ORIGINAL ARTICLE

Hospital-acquired infections in a Nigerian tertiary health facility: An audit of surveillance reports

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ABSTRACT

Background: Hitherto efforts to implement data driven prevention guidelines for hospital-acquired infections (HAI) in Nigeria have been limited by the inadequate knowledge of the risks of these infections. This study evaluated the occurrence of HAI in a foremost tertiary health facility over a 5-year period for the purpose of reinforcing control efforts. **Materials and Methods:** A retrospective survey of records from the infection control unit of the University College Hospital, Ibadan, Nigeria, was done for the years 2005-09. For the 5 years studied 22,941 in-patients were reviewed and the data of those who developed infections during admission were retrieved and analyzed. The prevalence, types, and causative organisms of HAI were determined. The chi-square test was used to evaluate associations. **Results:** The prevalence of HAI over the 5-year period was 2.6% (95% CI: 2.4–2.8). Surgical and medical wards had the most infections (48.3%) and (20.5%) respectively. Urinary tract infection (UTI) and surgical site infection (30.7%) were the most prevalent (43.9%) HAI. UTIs were significantly higher in surgical and medical wards, surgical site infections in obstetrics and gynecology wards, and soft tissue infections and bacteremia in pediatric wards ($P<0.05$). Gram-negative infections occurred about four times as often as gram-positive infections with *Klebsiella sp*. and *staphylococcus aureus* being the predominant isolates (34.3%) and (20.1%) respectively. **Conclusion:** Efforts to limit HAI should be guided by local surveillance data if progress is to be made in improving the quality of patient care in Nigeria.

Key words: Hospital-acquired infections, infection control, Nigeria, surveillance

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INTRODUCTION

In the 21st century it is unacceptable that a person who is ill runs the additional risk of acquiring an infection while seeking respite from his present ailment.[1] Hospital-acquired infections (HAI) are thus a major patient safety issue as a cause of preventable illness and death. As a result, the prevention and control of these infections have become a priority. Surveillance or monitoring of these infections has been recognized as key to the control of these infections.[1]

Concern about HAI is global; however, in developing countries where the burden is estimated to be highest, information on surveillance activities in the prevention and control of HCAI is not often available.[2] The developments in the surveillance and monitoring of HAI in these countries also lag behind those of more industrialized countries and the mandatory surveillance requirements as it obtains in some other countries have largely not being implemented.[3] As a result of this relative lack of information there has been no significant change to improve existing surveillance systems.[4-6]

In Nigeria also, the inadequate knowledge of the risks of HAI and the measures of risk reduction have limited control activities. To prevent HAIs it is necessary to identify sources and modes of transmission of infection and to implement data driven prevention guidelines and practices.[7] This study therefore aimed to evaluate the pattern and occurrence of HAI in a foremost tertiary health facility over a 5-year period for the purpose of reinforcing control efforts.

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MATERIALS AND METHODS

The study was carried out at a foremost tertiary hospital in south west Nigeria by reviewing records from the infection control unit of the hospital for 2005–09. The hospital is an 850-bed hospital with surgical, medical, obstetrics,

gynecology, and pediatric departments. Data were primarily collected by the infection control nurses using a surveillance form which documents the results of samples from in-patients who had undergone microscopy culture and sensitivity. These samples had been obtained from patients meeting the criteria for HAI during admission (i.e., infections not present and without evidence of incubation at the time of admission to the hospital). Information on the number of infections, total number of admissions in each ward (including the intensive care unit), sites of infection, and isolated pathogens was obtained from the surveillance forms. Prevalence of HAI was determined for each year based on the number of HAI divided by the total number of admissions. Data were analyzed with Epi-Info 2000. Proportions were determined and the chi-square test was used to explore the differences in the proportions of HAI at a significance level of 5%.

RESULTS

Figure 1 shows the prevalence of HAI for each year studied. Rates climbed slowly from 2.4% in 2005 to 3.1% in 2008; a decline was however noted in 2009 with a rate of 2.3%. The overall prevalence of HAI for the 5-year period was 2.6% (95% CI: 2.4–2.8).

