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Prevalence and Risk Factors of Surgical Site Infections in Fort Portal Regional Referral Hospital: A Retrospective Cross-Sectional Study

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ABSTRACT

Postoperative wound infection is a significant cause of nosocomial infections, accounting for 20%-25% of all infections worldwide. Despite technological advancements in surgery and wound management, wound infection remains the most common nosocomial infection, particularly in patients undergoing surgery. The study aimed to assess the prevalence and factors associated with surgical site infections in the surgical ward at Fort Portal Regional Referral Hospital. The study used a retrospective cross-sectional design and included men, women, and children who would undergo surgical operations. The sample size was determined using the Kish Leslie formula and a retrospective study was conducted from January to April 2022. The study analyzed data on surgical site infections (SSIs) in the surgical ward of Fort Portal Regional Referral Hospital, revealing a prevalence of 11.9%. The study found that the risk factors for SSIs were rural residence, advanced age, diabetes mellitus, obesity, tobacco use, HIV/AIDS, longer duration of surgery, previous surgical history, delayed wound dressing, and use of a drain. These factors were found to be multifactorial, with some patients having multiple risk factors at play. The study concluded that the prevalence of SSIs in Kabarole is high enough to warrant intervention.

Keywords: Post operative, Surgical, Hospital, Nosocomial, Infection, Risk factor

INTRODUCTION

Surgical site infection (SSI) is an infection that develops within 30 days after an operation or one year if an implant is placed, and the infection appears to be related to the surgery. SSIs remain a major cause of morbidity and death among the operated patients and continue to represent about a fifth of all healthcare-associated infections [1]. Surgical site infection (SSI) is a global burden that contributes to the morbidity and mortality of patients undergoing abdominal surgeries. [2] Although at least 5% of patients develop an SSI after surgery, these infections seem to cause remarkably little concern, remaining largely unreported in the media. [3], Despite improvements in operating room practices, instrument sterilisation methods, better surgical technique, and the best efforts of infection prevention strategies, surgical site infections remain a major cause of hospital-acquired infections, and rates are increasing globally even in hospitals with the most modern facilities and standard protocols of preoperative preparation and antibiotic prophylaxis. Moreover, in developing countries where resources are limited, even basic life-saving operations, such as appendectomies and caesarean sections, are associated with high infection rates and mortality [4]. According to a World Health Organisation (WHO) report, the incidence of SSIs ranges from 1.2 to 23.6 per 100 surgical procedures. In developed countries, SSI has been reported to affect from 5% to 15% of hospitalised patients in regular wards and as many as 50% or more of patients in intensive care units (ICUs), while in developing countries the magnitude of the problem remains largely underestimated [5]. According to recent evidence, the risk factors for SSI are multifactorial and complex. For instance, preexisting illness [6], wound contamination [7], American Society of Anesthesiologist's (ASA) score III or IV [8], non-use of prophylactic antibiotics [9], presence of hypovolemic [10], longer duration of operation longer preoperative hospital stay postoperative hospital stay [11], advanced age alcohol use [12], previous surgery use of drain, use of iodine alone in skin preparation smoking [13], absence of wound care, and hair removal inside operating room were some associated factors. The operation succeeded, but the patient is dead." As surgeons became more skilled and the introduction of anaesthesia in the 1850s allowed for more complex operations, this became a more heartbreaking comment. The word 'Hospitalism' was introduced by Sir James Simpson in Edinburgh to describe what we now call hospital-acquired surgical-site infection. Shock, erysipelas (streptococcal infection) pyaemia (staphylococcal infection), and hospital gangrene were the big post-operative killers. Surgical site infection has replaced previously used-term surgical wound infection. The name SSI was

