Original Article :

Estimation Of Awareness Of Surgical Site Infections And Their Risk Factors Among Physicians In Surgical Departments In The Hail Region, Kingdom Of Saudi Arabia, 2019–2020

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Abstract

Background and Aims:

Surgical site infections (SSIs) are acquired as a result of complications during or after surgery, and they involve the skin and deeper tissues or organs. SSIs are considered a cause of substantial morbidity and mortality worldwide, as they are a frequent and worrisome part of postoperative recovery. SSIs account for 2% of surgical complications, which is more than 20% of health-care-associated infections. This study aimed to assess the levels of knowledge regarding surgical wound infection among physicians in surgical departments in the Hail region of Saudi Arabia.

Method:

This was a hospital-based cross-sectional study including all surgical consultants, specialists, residents, and medical interns affiliated with the Department of Surgery at all major hospitals in the city of Hail. A valid questionnaire was developed to assess the level of knowledge about SSIs among physicians in the city of Hail. The questionnaire was distributed randomly among the included sample. Data were analyzed on a computer using SPSS version 22.

الملخص

الخلفية والأهداف:

التهابات الموقع الجراحي تحصل نتيجة لمضاعفات أثناء الجراحة أو بعدها، تتضمن الجلد والأنسجة العميقة أو الأعضاء. تعتبر التهابات موضع الجراحة سبب» مهم «في أرتفاع معدل الأمراض والوفيات حول العالم. كما أنها جزء متكرر ومقلق من التعافي بعد الجراحة. تشكل التهابات موضع الجراحة ٢٪ من مضاعفات الجراحة، وهو أكثر من ٢٠٪ من الإصابات المرتبطة بالرعاية الصحية. تهدف هذه الدراسة إلى تقييم «الإتجاهات « ومستويات المعرفة وتقنيات تقييم المخاطر فيما يتعلق بعدوى الجرح الجراحي بين الأطباء في أقسام الجراحة في منطقة حائل بالمملكة العربية السعودية.

طريقة البحث:

كانت هذه دراسة مستعرضة في المستشفى تشمل جميع الاستشاريين، الجراحيين، المتخصصين، المقيمين والمتدربين الطبيين التابعين لقسم الجراحة في جميع المستشفيات الرئيسية في مدينة حائل. تم تطوير إستبيان صالح لتقييم مستوى المعرفة حول التهابات موضع الجراحه ومخاطر عدوى الجروح بين الأطباء في مدينة حائل. وزع الإستبيان عشوائياً على عينة الدراسة. تم تحليل البيانات على جهاز كمبيوتر باستخدام SPSS إصدار ٢٢.

النتائج:

تراوحت مستويات المعرفة بين ضعيف و جيد وتشير النتيجة الإجمالية بشكل مدهش إلى أن المشاركين لديهم معرفة "كافية".

Results:

The levels of knowledge ranged between poor and good, and the total score surprisingly indicates that the participants have fair knowledge.

Conclusions:

The overall knowledge about SSIs was fair but insufficient. Therefore, it is recommended that the WHO recommendations be implemented during the preoperative period. The authors emphasize the importance of more training programs for health care professionals. Generally, it is expected to improve knowledge and practices to maintain patient safety after surgeries.

Key words:

awareness, preventive, infections, surgery, surgical site infection.

الخلاصة:

كانت المعرفة العامة حول العدوى في موقع الجراحة عادلة ولكنها غير كافية. لذلك، يوصى بتنفيذ توصيات منظمة الصحة العالمية خلال فترة ما قبل العملية. يؤكد المؤلفون على أهمية المزيد من البرامج التدريبية للعاملين في مجال الرعاية الصحية.

عموما، من المتوقع أن يكون من المفيد تحسين المعرفة والممارسات للحفاظ على سلامة المرضى بعد العمليات الجراحية.

الكلمات المفتاحية:

وعي، وقائي ، عدوى ، جراحة ، عدوى موقع جراحي.

Introduction

According to the Centers for Disease Control and Prevention [1], surgical site infections (SSIs) are acquired by patients during or after surgery and involve the skin; in severe instances, the infection might spread to deeper tissues and organs [2]. SSIs are considered to be a substantial cause of morbidity and mortality worldwide [3]. SSIs are a frequent and worrisome part of postoperative recovery and account for 2% of surgical complications, which is more than 20% of health-care-associated infections (HCAIs) [4].