Distribution of hospital-acquired infections in each ward

The prevalence of HAI in each ward is shown in Table 1. Overall, 48.3% of all infections were from the surgical wards, 20.5% from medical, 15.1% from pediatric, and 16.1% from obstetrics and gynecology wards. The highest ward prevalence of HAI was in surgical wards 4.4% followed by pediatric wards 2.4%.

In each year reviewed, surgical wards consistently recorded the highest prevalence of HAI compared to other wards as shown in Figure 2. HAI peaked in 2008 with the highest prevalence of 5.9% in surgical wards and the least occurrence in obstetric wards at 1.4%.

Table 2 shows the cross-tabulation of HAI and type of ward. Surgical wards significantly had more HAI than other wards ($P<0.05$)

Sites of infections

Table 3 shows the different sites of infections; urinary tract infections occurred most often (43.96%), followed by surgical site infections (30.7%).

Hospital-acquired infections by sites of infection in each type of ward

As shown in Figure 3, urinary tract infections were the most common infections in surgical, obstetrics, and gynecology and medical wards. However, soft tissue/cutaneous infections were the most common type of infections in pediatric wards.

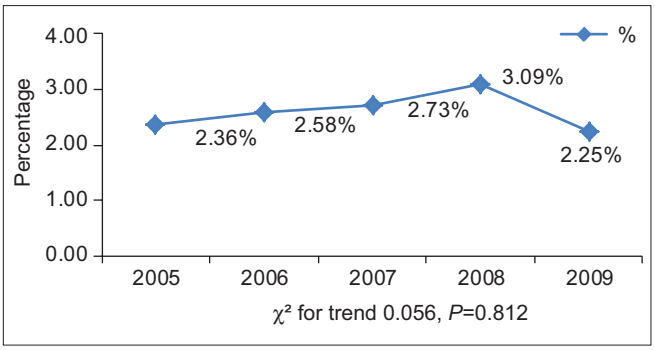
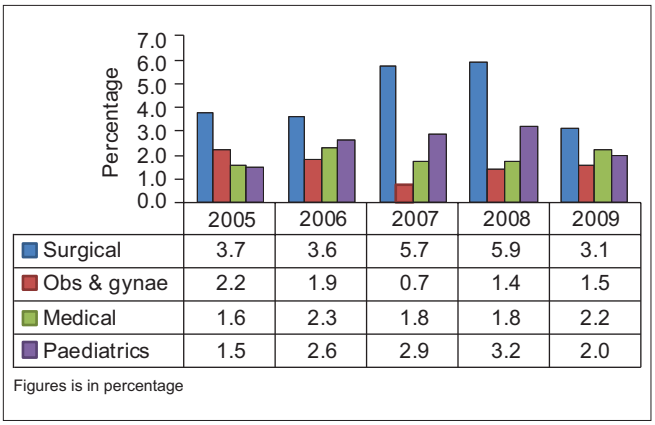


Figure 1: Prevalence of HAI in UCH Ibadan from 2005-09



	2005	2006	2007	2008	2009
Surgical	3.7	3.6	5.7	5.9	3.1
Obs & gynae	2.2	1.9	0.7	1.4	1.5
Medical	1.6	2.3	1.8	1.8	2.2
Paediatrics	1.5	2.6	2.9	3.2	2.0

Figures is in percentage

Figure 2: HAI in each ward in UCH Ibadan for 2005-09

Table 1: Distribution of HAI by wards in UCH, Ibadan

Wards	Number of HAI (%)	Total number of admissions	Prevalence per ward %
Surgical	288 (48.3)	6593	4.40
Observations and gynecology	96 (16.1)	6265	1.53
Medical	122 (20.5)	6370	1.92
Pediatrics	90 (15.1)	3713	2.42
Total	596 (100)	22,941	2.60

