Original Research Article

# The prevalence of postoperative wound infection in orthopaedic surgery at MGM medical college and hospital

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## Abstract

**Background:** Infection at the surgical site can be catastrophic in those who have undergone orthopaedic surgery, as it can result in a lengthier hospital stay and other complications. In terms of mortality and morbidity, there is a significant burden on the health-care system and patients. Surgical site infections are the second most common hospital acquired disease, after silent bacteriuria. **Methods:** The research was carried out at M.G.M. Medical College and L.S.K. Hospital's orthopaedic department. From July 2019 to July 2020, the study period. The study involved 100 participants who underwent elective orthopaedic surgery. The prevalence of postoperative wound infections and the impact on orthopaedic surgeries by assessing the efficacy of preoperative and postoperative systemic antibiotic use, as well as the role of sterile measures such as scrub suits, masks, sterile gloves, gowns, drapes, and operating room environments. **Results:** Total of 100 patients were enrolled for this study, out of 100 cases, 7 cases were found to have infection at the operative site on postoperative day 5. The overall incidence in this study was 7 %. We have found the significant negative Correlation between time of antibiotic administration and Pre-Operative stay, the r value was -.397** and p value was <0.0001. **Conclusion:** In addition, many surgical techniques are not standard, and a wide range of perioperative situations will need variations from established preventive regimens. Prophylactic antibiotic regimens should be offered for a wide range of surgical operations, according to my prospective investigation of antibiotic prophylaxis. The types of harmful microorganisms and the level of antibiotic resistance differed greatly between hospitals.

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## INTRODUCTION

Many factors influence surgical wound healing and influence both the risk of infection and the rate of infection.[1] The most significant risk factor is the amount of bacterial load,[2] but this risk has been reduced due to modern surgical methods and the use of prophylactic antibiotics. Many studies have published infection rates in the four surgical classes (clean, clean-contaminated, contaminated, and unclean wounds), however the majority of the literature uses Cruse and Foord's work as a baseline for infection rates.[3] Prior to the widespread use of prophylactic antibiotics, infection rates for clean wounds were 1-2%, 6-9% for clean-contaminated wounds, 13-20% for contaminated wounds, and over 40% for dirty wounds.[4] Infection rates have reduced considerably in the most contaminated groups after the introduction of routine prophylactic antibiotic use. In the US National Nosocomial Infection Surveillance (NNIS) system hospitals, infection rates of clean 2.1 percent, clean-contaminated 3.3 percent, contaminated 6.4 percent, and unclean 7.1 percent were documented.[5] However, there is a lot of variation in each class depending on the type of operation performed.[6] The surgical technique used can affect infection rates in a variety of ways, including skin preparation, shaving, and wound closure. The skin is colonised by a variety of bacteria, but Staphylococcus aureus accounts for up to

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50% of them. As a result, preoperative preparation is required. Preoperative chlorhexidine washes have been shown to lower the bacterial count on skin by 80-90 percent, resulting in reduced preoperative wound contamination.[7] The effect on SSI incidence, on the other hand, has been more difficult to demonstrate, and it is possible that prolonged washing releases organisms from deeper layers of the skin.

## MATERIALS AND METHODS

**Type of Study:** a prospective study.
**Place of Study:** Study conducted in the department of orthopaedics, M.G.M. Medical College and Hospital.
**Study Period:** From July 2019 to July 2020.
**Study Population:** The study involved 100 participants who underwent elective orthopaedic surgery. The incidence of postoperative wound infections and the impact on orthopaedic surgeries by evaluating the efficacy of preoperative and postoperative systemic antibiotics, the role of sterile measures such as scrub suits, masks, sterile gloves, gowns, drapes, and operating room environments in reducing surgical site infection, and assessing the efficacy of surgical asepsis (that is, surgeons hand scrub, antibiotics used prior to surgery)
**Inclusion criteria:** Patients above the age of 18 years• Elective surgeries (major or minor procedures).

