ejpmr, 2020,7(6), 840-844

SJIF Impact Factor 6.222

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article
ISSN 2394-3211
EJPMR

PREVALENCE OF SURGICAL SITE INFECTION IN ORTHOPEDIC SURGERY: A 3-YEAR ANALYSIS IN BANGLADESH

Malay Kumar Saha*[1], Md. Zakir Hossain[2], Joyosree Paul[3], Chitta Ranjan Debnath[4], Mohammad Jahangir Alam[5] and Md. Rezaul Karim[6]

[1]Associate Professor, Unit Chief, Department of Orthopaedic Surgery, MBBS, D-Ortho, MS-Ortho, Mymensingh Medical College, Mymensingh, Bangladesh.
[2]Associate Professor and Classified Specialist, Dept. of Otolaryngology & Head-Neck Surgery, MBBS, MCPS, DLO, FCPS, FACS (USA), FRCS (Glasg), Central Medical Board and Combined Military Hospital, Dhaka Cantonment, Dhaka, Bangladesh.
[3]Medical Officer (OPD), Mymensingh Medical College Hospital, Mymensingh, Bangladesh.
[4]Principal & Professor, Department of Hepatology, Mymensingh Medical College, Mymensingh.
[5]Professor, National Institute of Traumatology and Orthopaedic Rehabilitation, Dhaka, Bangladesh.
[6]Associate Professor, National Institute of Traumatology and Orthopaedic Rehabilitation, Dhaka, Bangladesh.

***Corresponding Author: Dr. Malay Kumar Saha**
Associate Professor, Unit Chief, Department of Orthopaedic Surgery, MBBS, D-Ortho, MS-Ortho, Mymensingh Medical College, Mymensingh, Bangladesh.

Article Received on 20/04/2020 **Article Revised on 10/05/2020** **Article Accepted on 30/05/2020**

ABSTRACT

Introduction: Despite modern surgical techniques and the use of antibiotic prophylaxis, surgical site infection remains a burden for the patient and health system. It is a major cause of morbidity, prolonged hospital stay, and increased health costs. Surgical site infection (SSI) is disastrous in orthopedic practice as it is difficult to rid the bone and joint of the infection. **Objective:** To assess the prevalence of SSI in orthopedic practice and to identify risk factors associated with surgical site infections. **Methods and Materials:** All patients admitted to the National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR) Dhaka, Bangladesh & dept. of orthopaedic surgery ward, Mymensingh Medical College & Hospital, Mymensingh, Bangladesh between January 2017and December 2019, male & female were included in the study group. The data, which were collected from the medical charts and from the QuadraMed patient filing system, included age, sex, date of admission, type of admission (elective versus emergency), and classification of fractures. Analyses were made to find out the association between infection and risk factors, the v^2 test was used. The strength of association of the single event with the variables was estimated using Relative Risk, with a 95% confidence interval and P<0.05. **Results:** A total of 101 of 2700 patients who had orthopedic or trauma operations contracted an SSI. The incidence of SSI was 3.74%. In all, 728 clean and elective operations were performed. During the study period, 101 SSI were detected, and the overall prevalence rate was 13.87%. There were 76 males and 25 females with an average age of 38.13±19.1 years. The demographic data are given. 71 patients were admitted directly to the orthopedic wards, 16 were transferred from the surgical intensive care unit and 14 from the surgical wards. Eighty three patients (83.1%) had various complications, and 3 patients (2.97%) died directly as a result of uncontrolled septicemia. The most common infective organism MRSA 27 patients (26.73%), Acinetobacter species in 21 (20.79%), Pseudomonas species in 19 (18.81%), and Enterococcus species in 16 (15.84%). 83 patients (82.1%) cultured a single organism, 15 had 2 infecting organisms, and 3 patients cultured more than 2 organisms. In all patients who had 2 or more organisms, Acinetobacter species was the common organism. **Conclusion:** SSI was found to be common in our practice. Emergency surgical procedures carried the greatest risk with Staphylococcus species and Acineto-bacter species being the common infecting organisms.

KEYWORDS: Surgical Site Infection, Orthopedic Surgery, Trauma.