introduced by the US Centre for Disease Control and Prevention (CDC) in 1992. According to historical sources, even the early men practised wound treatment. It is evidenced by cave paintings found in Spain dated back to 2–30 thousand years BCE [15] However, the first written sources trace back to Hammurabi's reign (approximately. 2000 BCE). In ancient Greece and Rome, wound healing was practised by Hippocrates, Celsus, and Galen. The saying *pus bonum et laudabile*, literally translated as 'good and praiseworthy pus' was a surgical dogma at the time. The presence of pus was considered a sign of normal healing [15]. Hippocrates commented on wound healing, saying, 'If the pus is white and not heinous, the health shall come; but if it is ichorous and muddy, the death will ensue' [16]. It was not until the 19th century that a breakthrough took place that eradicated the term pus laudabile from the medical literature [14]. It was then that Hungarian obstetrician Ignaz Philipp Semmel Weis (1818–1865) recommended that physicians wash their hands in chlorinated water before examining patients, which led to a drastic decrease in mortality. Nevertheless, it was the British surgeon Joseph Lister who would spray phenol over the surgical field and is now considered the father of modern asepsis [17]. According to a World Health Organisation (WHO) report, the incidence of SSIs ranges from 1.2 to 23.6 per 100 surgical procedures due to the due to the spread of antibiotic resistance. The incidence of SSIs is higher in developing countries relative to developed nations [18], reported as the second most common cause of hospital-acquired infection (HAI) in Europe and the United States of America (USA) [19]. Approximately 2–5% of surgical patients worldwide have developed SSIs [21]. SSIs are the most frequent type of HAI in low and middle-income countries (LMICs) and affect up to one-third of patients who have undergone a surgical procedure [21,22]. In LMICs, the pooled incidence of SSI was 11.8 per 100 surgical procedures [23]. In Africa, SSIs were the leading infections in hospitals, and their incidence ranged from 2.5–30.9% [24]. Substantial evidentiary variation in the prevalence of SSI exists across the globe, such as 10.56% in New York [7], 53% in Iran [25], and 16.4% in Uganda [26]. Despite the passing of time and enormous advances in medical technology, the problem of surgical site infections is still valid and hard to fight, although various methods are now used, including, e.g., air conditioning in operating rooms, antibacterial foils, and perioperative antibiotic prophylaxis. Postoperative wound infection has been reported to be one of the most common causes of nosocomial infections, accounting for 20%-25% of all nosocomial infections worldwide. Postoperative wound infections have been responsible for the increasing cost, morbidity, and mortality related to surgical operations and continue to be a major problem worldwide. Globally, surgical site infection rates have been reported to range from 2.5% to 41.9%. In the United States, approximately 2% to 5% of the 16 million patients undergoing surgery each year have postoperative surgical site infections. In a study conducted at Mbarara Regional Referral Hospital in western Uganda, the incidence of surgical site infection was 16.4%. This is in contrast with the overall SSI rate in mainland China, which is at 4.5%, in Seoul, South Korea, at 3.3%, and in the US at 2–3% [26]. Despite the technological advances that have been made in surgery and wound management, wound infection has been regarded as the most common nosocomial infection, especially in patients undergoing surgery. It is a common cause of illness, resulting in a prolonged hospital stay, increased costs, and general wound management practices becoming more resource-demanding. The problem is more serious in low-income countries where resources are scarce and staff is always in short supply. The study was designed to assess the prevalence and factors associated with surgical site infections in the surgical ward at Fort Portal Regional Referral Hospital.

METHODOLOGY

Area of Study

The study will be carried out in surgical at Fort Portal Regional Referral Hospital (FPRRH). The hospital is found within the city of Fort Portal, approximately 148 kilometres (92 mi) by road, west of Mubende Regional Referral Hospital. This location is approximately 294 kilometres (183 miles), west of Mulago National Referral Hospital, in Kampala, Uganda's capital and largest city—the coordinates of the hospital are:0°39'19.0"N, 30°16'53.0"E (Latitude:0.655278; Longitude:30.281389). The hospital offers several services including; OPD, inpatient, Ophthalmology, X-ray, ultrasound, Orthopedics, health promotion and education, occupational therapy, HIV immunization, environmental health, and special clinics among others.

Study Design

The study employed a retrospective cross-sectional design using quantitative methods of data collection.

