ORIGINAL ARTICLE

Frequency of surgical site infections in clean and clean contaminated surgeries in Bahawal Victoria Hospital, Bahawalpur

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Abstract

Introduction: Post-operative SSIs are most common health care associated infections in surgical patients, occurring in up to 5% of surgical patients.

Objectives: "To determine frequency of Surgical Site Infections in clean & clean contaminated surgeries.

Study design: Descriptive, case series study.

Study duration: January 2017 to December 2017

Settings: Surgical ward IV, Bahawal Victoria Hospital, Bahawalpur.

Materials & Methods: A total of 198 patients undergoing major surgeries, 18 to 60 years of age of both genders were included. Patients with previously infected wound, Immunocompromized patients, re-explored, CRF and CLD were excluded. Patient's wound was inspected on daily basis from the day of operation till the day of discharge and then was followed for one month after surgery in outpatient department by the researcher himself.

Results: Mean age was 37.31±11.18 years. Out of the 198 patients, 143(72.22%) were male and 55(27.78%) were females with male to female ratio of 2.6:1. Surgical Site Infections was found in 21(10.61%) patients, whereas there was no Surgical Site Infections in 177 (89.39%) patients.

Conclusion: In our study Surgical site infection was found 10.61%.

Keywords: Surgical site infection, clean contaminated wound, contaminated wound, immunocompromized patients

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Introduction:

Surgical Site Infection (SSI) is an infection that occurs after surgery from incision up to within 30 days after an operation or within 1 year if an implant was placed.[1] Clinical presentation of surgical site infection varies from a spontaneous wound discharge within 7 to 10 days of an operation to a life-threatening postoperative complication.

A number of risk factors are known to increase the risk of SSIs. These include obesity, advanced age, diabetes mellitus, mal-nutrition, prolonged pre-operative stay, infection at a remote site, duration of surgery, surgical technique, presence of drains, inappropriate use of anti-microbial prophylaxis, peri-operative temperature, and poor post-operative glycemic control.[2] Many of these are beyond our control, but optimizing perioperative conditions can certainly help decrease infection risk.

In 2002, the centers for Medicare and Medicaid services collaborated with the centers for disease control and prevention to implement the national Surgical Infection Prevention project.[3] The project objectives were to improve prophylaxis that are known to reduce SSIs. The Surgical Infection Prevention project has been replaced by the Surgical Care Improvement project (SCIP), which incorporates anti-microbial prophylaxis measures plus additional measures to decrease SSIs and other factors associated with surgery morbidity and mortality.[4]

SCIP identifies 3 primary anti-microbial performance measures: appropriate antibiotic selection, administration of antibiotics within 1 hour of incision (exceptions are vancomycin and fluoro-quinolones), and discontinuation of prophylactic antibiotics within 24 hours of surgery end time.[4] In 2005, Bratzler and colleagues reported baseline results from the national Surgical Infection Prevention campaign.[5] The data at that time indicated that surgeons performed reasonably well by selecting an appropriate antibiotic in 92.6% of cases.

SSI is the major cause of morbidity and death in operated patients and it potentially increases the hospital stay and treatment expenses of the patient.[6] Post-operative SSIs are most common health care associated infections in surgical patients, occurring in up to 5% of surgical patients..[1,7] In USA, between 500,000 and 750,000 SSIs occur annually.[8,9]

The recommended anti-microbials for prophylaxis have been previously published. In most clean surgeries, cefazolin is an acceptable agent that provides coverage of most Gram-positive skin flora.[2,3,4] Alternative agents with anaerobic coverage are used during intra-abdominal and gynecological procedures, such as cefoxitin, cefotetan, ertapenem, metronidazole, ampicillin-sulbactam, and clindamycin.[6,8] In 1 of the few recent randomized comparative trials , ertapenem was compared with cefotetan prophylaxis in colorectal surgery.[10,11]

The most common pathogen associated with surgical site infections is Staphylococcus aureus. There has been a slow but progressive increase in the incidence of methicillin-resistant Staphylococcus aureus (MRSA) among hospitalized patients, with some surgeons expressing the desire to use vancomycin as a routine prophylactic agent.[12] Awad and colleagues[13] demonstrated a 77% recovery of S Staphylococcus aureus infection following surgical debridement in 288 patients with post-operative infections.

The aim of our study was to determine frequency of surgical site infections (SSI) in clean and clean contaminated surgeries in our population. Then based on the results of this study, some practical recommendations can be made in.

