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A study on incidence of early surgical site infections in postoperative orthopaedic cases

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Abstract
Background: Surgical site infection (SSI) has always been a major complication of surgery and trauma and has been documented for 4000-5000 years. The present study analysed the various organisms causing infections and to study the incidence of surgical site infections in postoperative orthopaedic cases in tertiary care hospital in India.
Materials & Methods: The present study comprised of 100 orthopaedic cases of both genders in the department of Orthopaedics at a tertiary care centre. Patients with wound infection (pain or tenderness, localized swelling, redness or heat), a sample was taken of surgical site and transported to the microbiology laboratory for culture. Any surgical site infection (increased tempt, redness, discharge, suture gaping, and Southampton wound scoring system) was recorded. Follow up on post op day 3, 6, 14 and 30 days was performed. Southampton wound grading system was followed.
Results: Open reduction internal fixation surgeries were performed the most (22%), followed by plating (20%), dynamic hip screw placement (14%) and fixation by nailing (10%). Arthroplasty and tendon repair were done in 8% patients each. Fixation using proximal femoral nail, total knee replacement and total hip replacement were done in 7%, 6% and 5% patients respectively. SSI positive was seen among 14% and SSI negative in 86%.
Conclusion: The incidence of SSI in orthopaedics and trauma patients was comparable with the reported incidence in the literature.

Keywords: Surgical site infection, trauma, wound, post-operative cases

Introduction
The infection of a wound can be defined as the invasion of organisms through tissues following a breakdown of local and systemic host defences, leading to cellulitis, lymphangitis, abscess and bacteraemia [1]. Surgical site infection (SSI) has always been a major complication of surgery and trauma and has been documented for 4000-5000 years. Galen recognized that localization of infection in wounds, inflicted in the gladiatorial arena, often heralded recovery [2]. The understanding of the causes of infection came in the 19th century. Microbes had been seen under microscope, but Koch laid down the first definition of infective disease known as Koch's postulates [3]. Koch's postulates providing the agency of an infective organism: it must be found in considerable numbers in the septic focus, it should be possible to culture it in a pure form from that septic focus and it should be able to produce similar lesions when injected into another host. Louis Pasteur recognized that micro-organisms were responsible for spoiling wine, turning it into vinegar [4, 5].
Surgical Site Infections (SSIs), previously called post-operative wound infections, result from bacterial contamination during or after a surgical procedure [6]. Surgical site infections are the third most common hospital associated infection, accounting for 14-16 per cent of all infections in hospitalized patients. Among surgical patients, surgical site infections are the most frequent cause of such infections, accounting for 38 per cent of the total infections [7, 8]. Hence, current study is undertaken to analyse the various organisms causing infections and to study the incidence of surgical site infections in postoperative orthopaedic cases in tertiary care hospital in India.

Materials and Methods

The present study comprised of 100 orthopaedic cases of both genders in the department of Orthopaedics at a tertiary care centre. The consent was obtained from all patients. Duration of study was 08 months (06 months for data collection and 02 months for data analysis). Inclusion criteria was all orthopaedic cases operated at institute. Exclusion Criteria were cases operated at other hospitals, open fractures and cases of septic arthritis/ osteomyelitis.

Data such as name, age, gender etc. was recorded. All surgery patients were interviewed and daily observed during their hospitalization. When patient faced to clinical suspicion of wound infection (pain or tenderness, localized swelling, redness or heat), a sample was taken of surgical site and transported to the microbiology laboratory for culture. Also, post discharge patients who reported any of the symptoms of wound infection were asked to return to the hospital for re-examination.

