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A point prevalence of healthcare-associated infections in a university teaching hospital in Lagos, Nigeria

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Abstract

Healthcare-associated infections (HAIs) are of significant public health concern. They are associated with antimicrobial resistance and they increase the cost of healthcare, morbidity and mortality.
This study is a point prevalence survey of healthcare associated infection among admitted patients in the Lagos University Teaching Hospital (LUTH). It was done using the protocol of the optional healthcare-associated (HAI) module of Global Point Prevalence Survey (G-PPS) to determine the prevalence of healthcare-associated infections and the associated risk factors.
The prevalence of HAIs in Lagos University Teaching Hospital (LUTH) was 7.4 for unit-specific HAI prevalence; the intensive care unit had the highest prevalence of 50%, followed by the surgical wards (11.8%), while the Child and Neonatal wards had the lowest HAI prevalence of 3.3%. The associated risk factors included invasive procedures such as insertion of central venous catheter, urinary catheters, ventilators and surgery. Ventilator-associated pneumonia (25.0%) was the leading HAI in the adult ICU ward.

Keywords: Healthcare-associated infections; antimicrobial resistance, point prevalence survey

Introduction

Healthcare-associated infections (HAIs) are a significant public health concern. Millions of people are affected globally every year, contributing to mortality and morbidity related to infectious diseases; economic losses to the healthcare system and families; and also leading to strained healthcare systems.[1] Most healthcare-associated infections are due to antimicrobial-resistant organisms[2]. The World Health Organization has stated that the impact of healthcare-associated infection and antimicrobial resistance is incalculable. Over 24% of patients managed for healthcare-associated sepsis die; 52% die in the intensive care unit, and deaths due to HAI are doubled or tripled if they involve antimicrobial-resistant organisms[3]. Apart from increased morbidity and mortality, HAIs are associated with prolonged hospital stay, increased healthcare costs, and treatment failure due to antimicrobial resistance (AMR)[2,4].

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A meta-analysis showed that in the United States, the economic burden of the five most significant healthcare-associated infections (HAIs) is estimated at $9.8 billion. These HAIs include surgical site infections, ventilator-associated pneumonia (VAP), central line-associated bloodstream infections, Clostridioides difficile infections, and urinary tract infections (UTIs), which contribute to 33.7%, 31.6%, 18.9%, 15.4%, and less than 1% of the total costs, respectively.[5]

In sub-Saharan Africa, the burden of HAIs is high, but the prevalence varies by country and also by facility, depending on the availability of infection control measures. The overall prevalence of HAIs was estimated at 3.3%, and that of West Africa was at 9.5%. The most prevalent HAIs were bloodstream infections (59.4%); urinary tract infections (38.7%); surgical site infections (28.4%), and lower respiratory tract infections (17.1%)[6].

The risk factors associated with HAIs include extremes of age, invasive procedures and devices, co-morbidities, prolonged hospital stay, male sex, antibiotic use, and previous hospitalisation[7,8,9]. The objective of this study was to determine the point prevalence of HAIs, the most common types, and associated risk factors of HAIs in Lagos University Teaching Hospital, using the optional HAI module of the Global Point Prevalence Survey (Global-PPS) tool.

Methodology

A Point Prevalence Survey was conducted from October 21 to 25, 2024, in all the wards of the Lagos University Teaching Hospital (LUTH), Lagos, Nigeria.

Study setting

The study is a descriptive cross-sectional point prevalence survey (PPS) done in October 2024 as part of the Antimicrobial Stewardship Program (ASP) of LUTH -a 1050-bedded tertiary care hospital. The Global-PPS protocol, including the healthcare-associated infections (HAI) module, was used. The Global Point Prevalence Survey (Global-PPS) is a web-based tool to measure and monitor antimicrobial prescribing and resistance in hospitals worldwide (www.globalpps.com). The Global-PPS optional HAI module is an extension of the inpatient Global Point Prevalence Survey. It is designed to examine healthcare-associated infection (HAI) burden in relation to invasive devices and selected patient risk factors. It is listed in the Global-PPS document repository as the "Global-PPS inpatient protocol with optional HAI module – May 2024"[10].