Study Population

The study covered men, women and children who will undergo surgical operations and are at the surgical ward of Fort portal Region Referral Hospital and those only who will consent.

Sample Size Determination

The number of participants was calculated using the Kish Leslie (1965) formula. The prevalence of surgical site infection in Uganda was reported to be 10% based on the only available study in the WHO database.

The sample size required, n, was calculated using the following formula:

$$n = \frac{PqZ^2}{d^2}$$

Where p is the prevalence of surgical site infections 10% (p = 0.1); q = 1-p= 0.9 and z is 1.96 (for 5 % alpha error); and d is precision which is 0.05 (permissible margin of error at 5 % level of statistical significance).

$n=0.1\times0.9\times(1.96)^2/(0.05)^2$

n=138.

Sampling Procedure

A retrospective study was carried out from records of postoperative patients in the surgical ward at Fort Portal Regional Referral Hospital from 1st January 2022 to 30th April 2022.

Inclusion Criteria

The study included all patients above one year who will undergo surgery and are in the surgical ward of Fort Portal Regional Referral Hospital and only those who will consent.

Exclusion Criteria

The study excluded all those patients who will not consent, not on the surgical ward and also those whose wounds are not of surgical origin.

Data Collection Procedure

Permission was sought from the necessary authority which is the hospital director in charge surgical ward of Fort portal Regional Referral Hospital. Records of postoperative patients at the surgical were obtained from the records of other patients within the study period

Data Management and Analysis

Data was grouped and analyzed using Excel and a calculator. Then it was presented in the form of tables, bar graphs etc.

Quality Control

Patient demographics, data and bio-data will be counterchecked by asking the patient and also ensure that patients are followed up during their management.

Ethical Considerations

A letter of introduction to the hospital director, Fort Portal Regional Referral Hospital and in-charge surgical ward. Patients' informed consent was obtained Patients' names was not included in the report to ensure confidentiality.

RESULTS

Prevalence of Post-Operative Surgical Site Infections

A total of 420 surgeries were conducted during the six months of the study. Out of this number, 50 cases of SSIs were reported, giving SSIs a prevalence of 11.90%.

Factors Associated with SSIs

Among the 50 cases of SSIs reported, a univariate analysis of the risk factors was done to determine the existence of any statistical significance for each factor. The factors were categorised into three categories: host factors, procedure-related factors, and post-operative-related factors.

Host-related Factors Associated with SSIs (N = 50)

The host-related factors included age, obesity, tobacco use, HIV/AIDS, diabetes mellitus, hypertension, and residence (rural or urban). The analysis is presented in Table 1 below.

Table 1: Shows Host-related factors associated with SSIs (N = 50)

VARIABLES	FREQUENCY	PERCENTAGE
AGE Less <13 14-49 Advanced>50	 4 12 20	 8% 24% 40%
Obesity	8	16%
Tobacco use	6	12%
Residence Rural Urban	 37 3	 74% 6%
Co-morbidities		
HIV/AIDS	9	18%
Diabetes mellitus	22	44%
Hypertension	2	2%

