

Post-operative Surgical Site Infection Rates in a Public Hospital in Al-Kharj

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Abstract

Introduction: Surgical site infections (SSIs) are the most prevalent healthcare-associated infections that increase mortality and morbidity rates. **Aim:** The present study was a retrospective study that aimed to determine the post-operative SSI rate in a public hospital in Al-Kharj. **Materials and Methods:** The data were collected by the microbiology laboratory in the hospital and included the number of infections caused by Gram-positive and Gram-negative bacteria and the number of SSIs in the hospital. **Results:** Most of the infections in the present study were caused by Gram-negative organisms (83.00%). The most common bacteria were *Pseudomonas aeruginosa* (19.87%) followed by *Escherichia coli* (16.34%) and *Klebsiella pneumoniae* (13.13%). The SSI rate in the hospital was 2.32% (=21/906*100%). Most of the SSIs were caused by Gram-negative bacteria (80.95%). Most of the SSIs were caused by *Staphylococcus aureus* (19.04%), *P. aeruginosa* (14.29%), *Proteus mirabilis* (14.29%), *Acinetobacter* (14.29%), and *Citrobacter* (14.29%). **Conclusion:** The SSIs rate in Al-Kharj city is low but adopting protocols for surveillance and implementing guidelines are still needed to minimize the SSIs rate.

Key words: Healthcare-associated infections, post-operative infection, surgical site infection

INTRODUCTION

Healthcare-associated infections (HAIs) include catheter-associated urinary tract infections, central line-associated bloodstream infections, ventilator-associated pneumonia, and surgical site infections (SSIs).^[1] Results from recent studies reported that SSIs are the most prevalent HAIs.^[2-5]

SSI is a type of HAI that arises after surgery and related to the surgical site.^[6] At present, SSI is defined as an infection that happens within 1 year of operation if an implant is left in place or within 30 days of the operation if no implant is left in place.^[7] This infection may result in prolonged hospital stay, increased mortality and morbidity, increased health-care costs, and increased hospital readmissions even reoperation.^[8,9] Berríos-Torres *et al.* reported that SSIs are associated with higher rates of patient dissatisfaction, increased length of hospital stay, increased costs, and high morbidity and mortality rates.^[10] It is estimated that using an evidence-based approach can result in preventing half of the SSIs.^[10]

SSI rates have been found to be from 2.5% to 41.9% worldwide.^[11,12] The incidence of SSIs varies widely across countries and for different surgeries; however, it is estimated to occur in at least 2% of surgical procedures.^[13] SSI incidence may be nearly up to 4 times higher in low- and middle-income countries than the incidence in high-income countries.^[14]

LegesseLaloto *et al.* stated that SSIs remain a major cause of HAIs despite the improvements in instrument sterilization methods and operating room practices, using the best efforts of infection prevention strategies and using better surgical technique.^[15] They also reported that the SSI rates are increasing globally even in hospitals with modern facilities

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that implement the standard protocols of pre-operative preparation and antibiotic prophylaxis.^[15] The aim of the study was to determine post-operative SSI rate in a public hospital in Al-Kharj.

MATERIALS AND METHODS

Setting

This retrospective study included the patients who were admitted to the surgery department in a public hospital in Al-Kharj during 2016.

Specimen collection

The collection of post-surgical wound swabs or pus aspirates from the clinical infected surgical sites was conducted as recommended by laboratory standard procedure for specimen collection. Swabs were directly sent to the microbiology laboratory for analysis to inhibit the growth of some species at room temperature that may obliterate the true organisms and to avoid desiccation.

Inclusion and exclusion criteria

Inclusion criteria included post-surgical wound swabs or pus aspirates. Other specimens such as urine specimens and blood specimens were excluded from the study.

Ethical approval

The data were collected after the approval of the study by the hospital ethical committee with an IRB Log Number 18-474E.

Data collection and analyzing

The data were collected by the microbiology laboratory in the hospital and included the number of infections caused by Gram-positive and Gram-negative bacteria and the number of SSIs in the hospital. The descriptive data of SSIs and causative bacteria were represented as a numbers and percentages.

bacterial cultures, the most common bacteria were *Pseudomonas aeruginosa* (19.87%) followed by *Escherichia coli* (16.34%), *Klebsiella pneumoniae* (13.13%), *Acinetobacter* (11.04%), and *Staphylococcus aureus* either as *Methicillin-resistant S. aureus* or as *methicillin-susceptible S. aureus* (10.60%).

Table 3 shows the number and percentage of SSIs. The SSI rate in the hospital was 2.32% ($=21/906 * 100\%$). Most of the SSIs were caused by Gram-negative bacteria (80.95%).

Table 4 shows the causative pathogens of SSIs. Most of the SSIs were caused by *S. aureus* (19.04%), *P. aeruginosa* (14.29%), *P. mirabilis* (14.29%), *Acinetobacter* (14.29%), and *Citrobacter* (14.29%).