HAI – Hospital-acquired infections; UCH – University college hospital

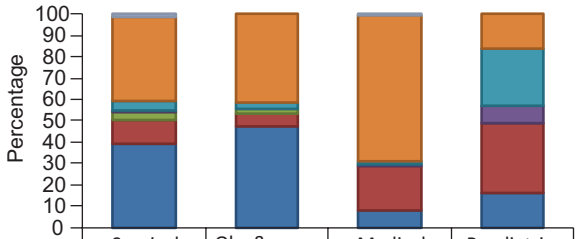
Table 2: Cross-tabulation of HAI and type of ward in UCH, Ibadan

Wards	HAI	
	Yes	No
Surgical	288 (4.40)	6305 (95.6)
Observations and gynecology	96 (1.53)	6169 (98.47)
Medical wards	122 (1.92)	6248 (98.08)
Pediatrics	90 (2.42)	3623 (97.58)
Total	596 (2.60)	22345 (97.4)

HAI – Hospital-acquired infections; UCH – University college hospital; $\chi^2=2943$; $P<0.001$.

Isolates from hospital-acquired infections

Gram-negative organisms constituted more than three quarters (78.3%) of all causative organisms in HAI. The isolates from HAI are shown in Table 4. *Klebsiella sp.* was the



	Surgical	Obs & gynae	Medical	Paediatrics
Others	1.4	0.0	0.8	0.0
Urinary tract	39.4	41.6	68.3	15.9
Bacteremia	4.6	3.0	1.6	27.3
Meningitis	0.7	0.0	0.8	8.0
Burns	3.5	2.0	0.0	0.0
Soft tissue	11.3	5.9	20.3	33.0
Surgical site	39.1	47.5	8.1	15.9

Figures is in percentage

Figure 3: HAI by sites of infection in each ward in UCH Ibadan

Table 3: Sites of hospital-acquired infections in UCH, Ibadan

Sites	N (%)
Urinary tract infection	252 (43.96)
Surgical site infection	183 (30.7)
Soft tissue and cutaneous infections	92 (15.44)
Bacteremia	42 (7.05)
Burns	12 (2.01)
Meningitis	10 (1.68)
Others*	5 (0.84)

UCH – University college hospital; *Gastrointestinal infections

predominant isolate (34.3%), followed by *staphylococcus aureus* (20.1%).

Table 5 shows the isolates from each site of infection. *Staphylococcus aureus* was the most often isolated organism in surgical site infections (29.2%), bacteremia 45.5%, and burn infections 31.2%. *Klebsiella spp*. was the predominant isolate in urinary tract infections (42.7%) and soft tissue infections (33.6%). *E. coli* was the most common organism in meningitis 30%.

DISCUSSION

The trend of HAI over a 5-year period in a tertiary health facility in Nigeria was presented. Prevalence ranged between 2% and 3% with no significant variation over the 5-year study period. An overall infection rate of 2.6% was found, revealing a slight decline from 3.0% to 4.9% reported in previous clinical audits for the years 1999–2004 and 1989–91 respectively for the same institution.[8] This decline may be indicative of better infection control measures in the hospital and recent efforts to limit the duration of hospital stay for in-patients. The observed trend of HAI is comparable to other studies from the country,[8,9] but lower than rates reported from some other countries.[10-12] However, direct international comparisons of HAI are often difficult due to methodological differences resulting from definitions of HAI, type of HAI covered and the health units surveyed.[4]

Consistent with other studies,[13,14] surgical wards continue to be hot spots for HAI. This is often due to the breached skin defenses resulting from invasive surgical procedures.

Table 4: Isolates from HAI in UCH, Ibadan

Pathogen	N (%)
Klebsiella spp.	242 (34.28)
Staphylococcus aureus	142 (20.11)
Escherichia coli	138 (19.55)
Pseudomonas aeruginosa	86 (12.18)
Proteus mirabilis	32 (4.53)
Pseudomonas sp.	31 (4.39)
Proteus sp.	24 (3.4)
Enterococcus faecalis	6 (0.85)
Strepotococcus spp.	5 (0.71)