**Criteria for exclusion**

- Immune deficiency,
- Patients on long-term corticosteroids,
- Patients undergoing immunosuppressive therapy,
- Patients with open fractures requiring external fixation devices

**In the operating room, aseptic precautions are taken.**
All conventional aseptic protocols, including the use of autoclaved gowns, drapes, sterile gloves, and equipment, were followed. A routine surgical scrub was performed for 5 minutes before to the operation.
During the procedure, the incision site was painted with spirit and 5% povidone iodine. Surgical concepts such as minimising tissue manipulation and ensuring proper haemostasis were followed in all patients. Drains were employed when they were required. To close the incision, suture material or skin staples were utilised. The suture/staples were treated with betadine ointment or Neosporin ointment before being covered with an adhesive bandage.
Injection Ceftriaxone was continued throughout the postoperative phase. The wound was inspected for signs of infection beginning on the third day and continuing until the,8 12th post-operative day. Patients were kept under observation until they were discharged. For patients who satisfied any of the criteria for wound infection, a wound sample was sent to the clinical microbiology laboratory for routine culture operations.
Data were reviewed for accuracy and completeness before being coded and entered into (Statistical Package for the Social Sciences) version 19.0 for analysis. The findings are displayed in frequency tables, cross tabulations, and figures. Categorical data is shown as a frequency distribution with percentages. Continuous data with a normal distribution are displayed as a mean with standard deviation. To determine the significance of research parameters on a categorical scale between two groups, the t test and the Chi-square test were utilised. P-values less than 0.05 were considered significant.

## RESULTS

**Table 1:** Distribution of surgical site infection among study population(n=100)

| Surgical site infection | No of cases | Percentage |
|---|---|---|
| Present | 07 | 07 |
| Absent | 93 | 93 |
| **Total** | **100** | **100** |

We have found in table **No1.** Total of 100 patients were enrolled for this study, out of 100 cases, 7 cases were found to have infection at the operative site on postoperative day 5. The overall incidence in this study was 7 %.

**Table 2:** Incidence of Age.

| Age group | SSIs Absent(n=93) | | SSIs Present(n=07) | | Total (n=100) | |
|---|---|---|---|---|---|---|
| | No | % | No | % | No | % |
| 18-20 | 31 | 100 | 00 | 0.00 | 31 | 100.0 |
| 21-40 | 30 | 96.8 | 01 | 3.2 | 31 | 100.0 |
| 41-60 | 24 | 85.7 | 04 | 14.3 | 28 | 100.0 |
| >61 | 08 | 80.0 | 02 | 20.0 | 10 | 100.0 |
| Total | 93 | 93.0 | 07 | 7.0 | 100. | 100.0 |
| Mean and SD Value | 38.45±12.21 | | 52.00±14.32 | | 39.45±12.32 | |
| p Value | 0.245(NS) | | | | | |

It was found incidence in relation to age the maximum number of cases had postoperative infection present among 41-60 years of age group i.e. 4(14.3%) out of 28 cases. And another 1 case present in group 21-40 years and >60 years of age 2 cases were found, respectively. The mean age of SSIs absent group was 38.45±12.21and SSIs present was 52.00±14.32, the average mean age of both groups was 39.45±12.32. There was no significant different in age, p value was 0.245.

**Table 3:** Incidence in Gender

| Sex | SSIs Absent | | SSIs Present | | Total (n=100) | |
|---|---|---|---|---|---|---|
| | No | % | No | % | No | |
| Male | 65 | 97.0 | 02 | 3.0 | 67 | 100.0 |
| Female | 28 | 84.8 | 05 | 15.2 | 33 | 100.0 |
| Total | 93 | 93.0 | 07 | 7.0 | 100 | 100.0 |
| Statistical Analysis | Chi-square- 5.0273<br>P Value- 0.024(S) | | | | | |

Incidence in relation to sex females was predominantly high in SSIs present cases. i.e. 15.2%(5 cases). Whereas male were 3.0 %(2 cases) respectively. In between the groups the chi-square value was 5.0273 and p value was 0.024(S).

**Table 4:** Incidence in relation to hospital stay.

| Hospital stay | SSIs Absent | | SSIs Present | | p Value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| Pre-operative Stay | 4.22 | ±0.84 | 1.45 | ±0.45 | 0.04 |
| Post- Operative stey | 8.75 | ±2.33 | 17.45 | ±3.44 | 0.01 |

The mean pre-operative stay in the SSIs Absent group was 4.22±0.84 days, compared to 1.45±0.45 days in the SSIs Present group, which is statistically significant (p<=0.04).