Ethical Considerations

The study was approved by the Health Research and Ethics Committee of LUTH. (Approval Number: ADM/DSCST/HREC/APP/4767). Data obtained from this study are anonymized and cannot be linked to any patient and is for quality improvement of the hospital. Data collection did not interfere with patient care.

Data collection

The Global-PPS tool and protocol, including the healthcare-associated infections (HAI) module, were used for data collection.

Data were collected by medical students of the University of Lagos who were trained on the use of the tool for this study. The information was extracted from the patient's medical records. Data collection in each ward was completed on the same day and entered into the Global-PPS web-based tool for validation and reporting.

Ward information (denominator data): The data collected included the total number of wards surveyed, total number of beds (occupied and empty), total number of admitted patients, and total number of patients on invasive devices.

Patient selection: The survey included inpatients on active antimicrobial prescriptions who had been admitted to each ward for at least 24 hours before the survey and were still present by 8:00 am on the day of the PPS. Additionally, patients with invasive devices such as vascular and urinary catheters, endotracheal intubation, tubes, and drains were included.

Patient information (numerator data): This included HAI, defined as infection following admission and/or intervention during hospital stay with infection symptoms developing48 hours after admission to the hospital; post-operative surgical site infection within 30 days of surgery OR 90 days after implant surgery; C. difficile-associated diarrhea (CDAD) > 48 hours post-admission or <30 days after discharge from previous admission; underlying co-morbidities; McCabe score;

microbiology result; previous antibiotic use <1-month; previous hospitalization <3 months; and presence of invasive devices such as vascular and urinary catheters, endotracheal intubation, tubes and drains.

Data analysis:

The data were entered into the Global-PPS web-based tool for validation and analysis.

Results were downloaded and presented as frequencies and percentages. The HAI rate (in %) according to the Global -PPS protocol was calculated as the number of patients with HAI divided by the number of admitted patients, multiplied by 100.

Results

A total of 257 patients were included in the study; 197 (76.7%) were adults, 52 (20.2%) and 8 (3.1%) were children and neonates respectively. Nineteen (7.4%) patients had healthcare-associated infections. In the adult wards, HAI prevalence was 8.6% (4.1% in the medical wards, 11.8% in the surgical wards and 50.0% in the intensive care units).

In the Child and Neonatal wards, HAI prevalence was 3.3% (n=2/60 patients) (Table 1).

Table 1: Point prevalence of healthcare-associated infections (HAI) in LUTH, Lagos, Nigeria

Wards/ICU	Number of patients on admission	Number of patients with HAI	HAI rate (%)	Intervention related	Surgical Site Infections	others
Children and neonatal	60	2	3.3	1.7	1.7	0
Adult						
Adult ICU	8	4	50.0	37.5	0	12.5
Adult medical ward	121	5	4.1	2.5	0	1.6
Adult surgical ward	68	8	11.8	1.5	4.4	5.9
Total adult ward	197	17	8.6	3.6	1.5	3.5
All wards surveyed	257	19	7.4	3.1	1.6	2.7

Intervention-related infections were the most prevalent HAI, accounting for 3.1% of cases. These device-associated HAIs included mixed-origin central venous catheter bloodstream infections (CVC-BSI), ventilator-associated pneumonia (VAP), and catheter-associated urinary tract infections (CAUTI). Postoperative surgical site infections followed, with a prevalence of 1.6%. The prevalence of other HAIs (HAI from another hospital and HAI from LTCF or nursing home) was 1.2%

In the adult ICU ward, intervention-related infections were the major contributor with ventilator-associated pneumonia (25.0%) being the leading HAI, followed by bloodstream infections (12.5%) (Fig 1). In the adult surgical ward, post-operative surgical site infections were the major contributor, followed by CAUTI (1.5%). Intervention-related infections were the HAIs in the Child and Neonatal wards,

Table 2: Point prevalence of different types of healthcare associated infections (HAI) in various wards and ICU in LUTH, Lagos, Nigeria

