



AN EVALUATION OF SURGICAL SITE INFECTIONS AND THEIR ANTIMICROBIAL SUSCEPTIBILITY IN PRIVATE HOSPITALS IN GWALIOR, MADHYA PRADESH

General Surgery

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ABSTRACT

Background: Surgical site infection (SSI) is one of the most common postoperative complication and causes substantial postoperative morbidity and mortality.

Objective: To find the incidence of postoperative surgical wound infections in clean and clean-contaminated surgeries in Surgery wards. To determine bacteriological profile and antimicrobial susceptibility patterns of the isolates.

Methods: A prospective study was carried out in a total of 100 patients operated for clean and clean-contaminated surgeries from department of Surgery of Private hospitals at Gwalior. Relevant details were noted in clinical history. Each patient was followed from the time of admission till discharge from the hospital and for 30 days postoperatively. The identification of the infecting organism was done by staining, and culture and antibiotic susceptibility by Disc Diffusion method.

Results: Out of 100 patients, 39 patients got infected post-operatively. Staphylococcus aureus was the most common organism isolated. Drug resistance was widespread, especially in Enterobacteriaceae, where the Cefotaxime resistant strains of Escherichia coli and Klebsiella pneumoniae were ESBL producing.

Conclusion: Judicious use of antibiotics along with evidence-based medicine is the need of the hour to stop the rise of these superbugs.

KEYWORDS

Surgical site infection, Antibiotic susceptibility, nosocomial infection.

INTRODUCTION-

Hospital-acquired infections are the most common type of nosocomial infection among surgical patients.¹ Surgery has made great advances in last 3 quarters of this century and postoperative wound infection is the most common complication faced by surgeon since the advent of surgery. But, despite efforts to control it and better understanding of sepsis, wound infection is still a clinical problem and some infections in clean wounds remain unexplained. Wound access to bacteria can be prevented by aseptic surgical techniques, or bacteria can be removed substantially by early wound toilet and uncomplicated healing can be expected. However, if by any reason, microorganisms gain a foothold and infection becomes established, antibiotics contribute to prevention and treatment of infection. Determination of the etiologic agent is vital in the final choice of the antibiotics. Apart from bacterial contamination of the wound, there are many other factors within the patient and his environment, both local and general, which ultimately determine the outcome. These local factors such as hematomas, seromas, suture material, poor surgical technique, degree of contamination and age, nutrition, hygiene play an important role in the etiology of postoperative wound infection.² Thus, the identification of factors that cause or predict these infections continues to be an important area of research. The incidence of surgical site infection (SSI) varies from hospital to hospital. Wounds were classified as clean/Class 1 or clean-contaminated/ Class 2 according to Centers for Disease Control (CDC) classification based on the degree of microbial contamination.³ So, this study was planned to find the incidence of postoperative surgical wound infections and bacteriological profile.

MATERIALS AND METHODS-

Study Design- Prospective Observational Study.

Study Settings- Department of Surgery and Microbiology of Private Hospitals in Gwalior, Madhya Pradesh, India.

Study Duration- 1 year from January 2017 to December 2017.

Sampling technique- Purposive sampling technique

Sample Size- Totally, 100 patients operated for clean and clean-contaminated surgeries from Department of Surgery. The details of the patients were recorded as per the proforma.

Inclusion Criteria- Clean surgeries (Class I operative wounds) and Clean- contaminated surgeries (Class II operative wounds), Contaminated surgeries (Class III operative wounds).³

Exclusion Criteria- Dirty surgeries (Class IV operative wounds), Stitch abscess, Episiotomy and circumcision wounds were excluded.

Methodology- A wound was considered infected if any one of the following criteria was fulfilled^{4,5}

1. Serous or nonpurulent discharge from the wound;

2. pus discharge from the wound;

3. serous or nonpurulent discharge from the wound with signs of inflammation (edema, redness, warmth, raised local temperature, tenderness, induration).

The swabs were obtained from deep inside the wound avoiding contact with skin under all aseptic precautions.

A smear was prepared and stained by Gram-staining method for early presumptive diagnosis and inoculated on Blood agar and McConkey's agar by streak method using Nichrome wire loop. The plates were incubated at 37°C overnight for 18-24 h. Identification of isolates was done by morphology and colony characteristics according to CLSI guidelines. Antimicrobial susceptibility was done using disk diffusion tests according to CLSI guidelines.⁶

Ethical Consideration- Obtained from all Hospitals

Statistical Analysis- Data will be consolidated and entered a Microsoft Excel spreadsheet and then transferred to Epi info version (7.1.3.0. centre for disease control and prevention, Atlanta, Georgia, USA, 2013) software for analysis.