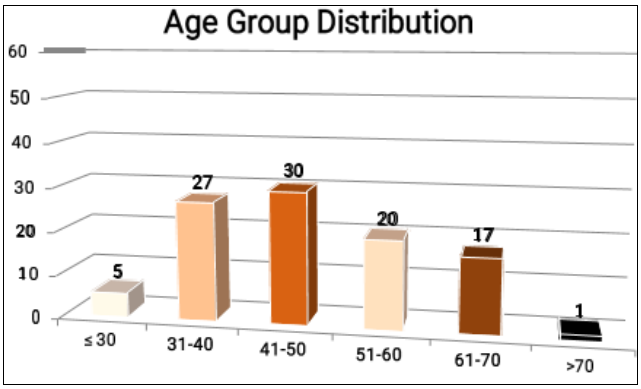
Post-operative management consisted of intravenous fluids/Antibiotics/Analgesics/Blood transfusion/immobilization/date of first dressing/ date of second dressing/date of suture removal/complications/active. Any surgical site infection (increased tempt, redness, discharge, suture gaping, and Southampton wound scoring system) was recorded. Follow up on post op day 3, 6, 14 and 30 days was performed. Southampton wound grading system was followed. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table 1: Distribution of patients

	Total- 100	
Gender	**Male**	**Female**
Number	60	40

Table 1 shows that there were 60 males and 40 females



Graph 1: Age wise distribution

Graph 1 shows that out of 100 patients studied, majority belonged to age group 41 to 50 years old (30%) followed by 27% from age group 31 to 40 years old. 20% patients were seen in age group 51 to 60 years old. 17% patients were seen in age group 61 to 70 years old. 5% patients were less than 30 years old. 1% patients were found in age group more than 70 years old. The difference was significant (P<0.05).

Table 2: Distribution of personal history

Personal history	Number	P value
Smoking	44	0.05
Prophylactic use of antibiotics	63	

Table 2 shows that there was history of smoking in 44 and prophylactic use of antibiotics in 63. The difference was significant (P<0.05).

Table 3: Site of injury

Site of injury	No. of patients (N=100)	Percentage (%)
Hand	10	10
Humerus	3	3
Shoulder	6	6
Knee	15	15
Femur	8	8
Hip	17	17
Pelvic	10	10
Ankle	6	6
Foot	2	2
Tendon repair	8	8
Multiple	8	8
Total	100	100

Table 3 shows that major site of injury was hip (17%), followed by knee (15%). 10% injuries each were spotted in hand, pelvic region. Femur and tendons had 8% each of all injuries. Ankle and shoulder had 6% each injuries. 3% injuries were received on humerus. Foot injuries comprised of 2% of all injuries. 8% patients had multiple fractures/ multiple site injuries.

Table 4: Type of surgery performed

Surgery performed	No. of patients (N=100)	Percentage (%)
Arthroplasty	8	8
Dynamic hip screw	14	14
Nailing	10	10
Open reduction internal fixation	22	22
Proximal femoral nail	7	7
Plating	20	20
Tendon repair	8	8
Total hip replacement	5	5
Total knee replacement	6	6

Table 4 shows that Open reduction internal fixation surgeries were performed the most (22%), followed by plating (20%), dynamic hip screw placement (14%) and fixation by nailing (10%). Arthroplasty and tendon repair were done in 8% patients each. Fixation using proximal femoral nail, total knee replacement and total hip replacement were done in 7%, 6% and 5% patients respectively.

Table 5: Distribution of wound details

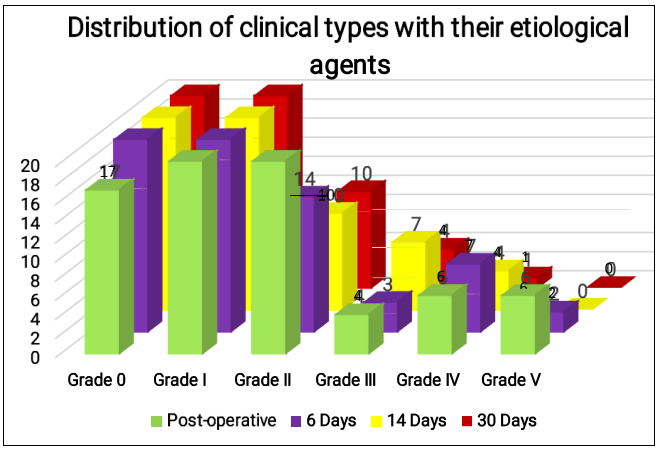
Chief complaints	Number	Percentage (%)
Increased temperature	19	19
Redness	14	14
Suture gaping	8	8
Pus discharge	12	12
No complications	46	46
Total	100	100

Table 5 shows that post-operatively few patients developed complications. Out of 100 patients studied, 19 patients (19%) had increased local temperature around wound and 14 patients (14%) had redness. Eight patients (8%) suffered from suture gaping and 12 patients (12%) complained of pus discharge from wound.

