 9% in 2006 and this accounts for the high period prevalence recorded. The point recorded in 2005 and 2006 could be attributed to the strike actions by hospital workers during this period, poor funding for infection control programme or ineffectiveness of the programme itself. Disparities in hygiene protocols and standard definition of cases of nosocomial infections may also be responsible for the observed differences in the prevalence rate

from one hospital to another which makes a direct comparison difficult (Wenzel, 1987).

The ICU had the highest period prevalence of 14.7% which is within the range quoted for developed countries of 9-37% (WHO, 2009) and much higher than the 8.4% in the 5 year review done in the same hospital (Onipede *et al.*, 2004). This high rate can be attributed to use of invasive devices in this unit. Studies have shown high incidence of device-associated infection which are 2-8 fold in developed countries (WHO, 2009). Gram-negative rods were the most frequently isolated microbes in HAIs in this survey which is also reported by Onipede *et al.* (2004). However, the pattern has changed with *Klebsiella* being the most implicated in this study as opposed to *Pseudomonas*. *Staphylococcus aureus* still remains the most implicated Gram positive bacteria. The pattern by pathogen is similar to what has been reported by other studies (Haley *et al* 1985, Forder, 1993, Pannuti and Grnbaum 1995, Starling *et al.*, 1997).

A previous study concluded that infrastructure was weak with regards to infection control and that hand washing which has been identified as a very important means of controlling HAIs was not optimal (Onipede *et al.*, 2004). Although no hand washing policy is in place, our survey shows that hand washing is commonly practised by health workers in this hospital which is commendable. Studies all over the world have shown wide variability in hand hygiene procedures (5-89%) with an overall average of 38% (WHO, 2009). This compliance may be due to the incessant hand hygiene campaign run by the infection control committee of the hospital. The willingness to carry out hand washing is however not supported by adequate facilities as most wards did not have the requisite tools for proper hand washing such as free flowing water. The use of containers to store water might be a reservoir for transmission of HAIs. Furthermore, non-availability of liquid antiseptic soaps, alcohol rubs, hand dryers and disposable towels are also barriers to proper hand washing. According to WHO, these are some of the self reported factors for poor adherence to hand hygiene (WHO, 2009).

CONCLUSION

Even though, record keeping was incomplete for site of infection and so could not be utilised in this

study, the prevalence of HAI has not changed significantly during the years under review though it seems on the decline and the pattern of organisms implicated has only changed slightly. Hand washing in this hospital is generally practiced; however the effectiveness of the hand washing is in doubt due to non availability of right materials for hand washing. Based on the above findings, we recommend that the infection control committee of the hospital be supported by management to carry out her surveillance activities efficiently through provision of diagnostic equipments and enabling policies on infection control. The management should ensure adequate supply of free flowing water to all service areas and provide state of the art hand washing facilities in the hospital.

REFERENCES

- CDC Report (2000). Monitoring Hospital-Acquired Infections to Promote Patient Safety - United States, 1990-1999. *MMWR*. **49**:149-153
- Chakravarthy M, Jawali V, Rosenthal VD and Venkatachalam N (2006). Process and Outcome Surveillance Plus Education And Feedback Effect On Device Associated Infections Rates In Indian Critical Patients. In: IFIC; July 3rd to 5th; Spier Estate, Stellenbosch, South Africa
- David OM and Famurewa O (2010). Towards Effective Management of Nosocomial Infections in Nigerian Hospitals - A Review. *Academic Arena*. **2**(5):1-7
- Forder AA (1993). Infection Control a Challenge in the Land of Contrast. *J Hosp Infect*. **3**: 87- 94
- French GL (1996). Repeated Prevalence Surveys. *Ballière's Clinical Infectious Diseases*. **3**:179-195
- Haley RW, Culver DH, White JW, Morgan WM, Emori TG, Munn VP and Hooton TM (1985). The Efficacy of Infection Surveillance and Control Programs in Preventing Nosocomial Infections in US Hospitals. *American J Epidemiol*. **121**:182-205
- Koksal I, Rosenthal VD, Aydin K and Caylan R (2006). Process and Outcome Surveillance plus Education And Performance Feedback Effect On Rates Of Device Associated Infections In Adult Intensive Care Units of One Turkish Hospital. In: VI Pan-American Infection Control and Hospital Epidemiology Meeting; 2006 September 11th to 15th; Porto Alegre, Brazil
- Ogunsola FT, Coker AO, Adetunji A and Iregbu KC (1995). Infection Control in the Lagos University Teaching Hospital for Improvement. In Abstract of the 1st International Conference on Nosocomial and Infection Control in Africa. Paper 5.
- Onipede AO, Oluyede CO, Aboderin AO, Zailani SB, Adedosu AN, Oyelese AO, Badmus TA, Ikem IC, Balogun CA and Olafinihan KF (2004). A Survey of Hospital Acquired Infections in Obafemi Awolowo University Teaching Hospital Complex, Ile-Ife. *Afr J Clin Exper Microbiol*. **5**(1):108-116
- Pannuti CS and Grnbaum RS (1995). An Overview of Nosocomial Control in Brazil. *Infect Contr Hosp Epidemiol*. **16**(3): 170-174
- Ramirez Barba EJ, Rosenthal VD, Higuera F, Oropeza MS, Hernández HT, López MS, Lona EL, Duarte P, Ruiz J, Hernandez RR, Chavez A, Cerrato IP, Ramirez GE and Safdar N (2006). Device-Associated Nosocomial Infection Rates In Intensive Care Units In Four Mexican Public Hospitals. *Am J Infect Contr*. **34**(4):244-247
- Rosenthal VD, Guzman S and Safdar N (2005). Reduction in Nosocomial Infection with Improved Hand Hygiene in Intensive Care Units of a Tertiary Care Hospital in Argentina. *Am J Infect Contr*. **33**(7): 392-7
- Salomao R, Blecher S, Maretti da Silva M, Vilins M, Hilário da Silva E and Rosenthal V (2005). Education And Performance Feedback Effect On Rates Of Central Vascular Catheter-Associated Bloodstream Infections In Adult Intensive Care Units of One Brazilian Hospital of Sao Paulo. In: APIC; 2005 June 19th to 23rd; Baltimore, Maryland, USA.
- Starling CE, Couto BR and Pinheiro SM (1997). Applying the Centre for Disease Control and Prevention and National Surveillance System Methods in Brazilian Hospital. *Am J Infect Contr*. **25**:303-311
- Starling CEF, Couto BRMF and Pinheiro SMC (2002). Multi-centre Study of the Definitions of Nosocomial Infections {abstract}. In abstract of the 4th Decennial

International Conference on Nosocomial and Health care. Associated infections; 5-9 March 2000, Atlanta, Georgia. *Infect Contr Hosp Epidemiol.* **21**-153

Villamil GW, Ruíz VG, Marrugo PA, Rosenthal VD (2005). Education And Performance Feedback Effect On Rates Of Central Vascular Catheter – Associated Bloodstream Infections In New Born Intensive Care Units In a Private Hospital of Sucre, Colombia. In: APIC; 2005 June 19th to 23rd; Baltimore, Maryland, USA

Wenzel RP (1987). Towards a Global Perspective of Nosocomial Infections. *Eur J Clin Microbiol.* **6**: 341-343

WHO (2003). Laboratory Biosafety Manual (2nd Edition) Geneva.

WHO (2009). Guidelines on Hand Hygiene in Healthcare: A Summary. WHO/IER/PSP/2009-07