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Surgical Site Infection Rates in Five Middle Eastern Countries: International Nosocomial Infection Control Consortium Findings

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ABSTRACT

Objectives: This study of surgical site infection (SSI) rates covers 29 International Nosocomial Infection Control Consortium (INICC) member hospitals in 22 cities across the Middle East, including Bahrain, Egypt, Kuwait, Lebanon, and Saudi Arabia. ***Methods***: Prospective cohort multinational surveillance data were collected through the INICC Surveillance Online System. Centers for Disease Control and Prevention/National Healthcare Safety Network (CDC/NHSN) definitions were applied for SSI. Surgical procedures (SPs) were categorized into 12 types according to the International Classification of Diseases, ninth revision (ICD-9) criteria, 9th edition. ***Results:*** From 2014 to 2023, we collected data on 304 SSIs associated with 21 322 SPs. Among the 12 observed types of SPs, comparable incidences were noted between the INICC hospitals of the Middle East and CDC/NHSN datasets across six types of SPs: breast, 1.1% vs. 0.9% ($p = 0.870$); cholecystectomy, 0.1% vs. 0.2% ($p = 0.360$); craniotomy, 3.0% vs. 2.1% ($p = 0.510$); herniorrhaphy, 0.8% vs. 0.7% ($p = 0.770$); abdominal hysterectomy, 1.2% vs. 1.1% ($p = 0.880$); and laminectomy, 1.6% vs. 0.7% ($p = 0.100$), respectively. INICC hospitals of the Middle East exhibited a significantly lower cesarean section rate compared to CDC/NHSN rates: 1.04% compared to 1.5% (relative ratio (RR) = 0.71, 95% CI: 0.58–0.87; $p = 0.001$). However, the following four types of SPs showed SSI rates significantly higher than those of CDC/NHSN: Appendix surgery, 1.8% vs. 1.1% (RR = 1.55, 95% CI: 1.02–2.36; $p = 0.041$); coronary artery bypass, 4.5% vs.1.4% (RR = 3.32, 95% CI: 1.82–6.08; $p < 0.001$); open reduction of fracture, 2.5% vs. 1.1% (RR = 2.24, 95% CI: 1.50–3.36; $p < 0.001$); and exploratory abdominal surgery, 3.8% vs. 1.7% (RR=2.30, 95% CI: 1.56–3.39, $p < 0.001$). ***Conclusions:*** Most SSI rates in this set of hospitals in the Middle East are similar to those of CDC/NHSN. It is recommended to focus on implementing effective interventions to reduce SSI rates for procedures with higher rates.

The US Centers for Disease Control and Prevention (CDC) have consistently tracked surgical site infection (SSI) rates using standardized criteria and methods for over five decades.[1] Established in 2002, the International Nosocomial Infection Control Consortium (INICC) has emerged as a leading and expansive network of researchers committed to investigating healthcare-associated infections (HAIs). Focusing primarily on monitoring and preventing HAIs, INICC endeavors to promote optimal practices to diminish the occurrence of these infections and mitigate their associated burdens. Through these endeavors, INICC aims to reduce mortality rates, minimize incurred expenses, shorten the average length of hospital stays (LOSs), and combat antimicrobial resistance (AMR).[2]

INICC employs the INICC Surveillance Online System (ISOS), a robust online platform crafted to enhance surveillance following established CDC/National Healthcare Safety Network (CDC/NHSN) criteria and methodology. ISOS empowers

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healthcare professionals to input and upload extensive data encompassing all patients, regardless of SSI status.[2] Adhering to these standards, INICC ensures reliable, accurate, and widely applicable analyses of SSIs in hospitals across the Middle East, Latin America, Asia, and Eastern Europe, with a particular emphasis on, though not limited to, low- and middle-income countries (LMICs).[3,4]

SSIs stand as the foremost postoperative complication globally, exerting a disproportionate effect on patients in LMICs.[5] Past reports from INICC have supported these observations, as highlighted in a global report published in 2013.[6]

HAIs rank as the fifth most frequent cause of mortality in acute-care hospitals in the USA.[7] In the USA, four main categories of HAIs dominate, comprising roughly three-quarters of all HAIs in acute-care hospitals: catheter-associated urinary tract infections, central-line-associated bloodstream infections, ventilator-associated pneumonia, and SSIs. The average hospital cost per SSI is approximately USD 25 500.[8]

We sought to compile information concerning SSIs in the Middle East from 1 January 2014 to 31 December 2023 and provide a thorough analysis of SSI occurrence, including the identified patterns of microorganism profiles and AMR. To accomplish this goal, we meticulously gathered data from a diverse selection of hospitals across Middle Eastern nations, enabling us to generate accurate estimates of SSI incidence within the examined population.