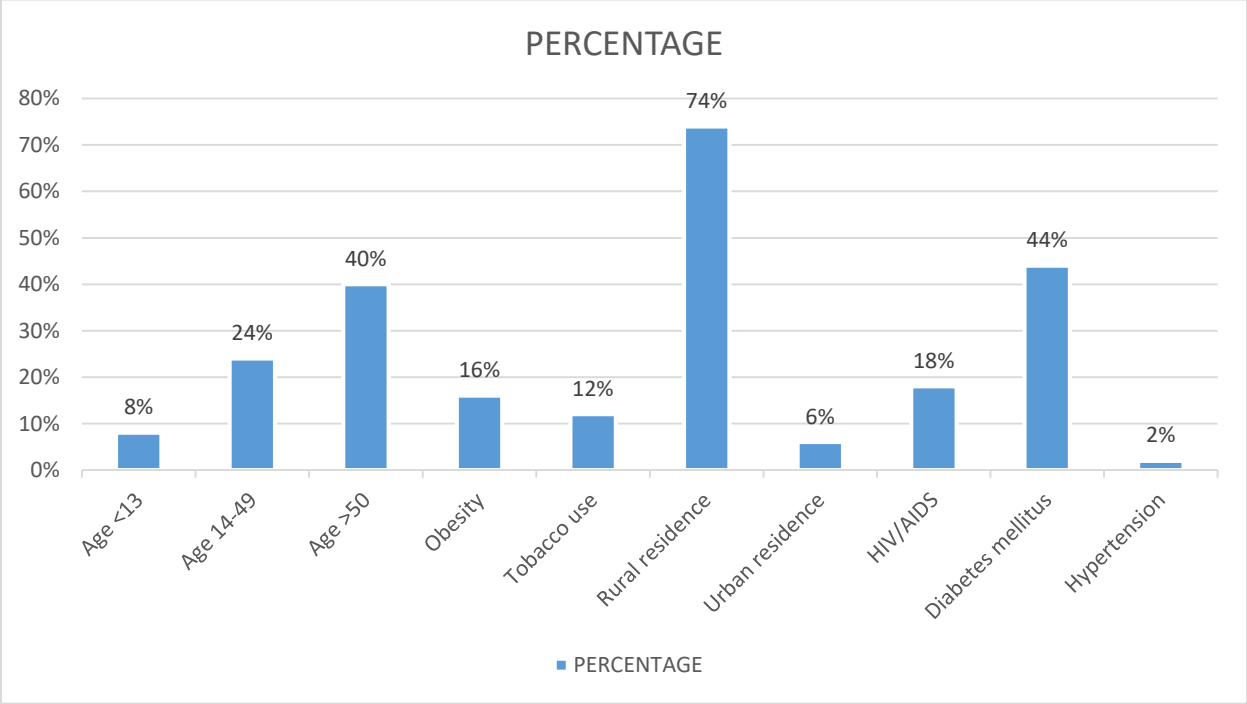


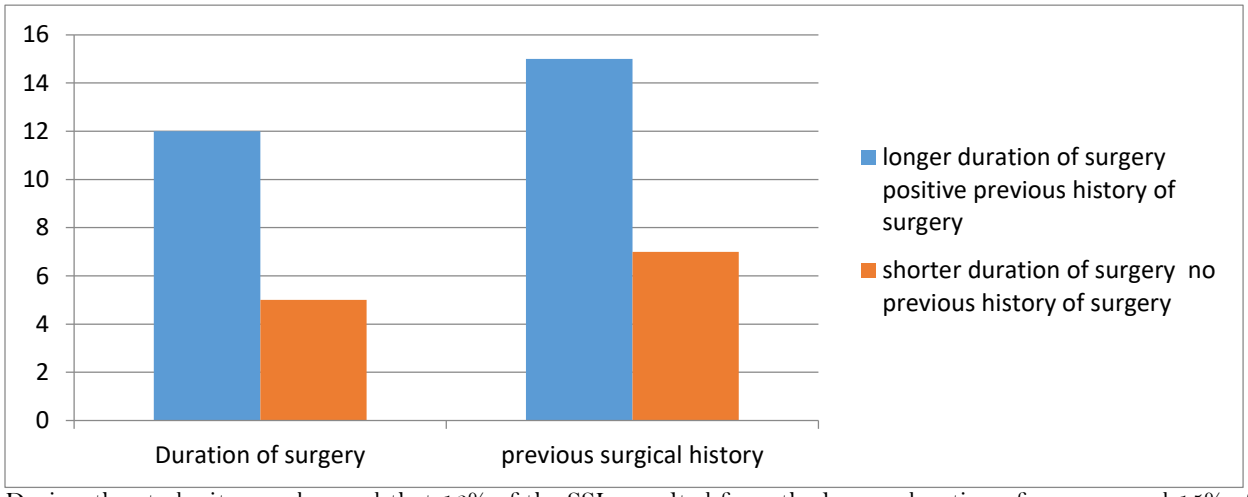
Figure 1: Host-related factors associated with SSIs (N = 50)