Operational Definitions:

1. Clean Cases: A case is called clean case if it includes all of them:
a. Uninfected wound, no signs of inflammation (red, hot, tender)
b. Respiratory, gastrointestinal and genitourinary tracts not explored.
c. Wound closed primarily.

2. Clean Contaminated Cases: A case is called clean contaminated if under vision; respiratory, gastrointestinal or genitourinary tract is explored and there is no unusual contamination.

3. Clean Wound: A wound is called clean wound if it includes all of them on local examination under vision:
a. No sign of inflammation (red, hot, tender, stitch tightening)
b. No pussy discharge from wound.
c. No pussy discharge on dressing.
d. No organism isolated from an aseptically obtained culture of fluid or tissue.

4. Infected Wound: A wound is called infected wound if it develops all or any of them on local examination under vision:
a. Signs of inflammation (red, hot, tender, stitch tightening)
b. Pussy discharge from wound with or without laboratory confirmation
c. Pussy discharge on dressing with or without laboratory confirmation.
d. Organisms isolated from an aseptically obtained culture of fluid or tissue.

5. Surgical Site Infection: Surgical Site Infection (SSI) is an infection that occurs after surgery at any point from incision to within 30 days after an operation.

Material & Methods:

Study Design: Descriptive, case series study.

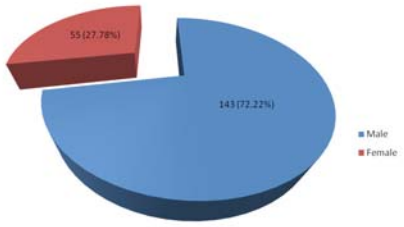

Figure. 1: Distribution of patients according to gender (n=198)

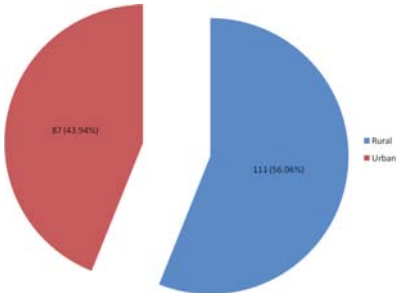

Figure. 2: Distribution of patients according to place of living (n=198)

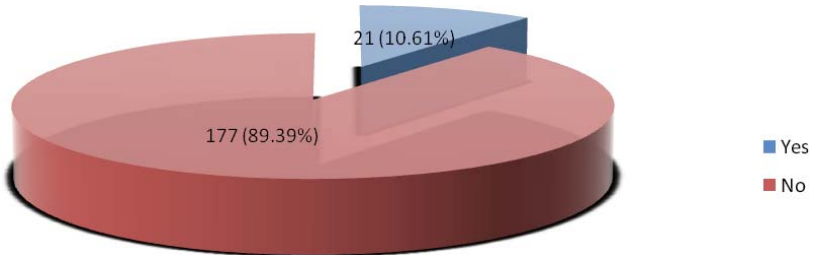

Figure. 3: Distribution of patients with Surgical Site Infections (n=198)

Setting: Surgical Ward IV, Bahawal Victoria Hospital, Bahawalpur.

Duration of study: January 2017 to December 2017

Sample size:

- Anticipated proportion = 7.6%
- Confidence level = 95%
- Precision required (d) = 0.037
- Sample size = 198
- Total 198 patients were included in the study.

Our sample technique, non-probability, consecutive sampling.

Sample selection:
Inclusion Criteria Clean & clean contaminated surgeries, First time operated patients, Male and female patients with age more than 18 years and less than 60 years.

b. Exclusion Criteria:

We have excluded those patients having previously infected wound, Male and female patients having age less than 18 years and more than 60 years, Re-explored, Immunocompromized patients (assessed on history and medical record), Patients taking steroids for last 1 month (assessed on medical record), Patients with chronic renal failure (assessed on history and s/creatinine >1.3 mg/dl), Patients with chronic liver disease (assessed on history and s/bilirubin >1.0 mg/dl).

Data cellection procedure: Study population is both male and female patients admitted in Surgical Ward IV, BVH, Bahawalpur between ages of 18 and 60 years. Patients operated by surgeons who have completed at least 3 years of residency under CPSP were included in the study. Patient biodata, diagnosis, type of surgery, wound properties and culture report were noted on a prescribed proforma. Surgical wounds were classified according to the Centre for Disease Control (CDC) classification.