Table 6: Surgical site infection

Parameter	No. of patients (N=100)	Percentage (%)
SSI Positive	14	14
SSI Negative	86	86

Table 6 shows that SSI positive was seen among 14% and SSI negative in 86%.



Graph 2: Distribution based on Southampton wound grading

Graph 2 shows that Southampton wound grading system was used to analyse progress of wound healing. Post-operatively six wounds were grade V, which improved to two wounds on day six and no grade V wound on day 14 and 30. Six grade IV wounds were seen post-operatively, which increased to seven wounds on day 6 follow up and subsequently decreased to four and one grade IV wound on day 14 and 30 days follow up. Similarly, grade 0 wounds improved from 17 wounds post-operatively to 27 wounds, 35 wounds and 47 wounds at day 6, 14 and day 30 follow up respectively.

Discussion

A surgical site infection is an infection within 30 days if no implant is left in place, or within 12 months of surgery if an implant is left in place after the operation that occurs in the part of the body where the surgery took place [9]. Superficial surgical site infections can involve the skin and subcutaneous only. Deep surgical site infections are more serious and can involve tissues under the skin, organs, or implanted material [9, 10]. Infection is confirmed by at least one of the following: Purulent drainage with or without laboratory confirmation, from the superficial incision or organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision. Also, at least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness, or heat should be existed.[12] Surgical Site infections are a common cause of nosocomial infection, accounting for 38 percent of nosocomial infections. Overall risk of SSI is 2–5% percent of the more than 30 million patients undergoing surgical procedures each year. SSIs are associated with substantial morbidity and mortality, prolonged hospital stay, and increased patient cost [13].

Our study similar to the literature showed that SSI was more common in patients of over 50 years of age. Data from the United Kingdom quantify the impact of being overweight or obese on the risk of infection in knee and hip replacement, with elevation in SSI rates from 0.4% to 1% [14]. In our study incidence of SSI in patients with high BMI was developed from 2.8% to 7%. The other independent risk factors for patients developing Orthopaedic SSI included an emergency operation and prolonged surgery and hospitalization.

One hundred cases operated under Department of Orthopaedics, formed the study population. The incidence of surgical site infections in our study was 14%. In our study male predominance was seen in terms of fracture distribution. Males posted for surgery with various fractures were 60% while females suffering from the same were 40%. Male to female ratio was 1.5:1. Mean age was found to be 47.51 ±10.9 years. Majority of cases belonged to age group 41 to 50 years old (30%); followed by 27% from age group 31 to 40 years old. Almost half of study population was overweight (49%). 41% patients were normal with reference to BMI and 9% patients were obese. 44% patients gave positive history of smoking and 63% patients affirmed using antibiotics prophylactically. 52 patients had comorbidities like DM, hypertension and anemia.

In study by Rabeul Karim [15] age of 140 patients ranged from 13-65 years were included. Most of the patients (125, 89.29%) were in between 10-49 years; with mean age 32.93 years and standard deviation 3.79 years. It was revealed that among 140 patients 24 (17.14%) developed surgical site infection (SSI). Overall rate of SSI was 17.14%.

Surgical site infections are considerable problem in orthopaedic patients. Our infection rate was quite high and needs proper measures to control it because it had great financial burden on patient and on hospital resources and could lead to increase morbidity and mortality in patients.

There are some limitations of the study. It covered a period of only 6 months and thus may not account for seasonal variations. Since the number of patients included in the study was relatively small, the power of the study was not great enough to estimate the effect of less frequent variables-therefore, investigation performed on a larger number of patients would be desirable.

Conclusion

Authors found that this study shows that the incidence of SSI in Orthopedics and trauma patients was comparable with the reported incidence in the literature. We believe that development of SSI is a complex process, which is dependent on several different factors related to the patient, the surgical environment (such as the ICU), staff involvement, and finally the surgical technique. We were able to identify the areas that need to be addressed to further reduce the incidence of SSI in our patients.

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