A study conducted in 2017 argued that SSIs are a preventable complication, as it is estimated that approximately half of SSIs could be prevented by adhering to proper postoperative hygiene, which includes proper sterilization techniques of the operative field [5]. Hand hygiene, use of antibiotics, avoidance of shaving, limiting traffic, controlling crowdedness, employing personal protective equipment (e.g., masks, gowns, hair covers, and gloves), and other strategies reported by multiple studies [3, 6]. Prevention of SSIs is particularly cost-effective as the total number of surgical procedures performed is increasing worldwide [3]. According to a study in 2017, applying preventive measures in a health institute is cost-effective and can reduce bad and devastating outcomes [7].

Accurate measurement can be a challenge in patient safety, but the CDC's National

Healthcare Safety Network has developed standards for SSI measurement, which are also used by the National Surgical Quality Improvement Program (NSQIP) [1].

In 2019, a study conducted in Jeddah city reported that 6.7% of physicians had good knowledge of SSIs, while 30.2% had poor knowledge [8]. Therefore, the present study aimed to estimate the level of awareness of SSIs among physicians in surgical departments in the Hail Region of the Kingdom of Saudi Arabia.

Materials

Study Design and Participants

This hospital-based cross-sectional study was conducted at the Departments of Surgery at Hail General Hospital, King Khalid Hospital, Maternity and Children Hospital, and King Salman Specialist Hospital in Hail city from October 7 to 27, 2019. All surgical consultants, specialists, residents, and medical interns who were doing the internship in surgery departments were invited to participate in the study after gaining a written consent. The participants were divided into four groups:

Group 1: 11 interns.

Group 2: 18 residents.

Group 3: 50 specialists.

Group 4: 18 consultants.

All groups were working at the hospitals at the time of the present study. A questionnaire was distributed to all of the included departments by the departments' coordinators and secretaries.

A 20-item multiple-choice questionnaire was developed by reviewing the previous literature and consulting with a group of certified surgeons. These steps allowed for the identification of the important factors and knowledge that must be followed to reduce SSIs. These also facilitated the development of a valid questionnaire to properly assess the levels of knowledge about SSIs and risks of wound infection among physicians in the city of Hail. The questionnaire was distributed randomly among the included sample.

After recruitment, the participants were asked to specify their position. Then, the questionnaire was distributed among the participants, and they were asked to answer the questions according to their knowledge about SSIs and the risks of wound infections. Then, the level of knowledge was assessed for all participants.

Method

Statistical Analysis

Data were analyzed on a computer using SPSS version 22.

Ethical Approval

The study was approved by the University of Hail College of Medicine Ethical Committee, approval number: HREC 00114/

CM-UOH.04/20.

Results

With respect to the distribution of the participants by age, the group between 31 and 40 years of age had the highest representation (32%), and the group of those 50 years of age and older had the lowest (16.5%). Males had the highest representation (78.4%), and females comprised 21.6% of the sample. Table 1 shows which position (i.e., specialist) had the highest representation (51.5%), with interns comprising only 11.3% of the sample.

Table 1: Characteristics of participants

Variable		Frequency	Percentage
Position	Intern	11	11.3%
	Resident	18	18.6%
	Specialist	50	51.5%
	Consultant	18	18.6%
	Total	97	100%

The respondents were categorized as having good knowledge (> 80% correct answers or a ≥ 77 total score), fair knowledge (50% correct answers or a ≥ 48 total score), or poor knowledge (< 50% correct answers or a < 48 total score). The statistical analysis results using SPSS version 22.0 are demonstrated in Figure 1 and Table 2, which showed that the level of knowledge was between poor and good, and the total score was fair.

Table 3 presents the means and standard deviations (SDs) by job position. A total

Figure 1.