	Hospital wide	Children and neonatal	Adult ICU	Adult medical wardsl	Adult surgical wardsl	Total Adult wards
Intervention−related infections (%)						
Mixed origin	0.8	1.7	0.0	0.8	0.0	0.5
CVC−BSI	0.8	0.0	12.5	0.8	0.0	1.0
PVC−BSI	0	0.0	0.0	0.0	0.0	0.0
Ventilator−Associated Pneumonia (VAP)	0.8	0.0	25.0	0.0	0.0	1.0
CAUTI	0.8	0.0	0.0	0.0	1.5	1.0
Other Hospital−Associated Infections (%)						
HAI of mixed or undefined origin	0.4	0.0	0.0	0.0	1.5	0.5
Blood Stream Infection (BSI)	0.8	0.0	12.5	0.0	1.5	1.0
Hospital−Acquired Pneumonia (not VAP)	0.0	0.0	0.0	0.0	0.0	0.0
Urinary Tract Infection (UTI)	0.0	0.0	0.0	0.0	0.0	0.0

Discussion

The findings from this study at the Lagos University Teaching Hospital (LUTH), Nigeria, reveal a healthcare-associated infection (HAI) point prevalence rate of 7.4%. This rate is comparable to WHO average rate for developed countries estimated at 7.0% and lower than the rate for developing countries of 10.0%[10]. It is also lower than the estimated rate for West Africa (9.5%) and other developing countries like Indonesia (17.9%)[1,9]. Studies in other Nigerian tertiary institutions using the same methodology as ours have reported higher values 10.0% in River State University Teaching Hospital and 14.3% in three acute care hospitals in northern Nigeria[11,12]. Although the prevalence of HAI from our study seems to be lower than those of other centres in

Nigeria and other lower- middle- income countries, there is still need for enhanced infection prevention and control measures within the institution. The data highlights significant variations in HAI prevalence across different wards, patient demographics, and infection types, offering critical insights into factors driving HAIs and potential areas for intervention.

In adult wards, the prevalence of HAIs is notably higher at 8.6%, with the highest rates observed in the intensive care unit (ICU) at 50.0%. This aligns with existing literature suggesting that ICUs are hotspots for HAIs due to the frequent use of invasive medical devices such as ventilators and central lines, as well as the critical condition of patients[7,8,9]. Ventilator-associated pneumonia and bloodstream infections were identified as the leading contributors to HAIs in the ICU, underscoring the need for targeted interventions like strict ventilator care bundles and improved aseptic techniques during device insertion and maintenance.

In surgical wards, postoperative surgical site infections were the major contributors to HAIs, followed by catheter-associated urinary tract infections (CAUTIs). These findings point to the importance of enhancing perioperative care protocols, including proper sterilization practices and timely removal of catheters, to reduce infection rates in surgical settings. In contrast, the child and neonatal wards showed a lower HAI prevalence of 3.3%, with intervention-related infections from mixed origins being the primary concern. While this lower prevalence is encouraging, it highlights the need for consistent monitoring and tailored infection prevention strategies for pediatric populations, taking into account, their unique vulnerabilities, such as immature immune systems.

The study also identifies intervention-related infections (3.1%) as the most prevalent HAI type across LUTH, followed by postoperative surgical site infections (1.6%). This pattern reinforces the importance of adhering to evidence-based practices in the use of medical interventions and postoperative care4. Notably, Clostridioides difficile-associated diarrhea (CDAD) was not observed; this may be because the hospital microbiology laboratory does not routinely perform anaerobic culture for C. difficile even so, no healthcare- associated diarrhea was noted in this survey. The reason for this needs to be further investigated.

Limitations of this study and recommendation

This is a point prevalence survey that relies on documentation in the case notes of eligible patient at the time of survey and it is affected by incomplete or missing data. Only patients on antibiotics are surveyed; therefore, the results obtained exclude HAIs not treated with antibiotics. Point prevalence survey does not determine incidence, monitor trends and cannot be used to establish causal relationships with associated risk factors;

Overall, these findings identify the areas that can be targeted by the infection prevention and control interventions to reduce the prevalence of HAIs and improve patient safety in LUTH. Although useful data have been derived from this study, we recommend that measures be put in place for the facility to carry out active surveillance of HAIs, which is more useful in monitoring trends, infection control and quality improvement.

Conclusion

The point prevalence of HAI in LUTH Lagos, Nigeria is 7.4%. Although this is lower than other tertiary institutions, there is still a need for infection prevention and control measures for HAIs in our facility. Bloodstream infections were the most common HAIs and the ICU had the highest prevalence

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