I INTRODUCTION

Infection at or near surgical incisions within 30 days of an operative procedure, dubbed surgical site infection, contributes substantially to surgical morbidity and mortality each year. Surgical site infection (SSI) is defined as microbial contamination of the surgical wound within 30 days of an operation or within 1 year after surgery if an implant is placed in a patient.[1] The risk of SSI is higher in developing countries relative to developed nations. SSI accounts for over 20% of all healthcare-associated infections in surgical patients. It results from microbes thriving in the surgical site because of poor preoperative preparation, wound contamination, improper antibiotic selection, or the lack of ability of an immunocompromised patient to fight against infection. These infections are common and range in severity from minor, self-limiting, surface infections to severe diseases requiring all the resources of modern medicine. It is estimated that annual incidence of SSI in the United States is 1.07%; with 8000 deaths directly related to SSI and a financial cost of treatment to $10 billion.[2] The problem of SSI is universal; in the United Kingdom, the extra cost for each SSI is approximately E2500 (US $3394),[3] and the length of the hospital stay increases between 5.8 and 17 extra days.[4] Surgical-site infections cause increased morbidity, mortality, extended hospital in-patient stays, and economic burden to the hospital resources.[5–8] Many preventable causes of SSI have been identified, and if proper measures are implemented, the incidence could be reduced. Patients, surgeons, and nurses, as well as operative room atmosphere and instrumentation are prime areas of concern. Various methods have been established to reduce infections in implant surgery, but infection does occur. The washing of hands and maintaining basic hygiene,[9] prophylactic antibiotics given at the proper time and at the correct strength,[10] surgical clothing,[11] and reducing the flow of staff in the operating room[12–14] all contribute to lowering the incidence of infection.

II OBJECTIVE

To assess the prevalence of SSI in orthopaedic practice and to identify risk factors associated with surgical site infections.

III METHODS AND MATERIALS

All patients admitted to National Institute of traumatology & Orthopaedic Rehabilitation, Dhaka, Bangladesh & department of Orthopaedic Surgery, Mymensingh Medical College& Hospital, Mymensingh, Bangladesh, male and female wards between January 2017 and December 2019 were included in the study group. Our main aim was to detect the occurrence of SSI within 30 days of the surgical procedure. The data, which were collected from the medical charts and from the Quadra Med patient filing system, included age, sex, date of admission, type of admission (elective versus emergency), and classification of fractures. Analyses were made to find out the association between infection and risk factors, the v^2 test was used. The components of the National Nosocomial Infections Surveillance (NNIS) system surgical-patient risk index used in this study were as following. As a typical practice prophylactic, intravenous antibiotics got on call to the operating room. The infection was assessed by the infective organism, sensitivity of the antibiotics, and recovery. Any additional days the patient stayed within the hospital were calculated on the idea of ordinary discharge after each such procedure.

The incidence rate of SSI, consistent with the various categories of the individual components of the index (ASA, GWC, and T time), was calculated. The strength of the association between each of those factors and therefore the incidence rate of SSI were estimated using the Goodman-Kruskal G coefficient. A quantity of association between 2 variables established on an ordinal level. Analyses were made to find out the association between infection and risk factors, the v^2 test was used. The strength of association of the single event with the variables was estimated using Relative Risk, with a 95% confidence interval and P<0.05.

Identifying the prevalence of SSI

The SSI Surveillance Record Form was developed, based on the SSI definition of the CDC, which was used to identify the prevalence of SSI and to determine the causative pathogens. It consisted of two parts: patient profile data and clinical diagnostic criteria for SSI. Among the patient profile data was included patient general information and operation data. Each clinical diagnosis of SSI included the CDC Surveillance Criteria for diagnosis SSI. In order to be considered to have a case of SSI, a patient had to have at least one the following criteria: (1) purulent drainage from the incision; (2) the incision yielding organisms from the pus culture test; (3) at least one the following clinically indicated infection signs and symptoms: fever; pain; swelling; warmth; redness; or tenderness to palpation; and (4) diagnosis of infection by an attending clinicians.[4] In addition, the SSI Surveillance Record Form was validated by five experts in the fields of surgery and infection control. This instrument was revised two times, based on the experts' comments, until the final version used in the study was prepared.

Statistical Analysis: The prevalence of SSI was calculated by dividing the number of SSI (numerator) by the number of operative patients (denominator) of the general and orthopedic surgical procedures conducted from 2017 to 2019. The result was expressed as a percentage. All data analysis windows SPSS version 19.0.

IV RESULTS

A total of 101 of 2700 patients who had orthopedic or trauma operations contracted an SSI. The incidence of SSI was 3.74%. In all, 728 clean and elective operations were performed. Among those procedures included in the study were: hernioplasty; cholecystectomy; laparotomy; prostatectomy; mastectomy; appendisectomy; choledecholithotomy; nephrolithotomy; ORIF (Open Reduction Internal Fixation); and various unclassified others. During the study period, 101 SSI were detected, and the overall prevalence rate was 13.87%. There were 76 males and 25 females with an average age of 38.13±19.1 years. The demographic data are given in [Table & Figure-1]. 71 patients were admitted directly to the orthopedic wards, 16 were transferred from the surgical intensive care unit and 14 from the surgical wards. Infection was significantly higher in patients who underwent an emergency procedure P<0.001.