It is important to know that univariate analysis was done for various factors and that there was more than one risk factor in some patients. It was the occurrence of certain risk factors that was important in this case, rather than the magnitude per se. It follows, from Table 1 above, that advanced age, obesity, residence, tobacco use, and the presence of co-morbidities were found to be of some statistical significance as risk factors for SSIs. It is apparent, however, that those found to have strong statistical significance were rural residence (74%), advanced age (40%), and diabetes mellitus (44%).

Procedure-related Factors (N=50)

The procedure-related factors that were assessed included the duration of the surgery and previous surgery history. Previous literature has used the longer duration of surgery and previous surgery history as risk factors.

Figure 2: Procedure-related Factors



During the study, it was observed that 12% of the SSIs resulted from the longer duration of surgery, and 15% of the SSIs resulted from patients who had a positive previous history of surgery, as shown in the figure above.

Post-operative Related Factors (N = 50)

The post-operatively related factors assessed included the use of a drain and delayed wound dressing. Previous literature has noted them as risk factors for SSIs. During the study, it was observed that 30% of the SSIs resulted from delayed wound dressing, whereas 25% of the surgical site infections resulted from the use of a drain, as shown in the figure below.

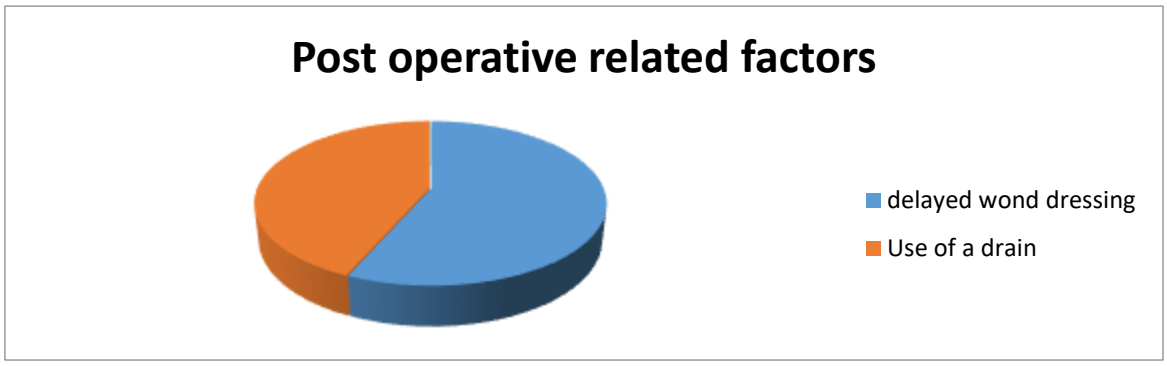


Figure 3: Post-operative Related Factors

DISCUSSION

Prevalence of Surgical Site Infections

The prevalence of surgical site infections was 11.9%. This falls within the global estimated range of 2.5% to 41.9%. That range probably shows the difference between rich resource countries (prevalence of 2–5%) and poor resource countries (prevalence of 2.5–30.9%). The value of 11.9% obtained in this particular study tends towards poor resource value. The argument that there is a high prevalence of SSIs in resource-poor countries as opposed to resource-rich countries is supported by the low values found in countries such as Switzerland, Oman and the USA [27]. Whereas in resource-poor countries such as India, Johannesburg in South Africa and Nigeria. Of more importance, though, is the fact that the values obtained in this particular study were lower than the 15.9% obtained at Mbarara Regional Referral Hospital by Lubega et al. [26]. This value difference could be attributed to a larger population size in the Mbarara study.