Our goal was to aid healthcare facilities in enhancing the quality of care by supplying risk-adjusted metrics applicable to local quality-improvement initiatives and facilitating comparative studies between institutions. Additionally, we strive to foster the development and dissemination of effective surveillance and analysis methodologies through collaboration with participating institutions. For these endeavors, we aimed to bolster safety protocols, benefiting both patients and healthcare providers while promoting the adoption of suitable interventions to address safety concerns. Furthermore, INICC advocates for collaborative research initiatives with participating healthcare institutions.

This study aimed to elucidate the epidemiology of SSIs and associated pathogens in the Middle East by documenting the pursuit of these concurrent objectives. In addition, we sought to analyze and compare the SSI rates in five Middle Eastern countries as documented by the INICC with the rates reported by the USA CDC/NHSN.

METHODS

The CDC/NHSN surveillance system employs standardized criteria and methods for tracking HAIs. Key elements include (1) definitions and criteria: clear definitions for different types of infections, including SSIs, ensure consistent data collection and reporting; (2) data collection: systematic data gathering from participating hospitals on infection rates, patient demographics, procedures, and outcomes; (3) methodology: surveillance involves regular monitoring and reporting of infection data, often conducted by trained infection prevention professionals (IPPs). This includes real-time data entry, and daily patient visits to ensure accurate tracking of infection occurrences; (4) comparative analysis: data is compared across different hospitals and regions to identify trends, risk factors, and areas needing improvement, aiding in developing targeted infection control strategies.

These criteria and methods enable reliable, comparable, and actionable data for improving patient safety and healthcare quality. The CDC/NHSN report is voluntary. Hospitals and healthcare facilities choose to participate in the NHSN to monitor and report HAIs. However, participation in NHSN can be highly encouraged or required by specific state health departments and accreditation organizations or to meet healthcare quality and reimbursement criteria set by entities like the Centers for Medicare and Medicaid Services.

In addition to the CDC/NHSN, the INICC report is also voluntary. INICC functions as a global network of IPPs who collaborate to mitigate the public health impact of SSIs. This includes efforts to decrease associated mortality rates, additional costs, LOS, and instances of AMR. To achieve these goals, INICC endeavors to standardize surveillance methods and relevant definitions, develop and implement infection control investigations to assess clinical and cost-effectiveness, partner with local entities to establish and enforce prevention guidelines, exchange data to facilitate scientific inquiries, disseminate evidence-based literature, and enhance the research capabilities of healthcare workers.[2]

INICC commenced international outreach and investigations in 2002. In 2007, the INICC foundation was established and operated in Argentina until 2020, when it ceased operations. It then underwent restructuring as a non-profit foundation headquartered in the USA. The foundation provides support and funding to INICC, including essential personnel such as epidemiologists, statisticians, medical writers, administrative staff, and others. Additionally, it funds activities such as software development and maintenance, as well as data entry and management.[2]

We chose a 10-year timeframe for our report to align with the reporting periods of previous studies published by the CDC/NHSN and CDC/National Nosocomial Infections Surveillance System. These studies, conducted from 1996 to 2009, had varying durations ranging from 3–12 years. Selecting this timeframe adheres to standard reporting practices and provides the benefit of a larger sample size. This increases the accuracy of our report and reduces the impact of year-to-year fluctuations.

For data collection, INICC conducts surveillance of SSI utilizing the ISOS, an online surveillance platform meticulously crafted and operated to align with CDC/NHSN definitions, criteria, and methodologies.[3,4] The ISOS enables the comprehensive and specific input and uploading of data for all patients throughout their hospitalization journey, from admission to discharge. Within the system, IPPs visit each patient daily, regardless of their SSI status, and directly record data at the patient's bedside using a tablet in real-time. This data is then uploaded and consolidated into the ISOS database. IPPs create a daily list of patients undergoing surgical procedures (SPs) and designate them for follow-up. Patients are monitored for 30 days post-surgery to detect any SSIs promptly, and for 12 months for those with prostheses. The collected data encompasses various parameters, including country and city, facility ownership, patient age, date of admission, type of ward, LOS, description of SPs, SSI incidence, microorganism profiles, AMR patterns, discharge date, and all-cause mortality rate throughout the hospitalization period.[2] The SSI rate was determined by dividing the number of SSIs by the number of SPs assigned and then multiplying the result by 100 to express it as a percentage.