Table 1: The number and percentage of Gram-positive and Gram-negative organisms

Bacteria	Total number of infections
Gram-negative bacteria	752 (83.00%)
Gram-positive bacteria	154 (17.00%)
Total	906

Table 2: The number and percentage of different organisms in the public hospital in 2016

Bacteria	Number	Percentage
<i>P. aeruginosa</i>	180	19.87
<i>E. coli</i>	148	16.34
<i>K. pneumonia</i>	119	13.13
<i>Acinetobacter</i>	100	11.04
<i>Proteus mirabilis</i>	77	8.50
<i>Enterococcus</i>	58	6.40
<i>S. aureus</i>	56	6.18
<i>Providencia</i>	41	4.53
<i>Methicillin-resistant S. aureus</i>	40	4.42
<i>Enterobacter</i>	26	2.87
<i>Citrobacter</i>	21	2.31
<i>Morganella morganii</i>	18	1.99
<i>Serratia</i>	9	0.99
<i>Klebsiella oxytoca</i>	7	0.77
<i>Stenotrophomonas</i>	6	0.66
Total	906	100.00

E. coli: *Escherichia coli*, *K. pneumoniae*: *Klebsiella pneumoniae*, *S. aureus*: *Staphylococcus aureus*

Table 3: The number and percentage of SSIs

Bacteria	Number and percentage of SSIs
Gram-negative bacteria	17 (80.95)
Gram-positive bacteria	4 (19.05)
Total	21

SSIs: Surgical site infections

RESULTS

Table 1 shows the number and percentage of Gram-positive and Gram-negative organisms in the public hospital in 2016. Most of the infections were caused by Gram-negative organisms (83.00%).

Table 2 shows the number and percentage of different organisms that caused infections during 2016. Out of the 906 positive

DISCUSSION

Most of the infections in the present study were caused by Gram-negative organisms. The most common bacteria were *P. aeruginosa* followed by *E. coli*, *K. pneumoniae*, *Acinetobacter*, and *S. aureus*. Ahmed reported that about 75.77% of the infections were caused by Gram-negative bacteria in a military hospital in Al-Kharj and that the most common microorganisms were *E. coli* followed by *P. aeruginosa*.^[16] Tolera *et al.* conducted a study in a university hospital in Ethiopia and reported that *S. aureus* isolates (18.5%) were the most common isolates followed by *E. coli* (16.7%).^[17] Ahmed and Khan conducted a study in a university hospital in Al-Kharj and reported that the most common bacteria were *E. coli* (26.58%) followed by *K. pneumoniae* (16.45%), *Enterococcus faecalis* (13.92%), *P. aeruginosa* (12.65%), and *S. aureus* (12.65%).^[18] Ahmed *et al.* stated that in a public hospital in Al-Kharj, ESKAPE pathogens (*Enterococcus faecium*, *S. aureus*, *K. pneumoniae*, *Acinetobacter baumannii*, *P. aeruginosa*, and *Enterobacter*) cause nearly half of the infections that were caused by bacteria and the most common ESKAPE pathogen was *K. pneumoniae* followed by *P. aeruginosa*.^[19]

The SSI rate in the present study was 2.32%. Most of the SSIs were caused by *S. aureus* (19.04%), *P. aeruginosa* (14.29%), *P. mirabilis* (14.29%), *Acinetobacter* (14.29%), and *Citrobacter*. Bhangu *et al.* conducted an international, multicenter, prospective cohort of consecutive patients undergoing gastrointestinal resection to document SSI in 343 centers across 66 countries and reported an overall 30-day SSI incidence of 12.3%.^[20] Berríos-Torres *et al.* reported that among those who undergo surgical procedures yearly in the United States, 2–4% will develop an SSI, representing a significant burden on the health-care system.^[10] Fan *et al.* reported that the average incidence of SSI in mainland China was 4.5%.^[7] Moreover, Mezemir *et al.* found that at an academic trauma and burn center in Ethiopia, the prevalence of SSI was found to be 24.6%.^[21] Lubega *et al.* reported that among emergency post-operative patients in Mbarara Regional Referral Hospital, the overall SSI incidence was 16.4%.^[22] Furthermore, Carvalho *et al.* stated that the incidence of SSI was 3.4%.^[23]

Khan *et al.* found that the overall SSI rate at a tertiary care facility in Peshawar, Pakistan, was 9.29%.^[24] In Europe, Annual Epidemiological Report 2016 reported 18,364 SSIs from a total of 967,191 surgical procedures and that the percentage of SSIs per 100 surgical procedures varied from 0.6% to 9.5% depending on the type of procedure.^[25] Alotaibi *et al.* stated that among a total of 120 participants who had surgery in Riyadh, the incidence of SSI was 1.7%.^[26] Alshammari *et al.* found that out of 2716 wound infection cases, 289 patients were diagnosed with SSI.^[27] They also reported that the implementation of hospital accreditation strategy decreased the rate of SSI from 20 per 1000 operations in 2009 to 3.5 per 1000 operations in 2018.^[27] Koumu *et al.*

Table 4: The causative pathogens of SSIs

Bacteria	Number of SSIs	Percentage
<i>E. coli</i>	1	4.76
<i>K. pneumoniae</i>	1	4.76
<i>P. aeruginosa</i>	3	14.29
<i>P. mirabilis</i>	3	14.29
<i>Acinetobacter</i>	3	14.29
<i>Providencia</i>	1	4.76
<i>M. morgani</i>	1	4.76
<i>Citrobacter</i>	3	14.29
<i>Enterobacter</i>	1	4.76
<i>S. aureus</i>	4	19.04
Total	21	100.00

SSIs: Surgical site infections

found that SSI post-appendectomy in a tertiary hospital in Jeddah, Saudi Arabia, was found in 7.16% of the patients.^[28]

CONCLUSION

The SSIs rate in Al-Kharj city is low compared to the infections rate in Saudi Arabia and also in comparison with other countries but adopting protocols for surveillance and implementing guidelines are still needed to minimize the SSIs rate.

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