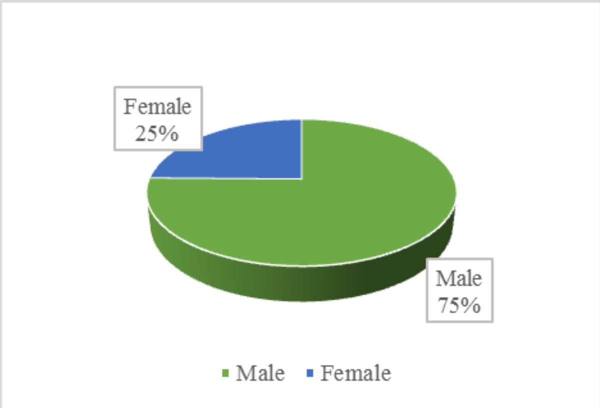

Figure-1: Sex distribution of patients.

Table-1: Demographic data (N=101).

Number of operations	2700
Number of patients with SSI	101
Average age, y	38.13± 19.1
Site of hospital admission	
Orthopedic wards	71 (70.2%)
Intensive care units	16 (15.8%)
Surgical wards	14 (13.8%)
ASA score	
ASA1	59 (58.4%)
ASA2	31 (30.6%)
ASA3	11 (10.9%)
Type of surgery	
Emergency	66 (65.3%)
Elective	35 (34.7%)

Table 2: Type of surgery (N=101).

Intramedullary nailing	53
Plate and screws	16
Spinal trauma	8
Scoliosis	1
Spondylolisthesis	1
THR	2
TKR	8
Implant removal	1
Others	11
Total	101

THR, Total hip replacement; TKR, Total knee replacement.

[Table 2] lists the procedures carried out, showing that the majority were trauma. The average operating time was 151.7±44.5 minutes (range, 40–370 minutes). Patients overstayed in the hospital owing to infection for an average of 24.75 days (range, 3– 150 days). 84 patients (83.1%) had various complications, and 3 patients (2.97%) died directly as a result of uncontrolled septicemia.

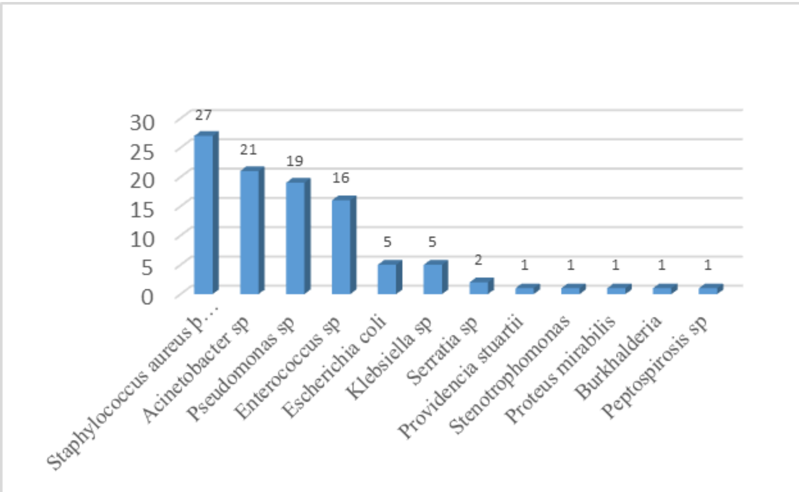

Figure-2: Infective organisms.

[Figure-2] gives the different organisms and the percentages. The most common infective organism was Staphylococcus species including Methicillin Resistant Staphylococcus aureus (MRSA) in 27 patients (26.73%), Acinetobacter species in 21 (20.79%), Pseudomonas species in 19 (18.81%), and Enterococcus species in 16 (15.84%). 83 patients (82.1%) cultured a single organism, 15 had 2 infecting organisms, and 3 patients cultured more than 2 organisms. In all patients who had 2 or more organisms, Acinetobacter species was the common organism.