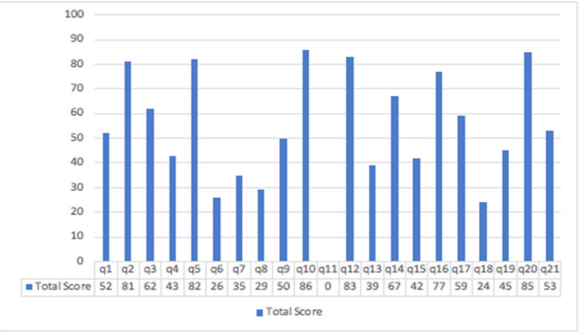


Table 2: Statistical analysis of questionnaire result

Question	Total score	SD	Level of knowledge
The United States Centers for Disease Control and Prevention (CDC) has developed criteria that define SSI as an	52	0.50	Fair knowledge
SSIs are classified into incisional SSIs, which can be superficial, deep or organ/space SSIs. Superficial SSI means	81	0.37	Good knowledge
Which is true about SSI classification	62	0.48	Fair knowledge
One of the most common isolated organisms in SSI	43	0.50	Fair knowledge
The best time for administrating prophylactic antibiotics	82	0.36	Good knowledge
Chances of developing SSI	26	0.45	Poor knowledge
All the following pre-operative antibiotics are commonly used except	35	0.48	Poor knowledge
Which statement is correct about wound classification	29	0.46	Poor knowledge
Which one of these risk factors is LEAST associated with SSI	50	0.50	Fair knowledge
Complications of SSI include which of the following	86	0.32	Good knowledge

The CDCb recommendations for the prevention of SSI include which of the following	0	0.00	Poor knowledge
Infected wounds can exhibit which one of these presentations	83	0.35	Good knowledge
Prophylactic antibiotics are discontinued after surgery within	39	0.49	Poor knowledge
Regarding hair removal for surgical patients, when is the best time	67	0.46	Fair knowledge
Regarding hair removal for surgical patients, it's best done by	42	0.50	Poor knowledge
Which one of these factors impairs wound healing	77	0.41	Good knowledge
In assessing nutritional status for a surgical patient, which statement is correct	59	0.49	Fair knowledge
Based on World Health Organization, the fourth step in hand hygiene technique is	24	0.43	Poor knowledge
The first step in surgical scrubbing is	45	0.50	Poor knowledge
The purpose of pre-operative skin cleansing is	85	0.33	Good knowledge
Total Average	53.35	0.42	Fair knowledge

Table 3: Statistics characteristics of job position

Position	Mean	Std. deviation
Intern	9.09	2.02
Resident	11.33	3.07
Specialist	11.44	2.74
Consultant	10.61	1.94
Total	11.00	2.68

of 97 doctors were included in this study. Among these respondents, 50 (51%) were specialists, 18 (18%) were residents, 18 (18%) were consultants, and 11 (11%) were interns. It was shown that 52 (54%) of doctors knew the correct definition of an SSI according to the criteria developed by the CDC; this was considered to be indicative of a fair level of knowledge. Further, 43 of the physicians had a poor level of knowledge, as only 44% knew about the most common organism associated with SSIs.

Regarding physicians' knowledge about the most common preoperative antibiotics and the best time for administrating prophylactic antibiotics, 82 (85%) knew these factors (good level of knowledge). More than half of the doctors (52%) knew the risk factors of SSI (fair level of knowledge). The physicians did not have any knowledge regarding the most effective method to prevent SSIs (0%), but 42 (43%) doctors knew the best method to remove hair from surgical patients (poor level of knowledge). A total of 24 (25%) doctors knew the proper hand hygiene techniques, including surgical scrubbing, and their purpose (poor level of knowledge).

It was found that 81 (83.5%) physicians knew the classification and definition of superficial SSIs (good level of knowledge). Less than half provided a correct answer to a question on the chances of

developing SSIs (26.8%) (poor level of knowledge). Only 35 (36.1%) answered a question about the antibiotics used in the preoperative stage correctly (poor level of knowledge). Most of the respondents, or 86 (88.7%), had a good level of knowledge regarding the complications of SSIs, and 83 (85.6%) had a good level of knowledge about the presentation of infected wounds. However, only 39 (40.2%) knew the appropriate time to discontinue a prophylactic antibiotic (poor level of knowledge).