In contrast, the SSIs present group spent more time in the hospital than the SSIs absent group. In both groups, the mean and SD value of hospital stay were 17.45±3.44 and 8.75±2.33, respectively, which were statistically significant. 0.01 was the p value.

**Table 5:** Correlation between time of antibiotic administration and Pre-Operative stay.

| Correlations | PRE –OPERATIVE STAY | ANTIBIOTIC ADMINISTRATION |
|---|---|---|
| Pearson Correlation | 1 | -.397** |
| p Value | | <0.0001 |
| No cases | 100 | 100 |

**. Correlation is significant at the 0.01 level (2-tailed).

We have found the significant negative Correlation between time of antibiotic administration and Pre-Operative stay, the r value was -.397** and p value was <0.0001.

**Table 6:** Correlation between time of antibiotic administration and Post-Operative stay.

| Correlations | POST –OPERATIVE STAY | ANTIBIOTIC ADMINISTRATION |
|---|---|---|
| Pearson Correlation | 1 | .821** |
| p Value | | <0.0001 |
| No cases | 100 | 100 |

**. Correlation is significant at the 0.01 level (2-tailed).

We have found the significant positive Correlation between time of antibiotic administration and Post-Operative stay, the *r* value was .821** and p value was <0.0001.

**Table 7:** Organism Isolated.

| Organism Isolated | No of Cases | Percentage |
|---|---|---|
| *Staphylococcus aureus* | 04 | 57.1 |
| *E. Coli* | 03 | 42.9 |
| **Total** | **07** | **100** |

The surgical site infection findings of gram positive and gram negative bacteria was isolated 3 (42.9%) cases had *E. Coli* and 4 (57.1%) cases had *Staphylococcus aureus* respectively.

**Table 8:** Sensitivity pattern of gram positive bacteria

| Antimicrobial agents | *Staphylococcus aureus (n=4)* | | |
|---|---|---|---|
| | S | I | R |
| Gentamycin (GEN) | 4 | 0 | 0 |
| Nitrofurantion (NIT) | 2 | 2 | 0 |
| Ciprofloxacin (CIP) | 0 | 0 | 4 |
| Teicoplanin (TEI) | 0 | 4 | 0 |
| Cefoxitin (CX) | 0 | 2 | 2 |
| Tetracyclin(TE) | 2 | 4 | 0 |
| Vancomycin (VA) | 4 | 2 | 0 |
| Piperacillin | 6 | 0 | 0 |
| Tazobactam | 6 | 0 | 0 |

**S**= SENSITIVE. **I**= INTERMEDIATE. **R**= RESISTANT

This was done by the KIRBY-BAUER Disc Diffusion Method according to the Clinical Laboratory Standards Institute (CLSI guide lines)

**Table 9:** Sensitivity pattern of gram negative bacteria.

| Antimicrobial agents | *Escherichia coli (n=3)* | | |
|---|---|---|---|
| | S | I | R |
| Gentamycin (GEN) | 1 | 2 | 0 |
| Nitrofurantion (NIT) | 1 | 2 | 0 |
| Ciprofloxacin (CIP) | 2 | 0 | 0 |
| Amoxy+Clavulanic (AMX) | 0 | 0 | 3 |
| Imipenem (IPM) | 3 | 0 | 0 |
| Amikacin (AK) | 1 | 2 | 0 |
| Co-Trimoxazole (COT) | 2 | 0 | 1 |
| Ceftazidime (CAZ) | 0 | 0 | 3 |
| Cefepime | 2 | 0 | 1 |
| Piperacillin | 3 | 0 | 0 |
| Tazobactam | 3 | 0 | 0 |

**S**= SENSITIVE. **I**= INTERMEDIATE. **R**= RESISTANT

This was done by the KIRBY-BAUER Disc Diffusion Method according to the Clinical Laboratory Standards Institute (CLSI guidelines)