V DISCUSSION

The incidence of SSI in the present study was 3.74%, which is below the reported worldwide incidence of 2.6% to 41.9%.[24] Second, our study differs from the literature therein SSI was more common in younger patients, whereas studies reported SSI to be high in patients of over 55 years age. This might be because the majority of our patients were operated due to trauma, and it's been reported that preoperative soft-tissue damage may be a major risk factor for developing SSI.[16] The opposite independent risk factors for patients developing SSI were having an emergency operation and having prolonged surgery. The bulk of patients with infection had an ASA score of 1, but other studies have suggested that the upper the ASA score, the upper the danger of infection.[16–18] The movement and number of staff within the OR is long known to influence the incidence of SSI. In our patients, we've practiced to scale back the staff within the OR to essential staff only, and this has shown that there was no serious deep-seated infection post arthroplasty, whereas during other sorts of surgery the entry and exit of the staff wasn't controlled. The incidence of SSI was significantly higher in trauma surgery versus total joint arthroplasty (P<0.001). There are apparent unintended differences in the quality of care that exist between patients undergoing joint arthroplasty or spinal surgery and those undergoing trauma surgery. There could be a couple of reasons for these differences. During total joint replacement, scoliosis and other spine surgery senior staff are available, while routine trauma surgery is performed by junior staff. Last, because of the gravity of infection in a patient with arthroplasty, surgeons tend to extend extra care while operating, and arthroplasty surgeons go the extra mile to limit SSI on the basis of research,[19–20] and monitoring the quality of care.[21] Barring the level of the surgeon, the other preventable differences cannot be justified. There are limited data available to review with regard to SSI in Saudi Arabian patients. Abdel Fattah[22], reported after a 12-month study of nosocomial infection from a military hospital, the incidence of SSI was 12.9%, whereas Khairy et al[23] reported an incidence of 6.8% after a prospective study. In both studies, the incidence appears higher than in our study. Even though the authors did not specify the different specialties these patients were taken. In the recent past, the outbreaks of Acinetobacter infections, which occur in intensive care units, have caused much concern to health care providers, hospital administrators, and patients at large. Trauma patients who are admitted to the ICU initially always carry a risk of infection, which they carry from the ICU to the wards. In this series, the majority of the patients who contracted an SSI and cultured Acinetobacter species apparently had been admitted to the ICU, which is the primary breeding ground for such organisms. Our study shows that Acinetobacter organisms are increasing their presence in the orthopedic wards, and this needs to be controlled. The most common infective organism was Staphylococcus species including Methicillin Resistant Staphylococcus aureus (MRSA) in 27 patients (26.73%), Acinetobacter species in 21 (20.79%), Pseudomonas species in 19 (18.81%), and Enterococcus species in 16 (15.84%). 83 patients (82.1%) cultured a single organism, 15 had 2 infecting organisms, and 3 patients cultured more than 2 organisms. In all patients who had 2 or more organisms, Acinetobacter species was the common organism. At present it appears that the morbidity and mortality that they cause are enormous and sometimes beyond the control of the treating physician's incidence of SSI was 12.9%, whereas Khairy et al;[23], reported an incidence of 6.8% after a prospective study. In both studies, the incidence appears higher than in our study. Even though the authors did not specify the different specialties these patients were taken. In the recent past, the outbreaks of Acinetobacter infections, which occur in intensive care units, have caused much concern to health care providers, hospital administrators, and patients at large. Trauma patients who are admitted to the ICU initially always carry a risk of infection, which they carry from the ICU to the wards. In this series, the majority of the patients who contracted an SSI and cultured Acinetobacter species apparently had been admitted to the ICU, which is the primary breeding ground for such organisms. Our study shows that Acinetobacter organisms are increasing their presence in the orthopedic wards, and this needs to be controlled. At present it appears that the morbidity and mortality that they cause are enormous and sometimes beyond the control of the treating physicians.

VI CONCLUSION

In conclusion, this study shows that the incidence of SSI in orthopedics and trauma patients is comparable the reported incidence within the literature. Overall prevalence rate was 13.87%. We believe that development of SSI may be a complex process, which depends on several various factors associated with the patient, the surgical environment (such because the ICU), staff involvement, and eventually the surgical technique. We were ready to identify the areas that require to be addressed to further reduce the incidence of SSI in our patients.