HAI – Hospital-acquired infections; UCH – University college hospital

Table 5: Isolates by infection sites in UCH, Ibadan

Isolates	N (%)
Surgical site infections	
Staphylococcus aureus	68 (29.2)
Klebsiella	61 (26.2)
Escherichia coli	41 (17.6)
Pseudomonas aeruginosa	35 (15.0)
Others	28 (12.0)
Soft tissue or cutaneous infection	
Klebsiella spp.	41 (33.6)
Staphylococcus aureus	32 (26.2)
Escerichia coli	19 (15.6)
Pseudomonas aeruginosa	15 (12.3)
Others	15 (12.3)
Meningitis	
Escerichia coli	3 (30)
Klebsiella spp.	2 (20)
Staphylococcus aureus	2 (20)
Pseudomonas aeruginosa	2 (20)
Pseudomonas spp.	1 (10)
Bacteremia	
Staphylococcus aureus	20 (45.5)
Klebsiella spp.	13 (29.6)
Others	11 (24.9)
Urinary tract infection	
Klebsiella spp	117 (42.7)
Escherichia coli	71 (25.9)
Pseudomonas aeruginosa	25 (9.12)
Pseudomonas sp.	17 (6.2)
Staphylococcus aureus	14 (5.11)
Proteus mirabilis	13 (4.74)
Others	15 (6.23)
Burns	
Staphylococcus aureus	5 (31.2)
Pseudomonas aeruginosa	4 (25.0)
Klebsiella spp.	3 (18.8)
Others	4 (25.0)

UCH – University college hospital

Urinary tract infections (UTI) emerged as the predominant HAI similar to other studies.[13,15,16] Pneumonia and blood stream infections were however not as prominent as reported by some other studies.[17,18] This can be explained by the infrequent use of central intravenous catheters and mechanical ventilators, making urinary catheters the most commonly used invasive device and hence the high prevalence of UTI as established by other studies.[18,19]

Gram-negative bacilli have been commonly associated with hospital-acquired infections.[12,20] Our findings also showed a predominance of gram-negative bacilli. A U.S. study reported a similar ratio of gram-negative bacilli to gram-positive cocci as 4:1.[21] *Staphylococc*i were also prominent particularly in blood stream infections similar to other studies.[22] A noticeable gap in this surveillance system was the lack of routine screening for Methicillin Resistant *Staphylococcus Aureus* (MRSA) which has been made mandatory in some countries.[1]

Limitations

Data were not disaggregated by age- or sex-limiting knowledge of demographic variables which might impact on susceptibility to HAI. Although this study was done in the largest tertiary hospital in Nigeria, findings cannot be assumed to be representative of the whole country due to differences which may exist in the patient profile and the spectrum of clinical activity. The inability of the hospital to determine the presence of important micro-organisms involved in HAI such as MRSA, Vancomycin Resistant *Staphylococcus Aureus*, Vancomycin *Resistant Enterococci* and Extended Spectrum Beta-Lactamases. Gram-negative bacteria and fungi limit the comparability of these findings.

Strengths

This study provides an update on HAI rates and also provides insight into infection control status in this major Nigerian hospital. Useful information for benchmarking purposes was provided.

CONCLUSIONS

For the 5 years reviewed HAI rates had been increasing albeit marginally and a downward trend was only observed in 2009, with UTI as a major contributor. HAIs are preventable harms and surveillance has been a key component of the activities to drive down rates of HAI in other countries. It is important that surveillance data are utilized in clinical decision making particularly in the prudent use of urinary catheters to limit the persistent high rates of UTI in this hospital. The use of a more robust surveillance system which is web-enabled can aid access to surveillance data by healthcare providers. Developing national infection control targets and standardized data collection procedures with rigorous performance management would allow for easier evaluation of healthcare systems in the country.