## DISCUSSION

According to the current study, surgical site infections occur at a rate of 6.0 percent. The presence of more people in the operating room, contaminated or filthy wounds, and dirty wounds were all found to be independent risk factors for surgical site infections. It was discovered that the highest number of cases had postoperative infection present among 41-60 year olds, i.e. 4 (14.3 percent) out of 28 cases. In addition, 1 case was detected in the 21-40 year age group, and 2 instances were found in the >60 year age group. The mean age of the SSIs absence group was 38.4512.21, and the mean age of the SSIs present group was 52.0014.32, for a total mean age of 39.4512.32. There was no statistically significant difference in age, with a p value of 0.245. In SSIs present cases, the incidence of sex females was disproportionately high. 15.2 percent, to be exact (5 cases). Males made up 3.0 percent of the total (2 cases). The chi-square value between groups was 5.0273, and the p value was 0.024. (S). The incidence rate in our study was higher than that of orthopaedic patients in wealthy countries,[8,9] but also higher than that of some emerging countries. The CDC classified 50% of cases as Class-II (Clean and Contaminated), while 25% were classified as Class-I and Class-III. Other investigations reported higher rates of infection stratified by wound class.[10] In our study, dirty, unclean, and trauma-related wounds may have contributed to surgical site infections. Increased surgical site infection rates in clean wounds, on the other hand, can be attributed to a lack of financial resources, antiquated equipment, inadequate operating room ventilation, and infection control measures. Despite the fact that several studies revealed no link between the NNIS index and surgical site infections, many nations utilise it as a predictor of surgical site infections.[11] Our investigation found a robust link between the NNIS score and surgical site infections. The average pre-operative stay in the SSIs Absent group was 4.220.84 days, compared to 1.450.45 days in the SSIs Present group, which was statistically significant (p=0.04). The SSIs present group, on the other hand, spent longer time in the hospital than the SSIs absent group. The mean and SD values of hospital stay in both groups were 17.453.44 and 8.752.33, respectively, which were statistically significant. The p value was 0.01. The bulk of surgical site infections are caused by the growing trend of short-stay hospitalization.[12] When compared to the SSIs lacking group, the current group took the longest to operate. This compares to 147.50 minutes for the current set of SSIs. SSIs were absent for 72.45 minutes. We discovered significant differences amongst the subjects. P 0.004. Previous research found that Staphylococcus aureus and gram-negative bacteria were the most prevalent causal agents.[10] While mupirocin was successful in lowering Staphylococcus aureus nasal carriage, it did not diminish surgical site infections.[13] Gram positive and gramme negative bacteria were recovered from surgical sites in three (42.9 percent) of the cases. Staphylococcus aureus was found in 4 (57.1 percent) of the cases. Increased operating room population can raise surgical site infection rates by 1.5 to 3.8 times.[14] Our operating rooms are old and poorly ventilated. Because air is a primary source of infection transmission, ultra-clean air systems and exhaust-ventilated clothes are recommended in joint prosthesis surgeries. Reducing the number of people in the operating room, for example, may have a similar effect. The standard wound categorization, as demonstrated in our study, is an important predictor of surgical site infection. The ASA score is well established to be a powerful predictor of surgical site infection, and our findings are consistent with previous research.[15] The most recent study verified the well-known fact that shaving can raise infection risk, and the CDC advised against shaving before or shortly before surgery, preferably with electric clippers.[16] Our findings support previous research indicating that an infection following surgery lengthens inpatient stay.[17] There are some faults in the study. Because of its short lifespan, it may not account for seasonal fluctuations. The demographics of the hospital population (such as age) may change over the winter. A single phone contact within 30 days of the procedure may not be enough to monitor surgical site infections. We infer that the number of postoperative surgical site infections was low because the median total hospital stay was 28 days, as postoperative infections normally emerge within 4 weeks of surgery. Because of the limited patient group, the study's power was insufficient to determine the influence of less prevalent traits; thus, a larger patient population would be preferable.