A total of 67 (69.1%) of the respondents answered correctly about the best time to remove the body hair before the operation (fair level of knowledge). More than half (77, or 79.4%) had a good level of knowledge about the factors that impair wound healing, and 59 (60.8%) knew how to assess the nutritional status of a surgical patient (fair level of knowledge). Less than half (45, or 46.4%) correctly answered a question about the first step in surgical scrubbing (poor level of knowledge), but 85 (87.6%) knew the purpose of preoperative skin cleansing (good level of knowledge). A score of 55% (53.5) was the mean level of knowledge and risk assessment of wound infection among physicians in the surgical departments in the Hail region (fair level of knowledge).

The study correlates the experience and qualifications with the total knowledge. Surprisingly, the total knowledge for the consultant was 53%, the specialist was 57.2%, the resident was 56.6%, and interns was 45%.

Discussion

The focus on SSI prevention is growing worldwide, and this process requires appropriate strategies since SSIs cause serious morbidity and mortality [9, 10]. SSIs are associated with common risk factors mentioned in various studies, such as old age (>55), diabetes mellitus, and immunocompromised status [11, 12]. SSIs account for approximately 2–20% of surgical procedures, depending on the procedure, and they can cause a significant economic burden and heavy demand on health care resources [7, 12, 13].

In the present study, the authors examined and analyzed the total knowledge scores among doctors regarding SSIs information and practice. The present work found that most of the doctors had a fair level of knowledge regarding the definition of SSIs, as 54% knew the correct definition of an SSI according to the CDC. This was similar to another study conducted in Jeddah in 2019, Saudi Arabia, which showed that 55.5% of respondents knew the definition [8].

The present study showed that most doctors had a good level of knowledge regard-

ing the classification of SSIs and the difference between each type (83.5%). Knowing the appropriate classification is crucial to respond and treat SSIs appropriately. There are two defined systems worldwide regarding wound assessment: the ASEPSIS scoring system and the Southampton Wound Assessment Scale, both of which help with assessment, grading, and identifying any complications, such as SSIs, postoperatively [11].

In the present study, most of the region's doctors were shown to have a fair level of knowledge about the most common type of SSIs, as 63.9% of the respondents knew that superficial incisional SSIs accounted for more than half of all SSIs. A lower percentage (58.8%) was reported in a study in a neighboring city, according to which only 9.3% of doctors knew that deep incisional SSIs were more common than superficial incisional and organ/space SSIs [8]. It was also revealed that 44% of the doctors had fair knowledge regarding the most common organisms causing SSIs, which are Staphylococcus aureus and Escherichia coli. The most common group of microorganisms to cause an SSI is gram-positive cocci, mainly Staphylococcus aureus [12]. The incidence of SSIs in Nigeria was 38% [13], while India reported a lower incidence of 12% 14. This was 15 times higher in non-developed countries than in developed countries. Moreover, a previous study conducted in India in 2016 reported that the perception of health care staff about SSIs was good enough (94%) [11]. However, the practices were inadequate (47%) [15]. Further, an international survey sponsored by the WHO demonstrated that the prevalence of nosocomial infections ranged from three to 21%, and wound infection percentages were surprisingly 5–34% [12].

The present study reported that 85% of the doctors had a good level of knowledge regarding the best time for administering prophylactic antibiotics, which was within 60 minutes before surgery. This number was higher than that of a study conducted in Jeddah in 2019, which showed that 78.2% of doctors had this knowledge[8]. Further, in this study, it was found that only 26.8% of doctors knew about the incidence of SSIs, which was 1–3%. This was similar to the previous study conducted in Jeddah, for which 25.2% of doctors knew the same fact [8].

The present study found that most of the doctors (88.7%) had good knowledge regarding the complications of surgical site infection, while only 11 of the respondents had no understanding of such complications. This was similar to the findings of a study conducted in 2019, which showed that 84.0% of the doctors knew about the complications of SSIs [8].

Regarding the question about the CDC recommendations for the prevention of SSI, none of the doctors were able to answer this correctly (0%). However, a more positive response rate was observed in a study conducted in Ethiopia among doctors and nurses to assess their knowledge of infection control practices and associated factors toward infection prevention (84.7%) [16]. Nevertheless, the present study results indicated that most of the doctors had a good level of knowledge regarding the presentation of infected wounds. The majority of doctors answered that infected wounds could exhibit purulent pus (85.6%), which was similar to the previous study in Jeddah that reported a rate of 89.1% [8].