The gathered data was categorized into 12 specific SPs to facilitate analysis based on the criteria outlined in the ninth edition of the International Classification of Diseases – ninth revision (ICD-9).[9] IPPs conducted a comprehensive review of reports for every patient undergoing SPs, meticulously documenting each procedure performed and assigning the corresponding ICD-9 codes to each case. These codes were then verified through collaborative review with the surgeon who performed the SP. Each of the 12 analyzed procedures was designated with the appropriate ICD-9 codes as follows: abdominal hysterectomy (HYST), appendix surgery (APPY), breast surgery (BRST), cesarean section (CSEC), coronary artery bypass (CBGB), craniotomy (CRAN), exploratory abdominal surgery (XLAP), gallbladder surgery (CHOL), herniorrhaphy (HER), intramedullary nail fixation, laminectomy (LAM), and open reduction of fracture (FX).[3,9]

This report lacked external funding, so financial constraints limited our capacity to collect data on various aspects. Specifically, we were unable to gather information on the duration of SPs, the level of contamination involved, and individual patients' severity of illness scores according to the American Society of Anesthesiologists guidelines.[10] Due to this constraint, categorizing the data by risk index category was not feasible. As a result, SSI rates were aggregated and analyzed based on the type of SPs. The combined SSI rates from participating INICC hospitals were compared to those published by the CDC/NHSN.[1]

The ISOS platform was employed to gather SSI data in participating hospitals, aligning with the most recent definitions, criteria, and methodologies for SSI surveillance disseminated by the CDC/NHSN. The definition of SSI adopted was consistent with that outlined in the CDC/NHSN surveillance criteria published in 2008. Participant institutions were communicated the surveillance definitions, and as updates were made to the CDC/NHSN definitions, the revised criteria were promptly shared with and implemented by our IPPs.[3,4]

Every participating hospital was required to have a microbiology laboratory to qualify for inclusion. This was crucial for facilitating the identification of microorganism profiles and AMR. Before uploading data to ISOS, IPPs screened them for any contaminated cultures. Subsequently, positive cultures were closely monitored, and associated data were uploaded to ISOS for the patient's hospital stay. SSI rates were calculated only after bedside data collection and relevant microorganism profiles were identified. Furthermore, this data enabled the analysis of observed patterns of AMR throughout the study period.[2–4]

The study covered 29 hospitals in 22 cities across five Middle Eastern countries: Bahrain, Egypt, Kuwait, Lebanon, and Saudi Arabia. The majority of these hospitals, 23 (79.3%), were publicly owned. Additionally, there were three (10.3%) privately owned for-profit facilities, with the remaining three (10.3%) classified as teaching hospitals.

Data analysis was conducted at INICC headquarters, situated at the University of Miami, USA, by two PhD biostatisticians. The study data were aggregated by type of SP, and analysis was performed using R software version 4.2. CIs at a 95% level and *p*-values were computed for both primary and secondary outcomes. The data were not stratified by hospital size or type. Confidentiality of patients' and hospitals' identities was rigorously maintained throughout the study. Approval for this study was obtained from the Institutional Review Boards of the participating institutions.

RESULTS

A total of 21 322 SPs were identified during the 10 years, with 304 associated SSIs. The mean ± SD age of patients undergoing SPs was 42.0 ± 18.2 years. Participating hospitals contributed to the study for an average duration of 15.1 months, with a SD of 11.1. The length of participation varied from 2.1 to 43.8 months across the hospitals.

Table 1 presents data regarding the incidence of SSI at INICC hospitals across the Middle East, categorized by the type of SP. This data includes the number of hospitals conducting each SP, procedures performed, identified SSIs, calculated SSI rate, and the corresponding 95% CIs. The SPs associated with the highest SSI rates were CBGB, CRAN, FX, intramedullary nail fixation, and others.

