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Concise Communication

Burden of healthcare-associated infections at six tertiary-care hospitals in Saudi Arabia: A point prevalence survey

Majid M. Alshamrani MD[1,2], Aiman El-Saed MD, PhD[1,2,3], Asim Alsaedi MD[4], Ayman El Gammal MD[5], Wafa Al Nasser MD[6], Syed Nazeer MD[7] and Hanan H. Balkhy MD[1,2,8]

[1]Infection Prevention and Control Department, King Abdulaziz Medical City (KAMC), Ministry of National Guard Health Affairs (MNGHA), Riyadh, Saudi Arabia, [2]King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia, [3]Community Medicine Department, Mansoura University, Mansoura, Egypt, [4]Infection Prevention and Control Department, KAMC, MNGHA, Jeddah, Saudi Arabia, [5]Infection Prevention and Control Department, King Abdulaziz Hospital, MNGHA, Al Hassa, Saudi Arabia, [6]Infection Prevention and Control Department, Imam Abdulrahman bin Faisal Hospital, MNGHA, Dammam, Saudi Arabia, [7]Infection Prevention and Control Department, Prince Mohammed Bin Abdul Aziz Hospital, MNGHA, Al Madinah, Saudi Arabia and [8]King Abdullah International Medical Research Center, Riyadh, Saudi Arabia

ABSTRACT

A point prevalence survey was conducted on May 11, 2017, among inpatients at 6 hospitals in Saudi Arabia. The overall point prevalence was 6.8% (114 of 1,666). The most common types of infections were pneumonia (27.2%), urinary tract infections (20.2%), and bloodstream infections (10.5%). Approximately 19.2% of healthcare-associated infections were device associated.

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Comprehensive surveillance of healthcare-associated infections (HAIs) is usually neither feasible nor sustainable using current resources. Therefore, point prevalence surveys (PPSs) have been suggested as a feasible and effective tool to estimate the burden of HAIs, including both traditionally and nontraditionally surveyed types of HAIs.[1] The overall burden of HAIs using a PPS has been estimated to be between 4.0% and 11.6% in a number of multihospital or multinational studies that have been conducted in developed countries.[2–5] Similar data from developing countries are limited, with a wider range of HAI prevalence between 3.7% and 14.9%.[6–8] Only a few PPS studies have reported the patient and hospital risk factors associated with infections.[6]

For more than 10 years, several hospitals in the Gulf region have been following the US National Healthcare Safety Network (NHSN) patient safety surveillance modules, including hospitals of the Ministry of National Guard Health Affairs (MNGHA). However, data on the overall burden of HAIs are largely missing, both locally and regionally. The only PPS study in Saudi Arabia was conducted in 2003 in a single MNGHA hospital and focused only on device-associated HAIs and surgical site infections (SSIs).[8] The objectives of the current study were to estimate the burden of all types of HAIs at 6 MNGHA hospitals and to identify associated pathogens and risk factors.

Author for correspondence: Majid M. Alshamrani, Emails: Dr_shomrani@yahoo.com (preferred) or Alshamranima2@ngha.med.sa

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Methods

This study was conducted at 6 MNGHA hospitals located in 5 cities in Saudi Arabia. The MNGHA hospitals are governmentally funded tertiary-care hospitals that provide services for >1.5 million Saudi National Guard soldiers, employees, and their families. The total bed capacity exceeds 2,345 beds. The study included all inpatients of all ages on the day of the PPS (May 11, 2017). The study included critical care units (ICUs), wards, and the emergency department (only patients admitted for >1 day).

The records of all inpatients on the day of the PPS were reviewed by 28 infection-control professionals for the possibility of active HAIs. All the infection-control professionals were working on routine HAI surveillance for a minimum of 2 years and attended a 1-day workshop on PPS methodology. In the workshop, an infectious disease consultant and an expert epidemiologist discussed case scenarios and responded to all concerns. The study was approved by the ethics committee of King Abdullah International Medical Research Center.

The PPS outcome included active infections that met the NHSN definitions for HAIs that occurred ≥2 days from the admission date.[9] Active HAIs were defined as the presence of infection symptoms or signs on the day of the survey or the use of antimicrobial therapy for HAIs treatment on the day of the survey, provided that the onset of the HAIs were within the previous 7 days. Infections with onset <2 days from the admission date were excluded except in the following situations: surgical site infections (SSIs), readmission within 2 days from discharge, and transfer from another hospital. "Other infections," such as febrile neutropenia and clinical sepsis that did not meet any NHSN diagnostic criteria were included according to the HAI definitions of European Centre for Disease Prevention and Control (ECDC).[2]

Table 1. Prevalence of Healthcare-Associated Infections by Demographic Characteristics Among Inpatients on May 11, 2017, in 6 MNGHA Hospitals

	Overall		HAI		No HAI		*P*
	No.	%	No.	%	No.	%	Value
Overall	1,666	100	114	6.8	1,552	93.2	
Gender							
Male	830	50	68	8.2	762	91.8	.030
Female	836	50	46	5.5	790	94.5	
Age groups, y							
<65	1,206	72	74	6.1	1,132	93.9	.064
≥65	460	28	40	8.7	420	91.3	
<1	231	14	13	5.6	218	94.4	.233
1–15	223	13	18	8.1	205	91.9	
16–45	429	26	22	5.1	407	94.9	
46–64	323	19	21	6.5	302	93.5	
Unit							
ICU	207	12	28	13.5	179	86.5	<.001
Non-ICU	1,459	88	86	5.9	1,373	94.1	
Ward, SCA	232	14	18	7.8	214	92.2	
Ward, all others	1,182	71	67	5.7	1,115	94.3	
Emergency (>1 d)	45	3	1	2.2	44	97.8	

Note. ICU, intensive care unit; SCA, specialty care areas included oncology, hematology, and organ transplant wards.