In the present study, 40.2% of respondents chose the correct time to discontinue prophylactic antibiotics as per the WHO SSI prevention guidelines [17]. Six of the respondents were consultants, 24 were specialists, seven were residents, and two were interns. According to an international survey, this reflected a poor knowledge that could be associated with a fear of malpractice lawsuits and the rising number of defensive medical practices [18]. In a Korean study conducted in 2020, it was reported that 15 out of 1,895 patients had had antibiotics appropriately discontinued [19]. Also, in a 2005 study done in the United States, it was concluded that merely 40.7% of patients discontinued antibiotics at the recommended time [10].

The World Health Organization (WHO) has recommended clipping as a hair removal technique only if necessary [20], and only 43.3% of participants in the present study answered this question correctly. Further, only 4.1% of them correctly answered the preferred timing of hair removal. There was no correct answer associated with the CDC guidelines that recommended clipping be done shortly before incision. However, the NICE guidelines recommend that the removal—if needed—should be on the day of surgery [21].

Participants had a good level of knowledge (79.3%) that steroid use was associated with SSIs, but in another study, 83.2% of respondents had this knowledge [8]. Further, in a King Abdulaziz University Hospital study, 69.7% of the doctors answered that serum albumin was the most commonly used marker to assess nutritional status for a surgical patient [8]. However, in the present study, 60.8% of the respondents in all groups, and just half of the consultants, answered this question correctly.

In the present research, less than half of the doctors (46.39%) knew that the first step in surgical scrubbing was the removal of any watches and rings from their hands, which indicated a poor level of knowledge. How-

ever, in another study in Jedda, most doctors knew about this first step (69.7%) [8]. Moreover, the fourth step in hand hygiene was correctly stated by a relatively small number of doctors (24\97), which reflected an even lower level of knowledge in the surgical scrubbing process. In comparison, another study showed similar results (20.4%) [8].

Finally, the doctors in the present study showed a good level of knowledge regarding the purpose of preoperative skin cleaning (87.6%), which was similar to the finding in the study at KAUH (80.7%) [8].

Conclusion

The present study has clarified that the overall knowledge about SSIs among doctors was fair but insufficient. Therefore, it is recommended that the WHO recommendations be implemented during the preoperative period to ensure high-quality care for every patient, thereby eliminating the risk of relapsing and unnecessary readmissions. It is also highly recommended that more training programs be initiated for health care professionals. Medical professionals need to improve their knowledge and evidence-based practices to maintain the patient experience at a higher level of safety after surgery.

Conflict of Interest

The authors declare that they have no competing interests.

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References

1. Centers for Disease Control and Prevention. Surgical Site Infection (SSI). 2010. https://www.cdc.gov/hai/ssi/ssi.html

2. McDermott K, Freeman W, Elixhauser A. Overview of Operating Room Procedures During Inpatient Stays in US Hospitals, 2014. https://www.hcup-us.ahrq.gov/reports/statbriefs/sb233-Operating-Room-Procedures-United-States-2014.jsp?utm_source=ahrq

3 .Allegranzi B, Bischoff P, de Jonge S, Kubilay Z, Zayed B, Gomes M. et al. New WHO recommendations on preoperative measures for surgical site infection prevention: an evidence-based global perspective. The Lancet Infectious Diseases. 2016;16(12):276–e287.https://doi.org/10.1016/S1473-3099(16)30398-X

4. Cruse P. Wound infection surveillance. Reviews of Infectious Diseases.1981;3(4):734–737.https://doi.org/10.1093/clinids/3.4.734

5. Berríos-Torres S, Umscheid C, Bratzler D, Leas B, Stone E, Kelz R. et al. Centers for disease control and prevention guideline for the prevention of surgical site infection 2017. JAMA Surgery. 2017;152(8):784–791. https://doi.org/10.1001/jamasurg.2017.0904

6. Patil B, Raval M, Chavan G. Knowledge and practices of health care professionals to prevent surgical site infection in a tertiary health care centre. International Surgery Journal. 2018;5(6):2248–2251. http://dx.doi.org/10.18203/2349-2902.isj20182231