## CONCLUSION

Many surgical procedures and postoperative situations need deviating from standard preventive regimens. Preoperative infections of non-wound locations, penicillin or cephalosporin allergy, trauma and other emergency surgeries, and preoperative infections of non-wound sites may all influence the decision and duration of perioperative prophylaxis. There are no studies that can assist in these situations. Surgical wound care and antimicrobial prophylaxis necessitate ongoing monitoring of prophylaxis failures and perioperative data changes.

## REFERENCES


1. Buggy D. Can anaesthetic management influence surgical-wound healing? Lancet 2000; **356**(9227): 355-7.
2. Berard F, Gandon J. Postoperative wound infections: the influence of ultraviolet irradiation of the operating room and of various other factors. Ann Surg 1964; **160**(Suppl 1): 1-192.
3. Cruse PJ, Foord R. The epidemiology of wound infection. A 10-year prospective study of 62,939 wounds. Surg Clin North Am 1980; **60**(1): 27-40.
4. Cruse PJE. Classification of operations and audit of infection. In: Taylor EW, editor. Infection in Surgical Practice. Oxford: Oxford University Press, 1992; 1-7.
5. Culver DH, Horan TC, Gaynes RP, Martone WJ, Jarvis WR, Emori TG, et al. Surgical wound infection rates by wound class, operative procedure, and patient risk index. National Nosocomial Infections Surveillance System. Am J Med 1991; **91**(3B): 152S-157S.
6. Ferraz EM, Bacelar TS, Aguiar JL, Ferraz AA, Pagnossin G, Batista JE. Wound infection rates in clean surgery: a potentially misleading risk classification. Infect Control Hosp Epidemiol 1992; **13**(8): 457-62.
7. Byrne DJ, Phillips G, Napier A, Cuschieri A. The effect of whole body disinfection on intraoperative wound contamination. J Hosp Infect 1991; **18**(2): 145-8.
8. Lecuire F, Gontier D, Carrere J, Giordano N, Rubini J, Basso M. Ten-year surveillance of nosocomial surgical site infections in an orthopedic surgery department. Rev Chir Orthop Reparatrice Appar Mot. 2003;89:479–86.
9. Kasatpibal N, Jamulitrat S, Chongsuvivatwong V. Standardized incidence rates of surgical site infection: a multicenter study in Thailand. Am J Infect Control. 2005;33:587–94. doi: 10.1016/j.ajic.2004.11.012.
10. Thu LT, Dibley MJ, Ewald B, Tien NP, Lam LD. Incidence of surgical site infections and accompanying risk factors in Vietnamese orthopaedic patients. J Hosp Infect. 2005;60:360–7.
11. Campos ML, Cipriano ZM, Freitas PF. Suitability of the NNIS index for estimating surgical-site infection risk at a small university hospital in Brazil. Infect Control Hosp Epidemiol. 2001;22:268–72.
12. Taylor EW, Duffy K, Lee K, Noone A, Leanord A, King PM, et al. Telephone call contact for post-discharge surveillance of surgical site infections. A pilot, methodological study. J Hosp Infect. 2003;55:8–13.
13. Kalmeijer MD, Coertjens H, van Nieuwland-Bollen PM, Bogaers-Hofman D, de Baere GA, Stuurman A, et al. Surgical site infections in orthopedic surgery: the effect of mupirocin nasal ointment in a double-blind, randomized, placebo-controlled study. Clin Infect Dis. 2002;35:353–8.
14. Pryor F, Messmer PR. The effect of traffic patterns in the OR on surgical site infections. AORN J. 1998;68:649–60. doi: 10.1016/S0001-2092(06)62570-2.

15. Soleto L, Pirard M, Boelaert M, Peredo R, Vargas R, Gianella A, et al. Incidence of surgical-site infections and the validity of the National Nosocomial Infections Surveillance System risk index in a general surgical ward in Santa Cruz, Bolivia. Infect Control Hosp Epidemiol. 2003;24:26–30.
16. Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR. Guideline for prevention of surgical site infection, 1999. Hospital Infection Control Practices Advisory Committee. Infect Control Hosp Epidemiol. 1999;20:250–80.
17. Vegas AA, Jodra VM, García ML. Nosocomial infection in surgery wards: a controlled study of increased duration of hospital stays and direct cost of hospitalization. Eur J Epidemiol. 1993;9:504–10.

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