RESULTS-

Table1- Surgical Procedures and Surgical Site Infections Rate

Procedure	Number of Cases (N=100)	Infected cases (N= 39)
Laparotomy	28	8 (32%)
Hysterectomy	16	8 (50%)
Appendectomy	16	8 (50%)
Gastric and small bowel	14	6 (40%)
Hernia	10	3 (33%)
Excision cyst	4	2 (50%)
Large bowel	4	1 (25%)
Amputation	4	1 (25%)
Thyroidectomy	4	2 (50%)

As per table 1 Overall post-operative surgical site infection rate was 39%. No sex prediction was done and most of the patients were > 60 years. Various surgical procedures were done and out of 100 cases around 39% of cases were infected. The most common surgery done was laparotomy (28%) in which around 32% cases were infected, followed by hysterectomy and appendectomy 50% cases were infected. Number of cases of hernia, excision cyst was few, but infection also seen among them. Rate of infection was higher in emergency cases (45%) than elective cases (21%). The infection rate in patients operated under general anesthesia is 45% and under

subarachnoid block anesthesia is 25% while one of the patients operated under local anesthesia is infected (12.5%). Use of drain is associated with more infection rate (14.28%). The nondrained wounds have less rate of infection (5.22%)

Table 2- Bacterial Isolates from Post-Operative Infected Cases

Procedure	Infected cases (N= 39)
Staph Aureus	8 (32%)
E.Coli	8 (50%)
S.Aureus with Kleibsella	8 (50%)
Acinetobacter with E.Coli	6 (40%)
P.Aeruginosa	3 (33%)
K.Pneumoniae	2 (50%)
E.Coli with P.Aeruginosa	1 (25%)
CONS	1 (25%)
S.Aureus with Acinetobacter	2 (50%)

Staphylococcus is the predominant bacterial isolate in various surgery in combination with Kleibsella and E.coli (50%). Single Staph is seen in 32% of infected cases. Gram-negative organisms were mostly isolated from surgeries on bowel, urinary tract and appendix.

Antibiotic susceptibility testing showed that all the strains of *S. aureus* resistant to penicillin, moderately sensitive to erythromycin (42.8%), tetracycline (28.5%), gentamicin (35.7%) and ciprofloxacin (42.8%). *Escherichia coli* was moderately sensitive to ampicillin (33.3%), gentamicin (50%), ciprofloxacin (50%), amikacin (66.6%) and cefotaxime (33.3%) and extensive resistance to tetracycline (90%). In case of *K. pneumoniae*, poor sensitivity to ampicillin and gentamicin (14.28%). None of the strains were sensitive to tetracycline. *Pseudomonas aeruginosa* was moderately sensitive to ciprofloxacin (44.44%), gentamicin (77.78%) and all the strains sensitive to ceftazidime, amikacin and imipenem.

DISCUSSION-

The delinquent of postoperative wound infection is seen in both developed and developing countries, despite introduction of careful antiseptic regime in surgical practice. It can occur from either an endogenous or an exogenous source. In this study, 39 patients got infected postoperatively with the postoperative SSI rate of 39%. This is comparable with the rates reported by various authors.^{4,5,7} Low infection rate in developed countries may be due to vast differences in working conditions dominant in these countries.^{8,9,10} The higher rates reported by some authors may be due to the inclusion of contaminated and dirty wound types and emergency surgeries in their studies.¹¹ It was reported by many authors that antibiotic coverage during the preoperative period drops the incidence of postoperative SSI.^{7,12} In the present study also, it was observed that preoperative antibiotic administration significantly reduces the rate of postoperative SSI ($\chi^2 = 9.81$; $P = 0.0017$). The higher rate of infection in elderly patients observed in the present study is in conventionality with the findings of several workers.^{11,12} Increasing age is correlated with a greater probability of certain chronic conditions, malnutrition and a fall in the body immunological efficiency, predisposing to SSI. The infection rate of clean and clean-contaminated wound types observed in the present study is comparable to the rate reported by Anvikar et al. and Sangrasi et al. Bacterial contamination increases with the duration of surgery, also the cells are increasingly damaged by exposure to air or to trauma due to surgical instruments or because longer procedures are more accountable to be associated with blood loss and shock thereby plummeting the patients general resistant. All these factors may contribute to increased rate of infection with growth in duration. The high susceptibility of Enterobacteriaceae to cefotaxime and amikacin in this study proved the usefulness of cefotaxime and amikacin in Enterobacteriaceae infections of surgery.^{7,13}

CONCLUSION-

Preoperative antibiotics, compact hospital stay, and proper control of comorbidities decline the incidence of postoperative infections. Significant is the emergence of drug resistant strains of *Acinetobacter* indicating their role in hospital acquired infection. Marked resistance of isolates to commonly used antibiotics indicates the need for sensible and rational use of these drugs to prevent the advent of antibiotic resistant strains. Surveillance of SSI with feedback of appropriate data to surgeons would be desirable to reduce the SSI rate.'

Conflict of Interest- None declared

Source of Funding- None

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