

Surgical site infection and Antibiotics use pattern in a tertiary care hospital in Nepal

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Abstract

Objective: To obtain information on surgical site infection (SSI) and the regimens used for surgical prophylaxis.

Methods: The study was carried out at Manipal Teaching Hospital, Pokhara, Nepal from 1st January to 30th June 2004. Inpatients and outpatients undergoing surgical procedures in General Surgery department were included. Data was collected on a specially designed proforma. Demographic details, details of SSI, results of culture/sensitivity testing and antibiotics used for prophylaxis were noted. Associations of SSI with different variables were studied.

Results: A total of 507 patients were included. SSI was noted in 37 patients (7.3%), of which 21 (56.8%) were superficial SSI. Total duration of antibiotic use, type of anaesthesia and post-operative fever showed significant statistical association with SSI. Organisms were isolated in 12 out of 37 SSI cases (32.4%). *E. coli* was the most organism isolated. Combination of ampicillin and cloxacillin was the most commonly used antibiotic regimen (138 patients) followed by combination of ampicillin, cloxacillin and metronidazole (26 patients).

Conclusions: The incidence of SSI was higher compared to developed countries. Surveillance systems for SSI and hospital guidelines for antibiotic prophylaxis are required (JPMA 58:148;2008).

Introduction

Surgical site infection (SSI) is the most common post operative complication and causes substantial morbidity, mortality and increases expenses for treatment.^{1,2} SSI is also the second most common hospital acquired infection.³ In the United States of America (USA) approximately one million patients develop SSI each year, increasing duration and cost of hospital stay.⁴ The magnitude of SSI varies considerably in different parts of the world. Rate of surgical site infection in USA has been reported to be 2.6 percent⁵, while a report from an African country Tanzania shows this figure to be 19.4 percent.⁶ Surveillance of SSI and providing feedback to the surgical team has been shown to reduce the incidence of surgical site infection and the cost incurred due to it.⁷

Preoperative control of co-morbid conditions, control of operative environment, proper skin cleansing and use of aseptic surgical technique are among the measures recommended to prevent SSI.⁸ Antibiotics have potential impact on preventing mortality in developing countries.⁹ Antimicrobial prophylaxis is postulated to be a measure with significant efficacy and impact on SSI.^{10,11} Excessive and inappropriate use of antibiotics in health care facilities and the communities contributes to development of antibiotic resistance. Multiple antibiotics are available and information about antibiotic use pattern is necessary to formulate a constructive approach to the problem of inappropriate drug use.⁸

Appropriate surgical antibiotic prophylaxis (SAP) can reduce the postoperative wound infection. Inappropriate use increases the selective pressure and favours the development of antimicrobial resistance.¹³ Around 30-50% of antibiotics use in hospitals is for SAP and between 30-90% of this prophylaxis is inappropriate.¹³ The antibiotic is either given at the wrong time or continued for a long period.¹⁴

A previous study carried out in two hospitals in Pokhara city, western Nepal had shown variations in the antibiotic use in SAP and noted that the hospitals rarely met the international guidelines for SAP.¹⁵

Information about the incidence of surgical site infection and the adherence of regimens for SAP to standard guidelines are lacking in Nepal. Hence the study was carried out to find out the frequency of surgical site infection and associated risk factors among patients undergoing surgical procedures in the department of General Surgery and to analyze the antibiotic use pattern among these patients.