Among the 12 types of observed SPs, comparable incidences were noted between the INICC hospitals across the Middle East and CDC/NHSN datasets across six types of SPs: BRST, CHOL, CRAN, HER, HYST, and LAM [Table 2]. Concerning CSEC, INICC hospitals across the Middle East exhibited significantly lower rates than CDC/NHSN. However, the following four types of SPs showed SSI rates considerably higher than those of CDC/NHSN: APPY, CBGC, FX, and XLAP [Table 2]. Finally, data for intramedullary nail fixation were absent in the CDC/NHSN reference data, precluding comparison.

The detection of pathogens resulted in a total of 122 microorganisms, with the distribution of each isolate as outlined below: *Escherichia coli* (32.8%), *Klebsiella* spp. (30.0%), *Staphylococcus aureus* (13.9%), *Acinetobacter baumannii* (10.7%), *Pseudomonas aeruginosa* (11.5%), *Enterobacter* spp. (4.92%), Coagulase-negative *Staphylococci* (2.5%), and *Enterococcus* spp. (0.8%). To estimate AMR and compare it with the UAE and CDC/NHSN data, calculations were conducted explicitly for microorganisms with > 13 samples. AMR data are presented in Table 3, while Table 4 compares AMR between INICC hospitals, the UAE National AMR report,[11] and CDC/NHSN hospitals.[12]

Table 1: Surgical site infections (SSIs) of the participating International Nosocomial Infection Control Consortium hospitals, 2014–2023.

Operative procedure description	Procedure code	Hospitals n	SSI n	Procedures n	SSI rate %	95% CI
Abdominal hysterectomy	HYST	7	2	164	1.2	0.15–4.41
Appendix surgery	APPY	15	33	1850	1.8	1.23–2.51
Breast surgery	BRST	2	2	187	1.1	0.13–3.86
Cesarean section	CSEC	15	134	12 834	1.0	0.88–1.24
Coronary artery bypass	CBGB	3	11	242	4.5	2.27–8.13
Craniotomy	CRAN	9	4	134	3.0	0.81–7.64
Exploratory abdominal surgery	XLAP	15	43	1120	3.8	2.78–5.17
Gallbladder surgery	CHOL	11	1	1120	0.1	0.002–0.50
Herniorrhaphy	HER	15	9	1091	0.8	0.38–1.57
Intramedullary nail fixation	-	9	6	128	4.7	1.72–10.20
Laminectomy	LAM	4	4	245	1.6	0.45–4.18
Open reduction of fracture	FX	17	55	2207	2.5	1.88–3.24

Table 2: Comparison of Surgical Site Infection (SSI) rates, in the hospitals of the International Nosocomial Infection Control Consortium (INICC) and the USA National Healthcare Safety Network.

Operative procedure description	Procedure code	INICC-2014–2023-SSI rate, %	CDC/NHSN-2006–2008-SSI rate, %	RR	95% CI	*p*-value
Appendix surgery	APPY	1.8	1.1	1.55	1.02–2.36	0.041
Breast surgery	BRST	1.1	0.9	1.13	0.26–4.93	0.870
Coronary artery bypass graft	CBGC	4.5	1.4	3.32	1.82–6.08	< 0.001
Gallbladder surgery	CHOL	0.1	0.2	0.39	0.05–2.92	0.360
Craniotomy	CRAN	3.0	2.1	1.39	0.52–3.68	0.510
Cesarean section	CSEC	1.0	1.5	0.71	0.58–0.87	0.001
Open reduction of fracture	FX	2.5	1.1	2.24	1.50–3.36	< 0.001
Herniorrhaphy	HER	0.8	0.7	1.12	0.51–2.44	0.770
Abdominal hysterectomy	HYST	1.2	1.1	1.11	0.28–4.43	0.880
Laminectomy	LAM	1.6	0.7	2.28	0.85-6.11	0.100
Exploratory abdominal surgery	XLAP	3.8	1.7	2.30	1.56-3.39	< 0. 001

CDC: Centers for Diseases Control and Prevention; NHSN: National Healthcare Safety Network; RR: relative risk.

Table 3: Percentage of pathogens reported from adult and pediatric healthcare-associated infections in intensive care units of acute-care hospitals that tested resistant to selected antimicrobial agents, 2014–2023.