Risk Factors Associated with SSIs

The factors predisposing to SSIs were assessed after being grouped into three categories: host-related factors, procedure-related factors, and postoperative factors. The host-related factors found to be of strong statistical significance were rural residence, advanced age, and diabetes mellitus. Others were age (<13, 14–49), obesity, tobacco use, and other co-morbid conditions, in particular HIV/AIDS and hypertension, which were not found to have statistical significance. Among the procedure-related factors, the longer duration of the surgery and a positive previous history of surgery were found to be significant risk factors for SSIs, as were the post-operative-

related factors of delayed wound dressing and use of a drain. These findings mirror results from several studies conducted prior [6,9] among others, some studies who's this study supports. further emphasising that the risk factors for SSIs are multifactorial, whereby in some patients, more than one risk factor was at play in the development of the surgical site infection.

CONCLUSION

The prevalence of surgical site infection in the surgical ward of Fort Portal Regional Referral Hospital is high enough to warrant intervention. The risk factors for surgical site infection in Kabarole were rural residence, advanced age, diabetes mellitus, obesity, tobacco use, HIV/AIDS, longer duration of surgery, previous surgical history, delayed wound dressing, and use of a drain. Hypertensive disorders were not found to be significant.

Recommendation

Lifestyle choices such as cessation of tobacco use, exercising, proper personal and environmental hygiene, and proper nutritional and weight management are key preventive measures against SSIs. Have their blood sugars monitored and properly controlled, and lastly, protect themselves against HIV/AIDS, which also increases the chances of SSIs. Health education on HIV/AIDS prevention is to be offered regularly to the clients of the facility, and more awareness creation is needed on SSIs and specifically on modifiable risk factors such as obesity and tobacco smoking. Last but not least, strict measures should be put in place for close follow-up and daily wound dressing. This study dwelt mainly on the host, procedure, and post-operative factors associated with SSIs and did not dwell much on the healthcare-related factors or provider-related factors that may contribute to SSIs.

REFERENCES

1. Kitembo S. K. and Chugulu S. G (2013). Incidence of surgical site infections and microbial pattern at KilimanjaroChristianMedical Centre. Annals of African Surgery.10(1)
2. Samuel B. Ariho, Herman Lule, EzeraAgwu and Abdullah Shaban, (2020) surgical site infections
3. Giri S. Kandel B. P., Pant S., Lakhey P. J., Singh Y. P. and Vaidya P. (2013). Risk factors for surgical site infections in abdominal surgery: a study in Nepal. Surgical Infections.14(3):313–318. doi: 10.1089/sur.2012.108.
4. V. Dinda, R. Gunturu, S. Kariuki, A. Hakeem, A. Raja, and A. Kimang'a, "Pattern of pathogens and their sensitivity isolated from surgical site infections at the Aga Khan University Hospital, Nairobi, Kenya," Ethiopian Journal of Health Sciences, vol. 23, no. 2, pp. 141–149, 2013.
5. M. R. Motie, M. Ansari, and H. R. Nasrollahi, (2006). "Assessment of surgical site infection risk factors at Imam Reza Hospital, Mashhad, Iran between 2006 and 2011," Medical Journal of the Islamic Republic of Iran, vol. 28, p. 52.
6. W. Mulu, G. Kibru, G. Beyene, and M. Damtie, (2012). "Postoperative nosocomial infections and antimicrobial resistance pattern of bacteria isolates among patients admitted at FelegeHiwot referral hospital, Bahirdar, Ethiopia," Ethiopian Journal of Health Sciences, vol. 22, no. 1, pp. 7–18.
7. Nwose, P. C. (2006). A prospective study of the incidence of surgical wound infection at the NNAMDI Azikiwe University Teaching Hospital. Faculty of Surgery: Nnewi.
8. Yaouba, D, Ngah, J. E, Perpoint, T, Mbo, A. J, Vanhems, P and Bénet, T (2016). Incidence and risk factors for surgical site infections in N'Gaoundéré regional hospital, Cameroon. Am J Infect Control.44(10):1195.
9. LegesseLaloto, T., HikoGemeda, D. and Abdella, S.H. (2017). Incidence and predictors of surgical site infection in Ethiopia: prospective cohort. BMC Infect Dis 17, 119.
10. Hartmann, M, Jönsson, K and Zederfeldt, B (1992): Effect of tissue perfusion and oxygenation on accumulation of collagen in healing wounds. Randomized study in patients after major abdominal operations. The European Journal of Surgery=Actachirurgica, 158(10):521–526.23.
11. Weldu, M. G, Berhane, H, Berhe, N, Haile, K, Sibhatu, Y, Gidey, T, Amare, K, Zelalem, H, Mezemir, R and Hadgu, T. (2018). Magnitude and determinant factors of surgical site infection in Suhul hospital Tigrai, northern Ethiopia: a cross-sectional study. Surg Infect. 19(7):684–90.20.
12. Halawi, E., Assefa, T and Hussen, S (2018). Pattern of antibiotics use, incidence and predictors of surgical site infections in a tertiary care teaching hospital. BMC research notes. 11(1):538.
13. Afenigus, A, Shbabawu, A and Melese, T. (2019). Surgical site infection and associated factors among adult patients admitted in west and east Gojjam zone hospitals, Amhara region. Ethiopia Nurse Care Open AccesJ. 6(3):107–12.
14. Gottrup, F. and Leaper, D (2004) Wound healing: historical aspects. EWMA Journal, 2004; 4(221).
15. Magner, L.N (1992): The art and science of surgery. A history of medicine. New York (NY): MarcelDekker, 279–305.
16. Hippocrates, G. and Coxe, J.R (1846): The writings of Hippocrates and Galen. Philadelphia (PA): Lindsay and Blakiston.
17. Thurston, A.J (2000): Of blood, inflammation and gunshot wounds: the history of the control of sepsis. Aust. N. Z. J. Surg., 70(12): 855–861.