Patients and Methods

The study was carried out at the Manipal teaching hospital (MTH) a 550 bedded tertiary care hospital in Pokhara city in Western Nepal. The hospital is attached to the Manipal College of Medical Sciences (MCOMS). A retrospective hospital record based study was carried out from 1 January to 30 June 2004. All in-patients and out-patients undergoing surgical procedures in the department of General Surgery

were included in the study. Patients whose records were not available were excluded. The data was collected from medical case sheets, nursing records, records of anaesthesia, operative records, microbiological and radiological reports. A special proforma designed for the study was filled which included age, gender, date of admission, date of surgery, date of discharge, diagnosis, co-morbid conditions, surgical procedure/s undergone, type of anaesthesia and duration of surgery. Details of pre-, intra- and post- operative antibiotics given were noted. In patients who suffered from SSI, the date of documentation of SSI, type of SSI and the organism isolated, if any, on culture and its sensitivity to commonly used antibiotics were noted. Radiological reports if any were considered. Diagnosis of SSI was made according to the National nosocomial infection surveillance (NNIS) criteria as given in the CDC definitions of Nosocomial infections.¹⁶ Surgical wounds were classified according to Centre for disease control (CDC) classification.¹⁶

Data was analyzed using SPSS version 10.0 for windows and results were expressed as percentage, mean and median. Association of SSI with different variables was determined univariate followed by multivariate analysis and expressed as Odds Ratio (OR). The variables which were shown to be significant on univariate analysis (p value <0.05) were considered for multivariate analysis. Odds Ratio, 95% confidence interval and p values were calculated. A p value <0.05 was considered significant.

Results

The total number of patients included in the study was 507 (305 males and 202 females). The mean age of the patients was 34.12 ± 18.95 years [range 0.5 - 81 years]. The age distribution of the patients is shown in Figure.

Surgical site infection was seen in 37 of the 507 cases (7.3%). The median day of documentation of surgical site

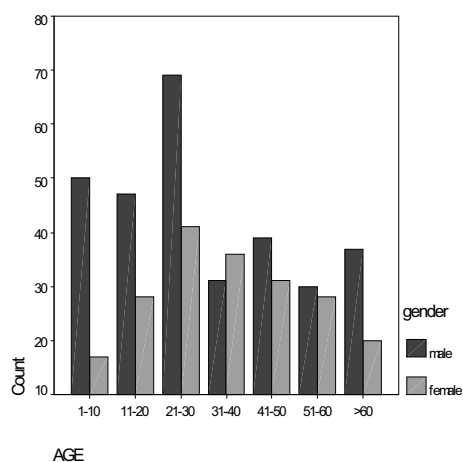


Figure. Age and gender distribution of patients.

Table. Factors associated with SSI.

Variable	Ssi/no of cases	Infection rate (%)	Odds ratio	95% CI	p- value
Post-op fever					
No	23/445	5.2	1	Ref	-----
Yes	14/62	22.6	3.05	1.33 - 6.98	0.008
Total duration of ab (days)					
<5	22/138	15.39	1	Ref	----
5 to 7	11/224	4.9	0.212	0.068 - 0.667	0.008
>7	4/145	2.8	0.393	0.168 - 0.922	0.032
Pre-op ab					
Given	24/298	8.1	1	Ref	-----
Not given	13/209	6.2	1.644	0.707 - 3.825	0.248
Anaesthesia					
La + Da	6/198	3.1	1	Ref	-----
Sa	9/94	9.6	4.185	1.280 - 13.677	0.018
Ga	22/218	10.1	3.375	1.175 - 9.693	0.024
Wound class					
Clean	17/265	6.4	1	Ref	---
Clean contaminated	5/129	3.9	0.395	1.134 - 1.164	0.092
Contaminated	2/25	8.0	1.115	0.217 - 5.713	0.897
Dirty	13/88	14.8	2.221	0.961 - 5.134	0.062

Ab: antibiotics

Da: dissociative anaesthesia

CI: confidence interval

La: local anaesthesia

Ga: general anaesthesia

SSI: surgical site infection

infection was 10.5 days after surgery [inter quartile range 5.75-16]. Sixteen of the 37 SSIs were diagnosed after discharge from the hospital. Of these eight were superficial, four were deep and four were organ/space infection. Among those diagnosed during the hospital stay thirteen were superficial, five were deep and three were organ/space infection. The percentages of clean, clean-contaminated, contaminated and dirty wounds were 53.2%, 28.6%, 4.9% and 14.2% respectively. The frequency of infection in each category were 6.4 % (17), 3.9% (5), 8% (2) and 14.8% (13). In cases where post operative fever was present, median day of documentation was 2 days after surgery (interquartile range 1 to 3).