REFERENCES

1. Horan TC, Gaynes RP, Martone WJ, Jarvis WR, Emori TG. CDC definitions of nosocomial surgical site infections, 1992: a modification of CDC definitions of surgical wound infections. Infect Control Hosp Epidemiol, 1992; 13(10): 606–608
2. Scott RD II. The Direct Medical Costs of Healthcare-Associated Infections in U.S. Hospitals and the Benefits of Prevention. Atlanta, GA: Centers for Disease Control and Prevention, 2009.
3. Plowman R, Graves N, Griffin MA, Roberts JA, Swan AV, Cookson B et al. The rate and cost of hospital-acquired infections occurring in patients admitted to selected special-ties of a district general hospital in England and the national burden imposed. J Hosp Infect, 2001; 47(3): 198–209.
4. Geubbels EL, Mintjes–de Groot AJ, Van den Berg JM, de Boer AS. An operating surveillance system of surgical site infections in The Netherlands: results of the PREZIES national surveillance network. Preventie van Ziekenhuisinfecties door Surveillance. Infect Control Hosp Epidemiol, 2000; 21(5): 311–318.

5. Awad SS, Palacio CH, Subramanian A, Byers PA, Abraham P, Lewis D et al. Implementation of a methicillin resistant Staphylococcus aureus (MRSA) prevention bundle results in decreased MRSA surgical site infections. Am J Surg, 2009; 198(5): 607–610.
6. Weigelt JA, Lipsky BA, Tabak YP, Derby KG, Kim M, Gupta V. Surgical site infections: causative pathogens and associated outcomes. Am J Infect Control, 2010; 38(2): 112–120.
7. Fry DE. The economic costs of surgical site infection. Surg Infect (Larchmt), 2002; 3(suppl 1): S37–S43.
8. Urban JA. Cost analysis of surgical site infections. Surg Infect (Larchmt), 2006; 7(suppl 1): S19–S22.
9. Pittet D. Compliance with hand disinfection and its impact on hospital acquired infections. J Hosp Infect, 2001; 48(suppl A): S40–S46.
10. Polk HC Jr, Christmas AB. Prophylactic antibiotics in surgery and surgical wound infections. Am Surg, 2000; 66(2): 105–111.
11. Tammelin A, Ljungqvist B, Reinmuller¨ B. Comparison of three distinct surgical clothing systems for protection from air-borne bacteria: a prospective observational study [abstract]. Patient Saf Surg, 2012 Oct 15; 6(1): 23.
12. Ayliffe GA. Role of the environment of the operating suite in surgical wound infection. Rev Infect Dis., 1991; 13(suppl 10): S800–S804.
13. Letts RM, Doermer E. Conversation in the operating theater as a cause of airborne bacterial contamination. J Bone Joint Surg Am, 1983; 65(3): 357–362.
14. Ritter MA. Operating room environment. Clin Orthop Relat Res., 1999; 369(369): 103–109.
15. Lilani SP, Jangale N, Chowdhary A, Daver GB. Surgical site infection in clean and clean-contaminated cases. Indian J Med Microbiol, 2005; 23(4): 249–252.
16. Bachoura A, Guitton TG, Smith RM, Vrahas MS, Zurakowski D, Ring D. Infirmity and injury complexity are risk factors for surgical-site infection after operative fracture care. Clin Orthop Relat Res., 2011; 469(9): 2621–2630.
17. Maksimovic´ J, Markovic´-Denic´ L, Bumbasirevi˘c´ M, Mar-inkovic´ J, Vlajinac H. Surgical site infections in orthopedic patients: prospective cohort study. Croat Med J., 2008; 49: 58–65.
18. 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 Noso-comial Infections Surveillance System. Am J Med, 1991; 91(3B): 152S–157S.
19. Lidwell OM, Lowbury EJL, Whyte W. Effect of ultraclean air in operating rooms on deep sepsis in the joint after total hip or knee replacement: a randomised study. Br Med J., 1982; 285(6334): 10–14.
20. Lidwell OM, Lowbury EJL, Whyte W. Airborne contamination of wounds in joint replacement operations: the relationship to sepsis rates. J Hosp Infect, 1983; 4(2): 111–131.
21. Karrholm¨ J, Garellick G, Rogmark C, Herberts P. Swedish Hip Arthroplasty Register Annual Report 2007. Gothenburg, Sweden: Department of Orthopaedics Sahlgrenska University Hospital, 2007.
22. Abdel-Fattah MM. Surveillance of nosocomial infections at a Saudi Arabian military hospital for a one-year period. Ger Med Sci., 2005; 3: 1–10.
23. Khairy GA, Kambal AM, Al-Dohayan AA, Al-Shehri MY, Zubaidi AM, Al-Naami MY et al. Surgical site infection in a teaching hospital: a prospective study. Journal of Taibah University Medical Sciences, 2011; 6(2): 114–120.
24. Lilani SP, Jangale N, Chowdhary A, Daver GB. Surgical site infection in clean and clean-contaminated cases. Indian J Med Microbiol, 2005; 23(4): 249–252.