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REFERENCES

1. Health protection agency. Mandatory surveillance of healthcare associated infection report, 2006. London: Health Protection Agency; 2006.
2. Pittet D, Allegranzi B, Storr J, Bagheri Nejad S, Dziekan G, Leotsakos A, *et al*. Infection control as a major World Health Organization priority for developing countries. J Hosp Infect 2008;68:285-92.
3. Health protection agency. Surveillance of healthcare associated infections report: 2008. London: Health Protection Agency; 2008.
4. Avasarala AK. Epidemiology of nosocomial infections (NCIs) Part-1. Prathima institute of medical sciences, Karimnagar, India; 2008. Available from: http:// www.pitt.edu/~super7/ 22011-23001/22391.ppt. [Last cited on 2010 Mar 3]
5. Okezie OA, Onyemelukwe NF. Nosocomial infection in a Nigerian rural maternity centre: A series of nine cases. East Afr Med J 2007;84:83-7.
6. Chandra PN, Milind K. Lapses in measures recommended for preventing hospital-acquired infection. J Hosp Infect 2001;47:218-22.
7. Harbath S, Sax H, Gastmeier P. The preventable proportion of nosocomial infections: An overview of published reports. J Hosp Infect 2003;54:258-66.
8. Oni A, Ewete AF, Gbaja AT, Kolade AF, Mutiu WB, Adeyemo DA, *et al*. Nosocomial infections: Surgical site infection in UCH Ibadan, Nigeria. Niger J Surg Res 2006;8:19-23.
9. Abubakar S. Implementation of an infection control programme in Kano. Northern Nigeria: IJIC Org; 2007.
10. Lahsaeizadeh S, Jafari H, Askarian M. Healthcare-associated infection in Shiraz, Iran 2004-2005. J Hosp Infect 2008;69:283-7.
11. Merchant M, Karnad DR, Kanbur AA. Incidence of nosocomial pneumonia in a medical intensive care unit and general medical ward patients in a public hospital in Bombay, India. J Hosp Infect 1998;39:143-8.
12. Zaidi AK, Huskins WC, Thaver D, Bhutta ZA, Abbas Z, Goldmann DA. Hospital-acquired neonatal infections in developing countries. Lancet 2005;365:1175-88.
13. Samuel SO, Kayode OO, Musa OI, Nwigwe GC, Aboderin AO, Salami TAT, Taiwo SS. Nosocomial infections and the challenges of control in developing countries. Afr J Clin Exp Microbiol 2010;11:102-10.
14. Peterson LR, Brossette SE. Hunting health care-associated infections from the clinical microbiology laboratory:passive, active and virtual surveillance. J Clin Microbiol 2002; 40:1-4.
15. Klavs I, Bufon Luznik T, Skerl M, Grgic-Vitek M, Lejko Zupanc T, Dolinsek M, *et al*. Prevalance of and risk factors for hospital-acquired infections in Slovenia-results of the first national survey, 2001. J Hosp Infect 2003;54:149-57.
16. Mayon-White R, Ducel G, Kereselidze T, Tikomirov E. An international survey of the prevalence of hospital-acquired infection. J Hosp Infect 1988;11 Suppl A:43-8.
17. Azzam R, Dramaix M. A one-day prevalence survey of hospital-acquired infections in Lebanon. J Hosp Infect 2001;49:74-8.
18. Gikas A, Pediaditis J, Papadakis JA, Starakis J, Levidiotou S, Nikolaides P, *et al*. Prevalence study of hospital-acquired infections in 14 Greek hospitals: planning from the local to the

national surveillance level. J Hosp Infect 2002;50:269-75.
19. Singh S, Pandya Y, Patel R, Paliwal M, Wilson A, Trivedi S. Surveillance of device-associated infections at a teaching hospital in rural Gujarat-India. Indian J Med Microbiol 2010;28:342-7.
20. Robert G, Edwards JR. Overview of nosocomial infections caused by gram-negative bacilli. Clin Infect Dis 2005;41: 848-54.
21. Bell JM, Turnidge JD. High prevalence of oxacillin-resistant Staphylococcus aureus isolates from hospitalized patients in Asia-Pacific and South Africa: Results from SENTRY antimicrobial surveillance program, 1998-1999. Antimicrob Agents Chemother 2002;46:879-81.
22. Wisplinghoff H, Bischoff T, Tallent SM, Seifert H, Wenzel RP, Edmond MB. Nosocomial bloodstream infections in US hospitals: Analysis of 24,179 cases from a prospective nationwide surveillance study. Clin Infect Dis 2004;39: 309-17.

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