Patient's wound was inspected on daily basis from the day of operation till the day of discharge and then was followed for one month after surgery in outpatient department by the researcher himself. The data of each patient was filled into a datasheet by the researcher. For patients who showed signs of SSI or any wound discharge, wound swabs were taken and sent to the laboratory for culture and antibiotic sensitivity. Culture time was 3 days.

No ethical issues found. Informed consent was taken in written.

Statistical Analysis: Data entry and analysis was done in IBM SPSS 20. Mean and standard deviation were calculated for age, height, weight and BMI. Frequency and percentage were calculated for gender, place of living (rural/urban), type of operation (clean/clean contaminated) and surgical site infections (yes/no). Comparison was

Table-1: Age distribution/ BMI of patients (n=198)

	Age (in years)	No. of Patients	%age	Mean ± SD
Age distribution	18-40	104	52.53	37.31±11.18 years
	41-60	94	47.47	
	BMI (in kg/m²)	**No. of Patients**	**%age**	**Mean ± SD**
BMI of patients	≤27	81	40.91	29.43 ± 4.29 kg/m²
	>27	117	59.09	

Table-2: Distribution of patients according to type of surgery (n=198)

Type of surgery	No. of Patients	%age
Clean	84	37.37
Clean contaminated	114	29.80

Table-3: Stratification of Surgical Site Infections with respect to age groups

	Surgical Site Infections		p-value
Age (years)	Yes	No	
18-40	11 (10.58%)	93 (89.42%)	0.989
41-60	10 (10.64%)	84 (89.36%)	

Table-4: Stratification of Surgical Site Infections with respect to gender

	Surgical Site Infections		p-value
Gender	Yes	No	
Male	12 (8.39%)	131 (91.61%)	0.103
Female	09 (16.36%)	46 (83.64%)	

Table-5: Stratification of Surgical Site Infections with respect to place of living

	Surgical Site Infections		p-value
Place of living	Yes	No	
Rural	11 (9.91%)	100 (90.09%)	0.719
Urban	10 (11.49%)	77 (88.51%)	

Table-6: Stratification of Surgical Site Infections with respect to place of living

	Surgical Site Infections		p-value
Type of surgery	Yes	No	
Clean	03 (13.51%)	81 (86.49%)	0.731
Clean contaminated	18 (10.17%)	96 (89.83%)	

Table-7: : Stratification of Surgical Site Infections with respect to BMI

BMI (kg/m2)	Surgical Site Infections		p-value
	Yes	No	
≤27	07 (8.64%)	74 (91.36%)	0.455
>27	14 (11.97%)	103 (88.03%)	

done between rates of SSI in clean and clean contaminated surgeries. Statistical significance was tested using chi-square test and P-value was set at <0.05.

Effect modifiers like age, gender, BMI, place of living and type of operation were controlled through stratification. Post-stratification chi-square test was applied and P-value was set at <0.05.

Results:

Age range in this study was from 18 to 60 years with mean age of 37.31±11.18 years. Majority of the patients 104 (52.53%) were between 18 to 40 years of age as shown in Table I. Out of the 198 patients, 143 (72.22%) were male and 55 (27.78%) were females with male to female ratio of 2.6:1 (Figure I). Distribution of patients according place of living and type of surgery are shown in Figure II and Table II respectively. Mean height was 156.29±12.53 cm and mean weight was 83.19±9.67 kg. Mean BMI was 29.43± 4.29 kg/m2 (Table I).

Surgical Site Infections was found in 21 (10.61%) patients, whereas there was no Surgical Site Infections in 177 (89.39%) patients as shown in Figure III.

When Stratification of Surgical Site Infections was done on age groups, it was found that there was no significant difference between different age groups as shown in Table III while the stratification of Surgical Site Infections with respect to gender has shown in Table IV which also showed no significant difference between male and female. Table V & VI have shown the stratification of Surgical Site Infections with respect to place of living and type of surgery respectively. Stratification of Surgical Site Infections with respect to BMI is shown in Table VII.

Discussion:

Surgical site infections are an important & major health care associated problem. It is the most frequent causes of post-operative morbidity and mortality. In developed countries, approximately 2% of surgeries are affected by SSIs. Although the rates of SSI are low in United States of America (USA) and European countries. World Health Organization (WHO) shows that SSIs are most frequently reported problem in low and middle-income countries (LMICs) with a pooled incidence of 11.8 episodes of SSI

per 100 surgical procedures.[14] we have conducted this study to determine frequency of Surgical Site Infections in Bahawal Victoria hospital.