Bacteria	No. of tested	Resistance, %											
		PIPTAZ	IPM	CST	CRO	CAZ	FEP	CIP	AMK	GEN	AMS	OX	VAN
Acinetobacter baumannii	13	15.4	15.4	0.0	7.7	7.7	0.0	15.4	7.	0.0	15.4	-	-
Escherichia coli	40	12.5	2.5	0.0	30.0	20.0	42.5	25.0	0.0	25.0	12.5	-	-
Klebsiella spp.	28	21.4	7.1	0.0	39.3	28.6	42.9	14.2	7.1	25.0	17.9	-	-
Pseudomonas aeruginosa	14	7.1	7.1	0.0	21.4	14.3	0.0	7.1	7.1	7.1	28.6	-	-
Staphylococcus aureus	17	5.9	0.0	0.0	5.9	0.0	5.9	0.0	0.0	5.9	17.6	5.9	0.0
Total	122	16.4	7.4	0.0	27.1	18.9	24.6	16.4	3.3	17.2	20.5	1.6	0.0

PIPTAZ: piperacillin-tazobactam; IPM: imipenem; CST: colistin; CRO: ceftriaxone; CAZ: ceftazidime; FEP: cefepime; CIP: ciprofloxacin; AMK: amikacin; GEN: gentamicin; AMS: sulbactam ampicillin; OX: oxacillin; VAN: vancomycin.

DISCUSSION

Our analysis unveiled some procedures with similar SSI rates and others with higher rates in participating INICC institutions in Middle Eastern countries compared to the USA CDC/NHSN data. BRST, CHOL, CRAN, HER, HYST, and LAM, showed similar SSI rates when comparing INICC institutions in Middle Eastern countries to the CDC/NHSN data. On the other hand, we observed a significantly lower SSI rate associated with CSEC at INICC hospitals compared with CDC/NHSN. Finally, when comparing SSI rates linked with four specific types of SPs, including APPY, CBGC, FX, and XLAP, we observed higher SSI rates in this set of hospitals from the Middle East than in the USA.

In most procedures, the SSI rate at INICC hospitals across the Middle East was similar or even lower than that of CDC/NHSN, showed the appropriate direction for infection prevention and control strategies in the Middle East. However, it was noted that an increased incidence of SSIs in some of the INICC data compared to the CDC/NHSN data likely reflected a heightened risk for patients undergoing SPs in the Middle East.[13] Multiple underlying factors could contribute to this disparity, including inadequate adherence to infection prevention protocols, limited hospital capacity leading to overcrowding, shortages of medical supplies and resources, and a deficiency of experienced healthcare workers, leading to low nurse-to-patient ratios.[13] Moreover, there was a correlation between SSI rates and hospital ownership, encompassing publicly owned facilities, for-profit privately owned facilities, not-for-profit privately

Table 4: Benchmark INICC data vs. US CDC/NHSN data of the percentage of pathogens reported from SSIs of acute-care hospitals that tested resistant to selected antimicrobial agents.

Pathogen/ antimicrobial	Resistance, %		
	INICC 2014–2023	CDC/NHSN 2015–2017	UAE 2022
Klebsiella spp.			
Ceftriaxone	39.3	13.7	29.0
Imipenem	7.1	3.1	4.8
Escherichia coli			
Ceftriaxone	30.0	18.2	33.0
Imipenem	2.5	0.6	1.0
Pseudomonas spp.			
Ceftazidime	14.3	10.2	NA
Staphylococcus aureus			
Oxacillin	5.9	41.9	35.1

INICC: International Nosocomial Infection Control Consortium; SSI: surgical site infection; CDC/NHSN: Centers for Disease Control and Prevention/National Healthcare Safety Network surveillance system; NA: not available.

owned facilities, teaching hospitals, and the country's socioeconomic status. Additionally, previous studies have linked lower infection risks with SPs conducted in countries with higher socioeconomic status.[2,14–17]

Throughout history, benchmarks have been pivotal in furnishing researchers with standardized and comparable metrics for surveillance purposes. As such, utilizing reference data from the CDC/NHSN report on SSI rates has proven indispensable in this multinational endeavor to reduce the occurrence of SSIs.[1] In 2002, INICC initiated its international standardized prospective surveillance program for SSIs, following the criteria outlined by the CDC/National Nosocomial Infections Surveillance System. It later transitioned to adopting the USA CDC/NHSN methodology for surveillance and reporting purposes. This methodology was designed to minimize bias and enhance the reliability and comparability of the data with existing literature.[2,15–17]

The earlier report on SSIs issued by INICC in 2013 shed light on this previously unexplored inequality. The continued effort detailed in this updated report emphasizes that this challenge remains substantial and prevalent, underscoring the urgent need for intervention to address the elevated rate of SSIs and its accompanying burden.[1,6]