7. De Lissovoy G, Fraeman K, Hutchins V, Murphy D, Song D, Vaughn B. Surgical site infection: incidence and impact on hospital utilization and treatment costs. American Journal of Infection Control. 2009;37(5):387–397. https://doi.org/10.1016/j.ajic.2008.12.010

8. Albishi W, Albeshri A, Mortada H, Alzahrani K, Alharbi R, Aljuhani F. et al. Awareness and level of knowledge about surgical site infections and risks of wound infection among medical physicians in King Abdulaziz University Hospital: Cross-sectional study. Interactive Journal of Medical Research. 2019;8(1), e12769. https://doi.org/10.2196/12769

9. Adane F, Mulu A, Seyoum G, Gebrie A, Lake A. Prevalence and root causes of surgical site infection among women undergoing caesarean section in Ethiopia: A systematic review and meta-analysis. Patient Safety in Surgery. 2019;13(34)1. https://doi.org/10.1186/s13037-019-0212-6

10. Bratzler W, Houck M, Richards C, Steele L, Dellinger P, Fry D. et al. Use of a

ntimicrobial prophylaxis for major surgery: Baseline results from the National Surgical Infection Prevention Project. Archives of Surgery. 2005;140(2):174–182. https://doi.org/10.1001/archsurg.140.2.174

11. Akhter M, Verma R, Madhukar K, Vaishampayan A, Unadkat P. Incidence of surgical site infection in postoperative patients at a tertiary care centre in India. Journal of Wound Care. 2016;25(4), 210–217.https://doi.org/10.12968/jowc.2016.25.4.210

12. Bagnall N, Vig S, Trivedi P. Surgical-site infection. Surgery. 2009;27(10):426-230.https://doi.org/10.1016/j.mpsur.2009.08.007

13. Owens D, Stoessel K. Surgical site infections: Epidemiology, microbiology, and prevention. Journal of Hospital Infection. 2008;70(2):3–10. https://doi.org/10.1016/S0195-6701(08)60017-1

14. Labrague J, Arteche L, Yboa C, Pacolor F. Operating room nurses' knowledge and practice of sterile technique. Journal of

Nursing and Care. 2012;1(4):1. https://doi.org/10.4172/2167-1168.1000113

15. Labeau S, Witdouck S, Vandijck D, Claes B, Rello J, Vandewoude K.et al. Nurses' Knowledge of Evidence-Based Guidelines for the Prevention of Surgical Site Infection. Sigma journals. 2010;7(1):1. https://doi.org/10.1111/j.1741-6787.2009.00177.x

16. Desta M, Ayenew T, Sitotaw N, Tegegne N, Dires M, Getie M. Knowledge, practice and associated factors of infection prevention among healthcare workers in Debre Markos referral hospital, Northwest Ethiopia. BMC Health Services Research. 2018;18(1):1–10. https://doi.org/10.1186/s12913-018-3277-5

17. Summary of a systematic review on surgical antibiotic prophylaxis prolongation [Internet]. WHO. World health organization ; 2019 [cited 2020]. Available from: https://www.who.int/gpsc/appendix25.pdf?ua=1

18. Tebano G, Dyar J, Beovic B, Béraud G, Thilly N, Pulcini C. Defensive medicine among antibiotic stewards: The international ESCMID AntibioLegalMap survey. Journal of Antimicrobial Chemotherapy. 2018:73(7):1989–1996. https://doi.org/10.1093/jac/dky098

19. Kwak G. Appropriate use of surgical antibiotic prophylaxis. Journal of Korean Medical Science. 2019;34(17):136. https://doi.org/10.3346/jkms.2019.34.e136

20. Summary of a systemic review on the effectiveness and optimal method of hair removal [Internet]. WHO. World health organization; 2019 [cited 2020]. Available from: : https://www.who.int/gpsc/appendix7.pdf?ua=1

21. National Institute for Health and Care Excellence (NICE). Surgical site infections: prevention and treatment. London: National Institute for Health and Care Excellence (UK). 2019. Available from: https://www.ncbi.nlm.nih.gov/books/NBK542473/