18. Curcio, D, Cane, A, Fernández, F and Correa, J. (2019). Surgical site infection in elective clean and clean-contaminated surgeries in developing countries. Int J InfectDis. 80:34–45.
19. Palumbo, V. D, Bruno, A, Di Trapani, B and Tomasello, G. (2016). Who global guidelines for the prevention of surgical site infection: a new step to improve PATIENTS'SAFETY before, DURING AND AFTER SURGERY2017.
20. Smyth, E., McIlvenny, G., Enstone, J., Emmerson, A., Humphreys H, Fitzpatrick F,Davies E, Newcombe R, Spencer R, Group HISPSS (2006). Four country healthcare associated infection prevalence survey 2006: an overview of the results. J HospInfect. 2008;69(3):230–48.
21. Danzmann, L., Gastmeier, P., Schwab, F. and Vonberg, R-P. (2013). Health care workers causing large nosocomial outbreaks: a systematic review. BMC Infect Dis. 13(1):98.
22. Ott, E, Saathoff, S, Graf, K, Schwab, F and Chaberny IF (2013). The prevalence of nosocomial and community-acquired infections in a university hospital: an observational study. DtschArztebl Int.110(31–32):533.
23. Organization WHO (2018): Global guidelines for the prevention of surgical site infection. 2016. World Health Organization website http://www.who.int/gpsc/ssi-prevention-guidelines/en
24. Nejad SB, Allegranzi B, Syed SB, Ellis B, and Pittet D. (2011). Health-care-associated infection in Africa: a systematic review. Bull World Health Organ.89:757–65.
25. NobandeganiZinat, M, DoulatabadShahla, N, Masoumeh, R, and Ardeshir A. (2011). Surgical site infection incidence after a clean-contaminated surgery in YasujShahidBeheshti hospital. Iran Investigación y Educaciónen Enfermería. 29(3):435–441.
26. Lubega A, Joel B and Justina Lucy N. (2017). Incidence and aetiology of surgical site infections among emergency postoperative patients in Mbarara regional referral hospital. South Western Uganda Surgery Research and Practice 2017;
27. H., Manisha, Yapa., Till, Bärnighausen., Till, Bärnighausen. (2018). "Implementation science in resource-poor countries and communities.." Implementation Science, undefined doi: 10.1186/S13012-018-0847-1

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