The AMR rates in SSIs identified by INICC in this report showed similar AMR rates compared with UAE, but higher rates compared with CDC/NHSN [Table 4]. INICC rates were found to be similar to those of UAE but exceeded of the CDC/NHSN rate across various parameters, including *P. aeruginosa* resistance to ceftazidime and imipenem, *Klebsiella* spp. resistance to ceftriaxone and imipenem, and *E. coli* resistance to cefepime, ceftriaxone, and imipenem. However, *S. aureus* displayed lower resistance in INICC hospitals compared to UAE and CDC/NHSN hospitals.[12]

AMR represents a significant threat to global public health. A study conducted in 2019 by the Universities of Oxford and Washington aimed to assess the burden of AMR. The models employed in the study revealed a rate of 57.9 per 100 000 deaths associated with bacterial AMR, with 14.4 per 100 000 deaths directly linked to bacterial AMR. The proportion of mortality attributed to AMR was steadily increasing, particularly impacting LMICs. Given the severity of this challenge, tailored interventions are essential, including implementing infection prevention and control policies, improved access to critical antibiotics, and the development of new antibiotics and vaccines. Therefore, a comprehensive understanding of the burden of AMR, focusing on primary drug-pathogen combinations, is crucial in mitigating its public health impact.[18]

To reduce the impact of SSIs in Middle Eastern nations, it is vital to continue adopting effective evidence-based interventions. These encompass strategies outlined by the CDC in 2017, offering detailed guidelines for preventing SSIs[19], and by SHEA/IDSA/APIC in 2022.[20] Substantial evidence strongly supports adopting essential practices in acute-care hospitals to reduce the risk of SSIs. These practices, among others, are outlined in the SHEA/IDSA/APIC guidelines for preventing SSIs. They include ensuring adherence to evidence-based standards and procedures for antimicrobial prophylaxis, employing a combination of parenteral and oral antimicrobial prophylaxis before elective colorectal SPs, preoperatively decolonizing surgical patients with an anti-staphylococcal agent in orthopedic and cardiothoracic surgeries, using both antiseptic and alcohol-containing skin preparatory agents in combination, maintaining normothermia unless hypothermia is specifically required, employing impervious plastic wound protectors in gastrointestinal and biliary tract surgeries, controlling blood glucose levels throughout the immediate postoperative period, and implementing checklists or bundles to ensure adherence to best practices.[20] We strongly advocate for the adoption and systematic monitoring of these practices as crucial steps toward reducing the incidence and mitigating the burden of SSIs in countries across the Middle East.

There are several limitations to our study. Firstly, over more than two decades, INICC has incorporated new hospitals into its network, many needing more prior experience in SSI surveillance and prevention. Consequently, these newly joined hospitals, including those that became members during the study period, tend to display higher rates of SSI and AMR. Secondly, it must be acknowledged that this study may not fully represent all hospitals in any specific country or the broader Middle Eastern region. Participation in the study was voluntary, and institutions did not receive compensation or funding. Therefore, there may be a bias toward attracting well-equipped hospitals experienced in HAI surveillance and infection prevention programs. This potential bias could lead to underestimating SSI and AMR rates compared to actual figures.

Thirdly, we could not stratify SPs by risk index severity due to budget constraints, thereby preventing the measurement of SP duration and the American Society of Anesthesiologists score. Fourthly, we needed a sufficient sample size of microorganisms to evaluate the AMR patterns of several microorganisms, limiting our ability to analyze the AMR of certain organisms.

Fifthly, we conducted post-discharge surveillance on patients who revisited the same hospital where the procedure was performed and categorized them as SSIs. However, there was a possibility that some patients sought care at another institution, and we did not include them as SSIs. This loss of post-discharge surveillance is a common issue in the HAI.[21] Lastly, since AMR was independently assessed at participating hospitals, discrepancies in institutional resources and the quality of microbiology laboratories may have led to inconsistencies in data quality.

CONCLUSION

The incidence of SSIs and AMR of some types of SPs in Middle Eastern hospitals surpassed the numbers reported by the CDC/NHSN. This discrepancy highlights the need to establish robust prevention measures to mitigate this problem significantly. SSIs and AMR were not only prolong hospital stays and increase expenses but also elevate mortality rates, underscoring the urgent imperative to address this challenge effectively.

Disclosure
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