Age range in this study was from 18 to 60 years with mean age of 37.31±11.18 years. Majority of the patients 104(52.53%) were between 18 to 40 years of age. Out of the 198 patients, 143(72.22%) were male and 55(27.78%) were females with male to female ratio of 2.6:1. Surgical Site Infections was found in 21(10.61%) patients, whereas there was no hyperglycemia in 177(89.39%) patients. A study conducted in March, 2011in Tanzania showed that overall Surgical Site Infection (SSI) rate was 7.6% of all operated cases. In clean surgeries it was 3.5% and in clean contaminated surgeries it was 8.7%. Superficial SSIs constituted 61.1%, while deep SSI constituted 27.8% and organ/space 11.1%.[10]

In a study on 250 patients, surgical site infection (SSI) was found in 65(26.0%) patients, of whom 56(86.2%) and 9(13.8%) had superficial and deep SSI respectively. The rate of SSI was 21.24%, 43.48% and 36.36% in clean, clean -contaminated and contaminated wounds respectively.[15] In a meta-analysis,[16] the average incidence of SSI in mainland China was 4.5% (95% CI: 3.1–5.8) from 2001 to 2012 and has decreased significantly in recent years. The remote western regions had a higher incidence of 4.6% (95% CI: 4.0–5.3). The most common surgical procedure was abdominal surgery (8.3%, 95% CI: 6.5–10.0). SSI occurred frequently in the elderly (5.1%, 95% CI: 2.2–8.0), patients confined to hospital for over 2 weeks (5.7%, 95% CI: 0.9–10.0), superficial incision wounds (5.6%, 95% CI: 4.4–6.8), dirty wounds (8.7%, 95% CI: 6.9–10.6), operations lasting for over 2 hours (7.3%, 95% CI: 4.9–9.7), general anaesthesia operations (4.7%, 95% CI: 2.7–6.6), emergency surgeries (5.9%, 95% CI: 4.2–7.7), and non-intra-medication operations (7.4%, 95% CI: 1.0–13.7).[16]

In another study, the overall infection rate was 8.95%. Surgical site infection rate was 3.03% in clean surgeries and 22.41% in clean-contaminated surgeries.[17] The SSI rate among the 720 patients investigated was 5%.

Risk factors for SSI identified were as follows:
Severity of disease (P = .001),
Presence of drains (P = .020),
History of previous hospitalization (P = .003),
Pre-operative stay (P = .005),
Wound classification (P < .001), and
Surgical duration (P < .001)

Independent risk factors identified included:
Wound classification (odds ratio ¼ 4.525; P < .001) and
Surgical duration (odds ratio = 2.554; P = .015)[18]

In another study, a total of 1,387 patients were included with a mean age of 35±14 years and 1,138(82%) were females. The rate of wound infection was found to be 9%. The majority of the infected wounds 120(96%) were superficial and only 5(4%) were deep incisional.[19] Uni-variate analysis revealed that five variables were significantly associated with the prevalence of wound infection; namely patient's body mass index (P=0.041), co-morbidity (P=0.006), presence of diabetes (P=0.010), ASA score (P<0.0001) and laparoscopic surgical technique (P=0.007). The rate of wound infection after clean–contaminated operations was 9.5%. It was low when compared with the rate of infection of 17.8% and 19.4% that was respectively.[18,19]

Classifying wounds by the degree of contamination is a dying practice. Haley demonstrated that the wound infection rate in clean cases to vary from 1% to 16%[20] and this led to Nicolls comment that although unproven, the greatest risk factor for post-operative infection appears to be the patients themselves'. This implies that as long as the traditional practice of adequate patient preparation is in place, the patient factors are predictive of subsequent SSI's. But one should not dismiss that the degree of wound contamination as inconsequential to subsequent SSI development.[21,22]

Conclusion:
This study concluded that rate of surgical site in-

fections was 10.61% which is quite high. So, we recommend that some practical recommendation should be done for preventing and managing these surgical site infections.

Conflict of interest: None

Funding source: None

Role and contribution of authors:

Dr Fayyaz Ahmad, collected the data and references and did the initial write up.

Dr Ahmad Yar, collected the data and refernecnes, went through the article, and made some changes

Dr Sheikh Atiq-ur-Rehman, critically review the article and did changes

Dr Zulfiqar Anjum, critically review the article and made the final changes

Dr Aqeel Ahmad, helped in collecting the data and references and helped in discussion writing.

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