All possible HAI events identified by infection control professionals were centrally reviewed and confirmed by an infectious disease consultant and an expert epidemiologist, with high concordance rate (94.7%; $\kappa = 0.71$). Differences in the prevalence of HAIs in different groups were examined using a $\chi 2$ test or the Fisher exact test as appropriate. All *P* values were 2-tailed. A $P < .05$ was considered significant. SPSS version 23.0 software (IBM, Armonk, NY) was used for all statistical analyses.

Results

Of 1,666 patient records reviewed, 114 HAI events were identified among 109 patients. As shown in Table 1, the overall point prevalence rate was 6.8%. This rate was significantly higher among males than females (8.2% vs 5.5%; $P = .030$) and tended to be slightly higher among older patients (8.7% in those ≥ 65 years old vs 6.1% in those < 65 years old; $P = .064$). Although most HAI events were identified outside ICUs (75.4%), the point-prevalence rate was significantly higher in ICUs (13.5%; $P < .001$) than in specialty care wards (7.8%) and other types of wards (5.7%). The most common types of HAI were pneumonia (27.2%), urinary tract infection (20.2%), bloodstream infection (10.5%), gastrointestinal infection (9.6%), skin and soft tissue infection (9.6%), and SSI (7.9%) (Figure 1).

Approximately one-fifth (19.2%) of HAI events were device associated; among them, 22.6% were pneumonia, 43.5% were urinary tract infections, and 41.7% were bloodstream infections. The most commonly reported potential risk factors were prolonged hospital stay of >2 weeks (52.6%), ICU admission during current hospitalization (33.3%), surgery within the previous month

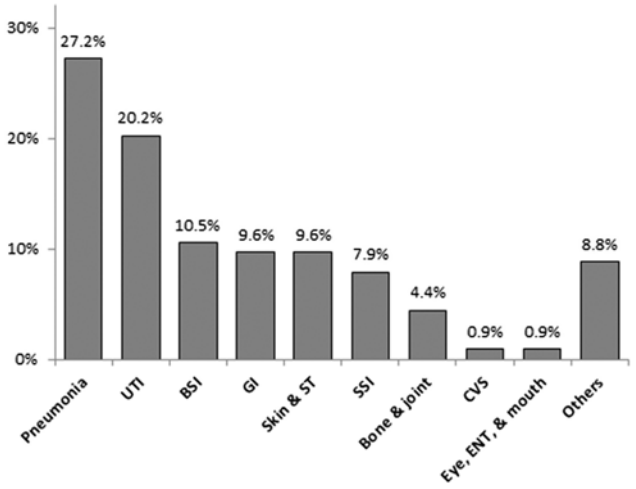

Fig. 1. Distribution of the types of healthcare-associated infections detected among inpatients on May 11, 2017, in 6 MNGHA hospitals. Note. UTI, urinary tract infection; BSI, bloodstream infection; GI, gastrointestinal system infection, ST, soft tissue; SSI, surgical site infection; CVS, cardiovascular system infection; ENT, ear, nose, and throat infection.

(28.1%), receiving enteral feeding (27.2%), and total parenteral nutrition (21.1%). The most common associated pathogens were *Pseudomonas* spp (18.9%), *Klebsiella* spp (18.9%), *Escherichia coli* (13.2%), *Staphylococcus aureus* (6.6%), and *Acinetobacter* spp (6.6%). Approximately 14.9% (17 of 114) of HAI events were diagnosed without culture.

Discussion

We observed a 6.8% prevalence of HAIs at 6 tertiary-care hospitals in Saudi Arabia. The burden of HAIs in MNGHA hospitals is generally comparable to those reported by large multicenter PPS studies done in European countries (6.0%),[2] the United States (4.0%),[3] Canada (11.6%),[4] Japan (7.7%),[5] Vietnam (7.8%),[7] and China (3.7%).[6] Nevertheless, these comparisons should be done very cautiously because multiple factors can markedly change the estimated burden. These factors include the use of different HAI definitions, inclusion of all versus random sample of eligible patients, inclusion of all ages versus exclusion of neonatal or pediatric patients, and the lack of a validation process for the diagnosed events.

In the current study, pneumonia was the most frequently diagnosed HAI, representing 27% of all HAIs. This rate was similar to the majority of previous reports, which ranked pneumonia as either the first[3,5–7] or second[2,4] most frequent HAI, with percentages ranging from 16%[5] to 47%.[6] On the other hand, the frequency of SSI in the current study (7.9%) was clearly less than those of previous reports, which reported rates similar or second to that of pneumonia (17%–27%).[2,3,5,7] However, our patients received SSI treatment at the outpatient or emergency departments (not an included location in this study) and some patients did not return to the same MNGHA hospital where surgery was done, which could explain this difference. Underreporting of HAIs cannot be excluded in this study, especially with SSIs. Additionally, infection control professionals collected data from their own hospitals. However, underreporting is a chronic problem inherited in the PPS design and can only be minimized by training data collectors and validating diagnoses.[10]

In conclusion, we report an HAI burden that is generally comparable to that in European and US hospitals but with some

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differences in infection type. Surveillance focusing on device-associated HAIs, especially in the ICU, are probably missing a significant proportion of the HAI burden in tertiary-care settings. This study could serve as a baseline for future PPS studies. Periodically repeating PPS studies may help identify priorities, may help in setting and/or evaluating targets for interventions, and can raise awareness in the healthcare community.

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