Table shows the factors significantly associated with SSI. No significant association was seen with pre-operative hospital stay and category of surgical wound. Data regarding duration of surgery was available only in 357 cases. On analysis of these cases duration of surgery showed a significant association on univariate analysis but not on multivariate analysis.

Culture and sensitivity testing of sample from infection site was done only in 12 (32.4%) of 37 cases. The most common organisms isolated were Escherichia coli (4), Staphylococcus aureus (2) and Streptococcus pyogenes (2).

Only one isolate of *E.coli* was sensitive to ampicillin. *Streptococcus pyogens* was sensitive to penicillin and erythromycin. *Klebsiella*, *Acinetobacter* and *Pseudomonas* were resistant to all the commonly used antibiotics.

At least one antibiotic was given to 94.7% of patients (480). Mean number of antibiotic given was 2.1 ± 1.36 . Mean duration of antibiotic use was 6.38 ± 5.35 days. Mean number of antibiotics prescribed in cases where SSI was present was 3.51 ± 1.80 and in cases where SSI was absent was 2.02 ± 1.26 . Mean duration of antibiotics use in these groups were 11.3 ± 10.32 and 6 ± 4.55 days respectively.

Most commonly used individual antibiotics were the combination preparation of ampicillin and cloxacillin (277) followed by metronidazole (162), ampicillin (93), gentamicin (84) and cefuroxime (83). Most commonly used antibiotic regimens were: ampicillin and cloxacillin combination preparation (138 patients), ampicillin and cloxacillin combination along with metronidazole (26 patients), ampicillin, metronidazole and gentamicin (14), metronidazole alone (13) and cloxacillin alone (12).

Discussion

The SSI rate of 7.3% in our study was lower than that reported from Tanzania⁶ but higher than USA.⁵ The proportion of deep and organ space infection in our study was 43.1% while it is 31.1% in reports from Tanzania.⁶ SSI incidence was 6.4% in clean wounds, 3.9% in clean contaminated, 8% in contaminated and 14.8% in dirty wounds. The low incidence in clean contaminated wounds could have been because of the extra precautions taken in these surgeries. The incidence of SSI in clean wound is more than the 3.1% as reported from Brazil¹⁷, while the frequency was less in clean contaminated, contaminated and dirty wounds (3.9% versus 5.2%, 8% versus 11.2% and 14.8% versus 20.7% respectively).

The duration of antibiotic use, type of anaesthesia and post operative fever was significantly associated with SSI in the presented study. The association between different factors and SSI may be statistical rather than etiological. Association of SSI with duration of antibiotic use could be because antibiotics were given for a longer duration in those who developed SSI. Patients developing SSI were three times more likely to have fever post operatively than those who did not have SSI. The fact that post operative fever was documented on second day (median) while SSI on 10th day (median) highlights the importance of fever as an early indicator of SSI and further studies should be conducted to confirm this. Category of surgical wound was a significant predictor of SSI on univariate analysis but not on multivariate analysis. Similar was the case with duration of surgery. In a study in Mexico City, the rate of SSI was 9.3%.¹⁸ The factors associated with SSI

were diabetes mellitus, obesity and longer duration of surgical drains placement. It may be difficult to compare our study to those reported in the literature as our study was confined to General Surgery department and the number of patients was low.

A large proportion (43.24%) of the total SSIs were diagnosed on follow up. This reaffirms the conclusion of other studies⁶ that post discharge surveillance is important in achieving more accurate SSI rates. We did not look into actual proportion of patients coming for adequate follow up because patient follow up could be a problem in Nepal. Patients do not usually come back unless they develop problems. Mountainous terrain and difficulties of accessing health services may be possible causes.

The proportion of superficial infection among those diagnosed in hospital was 62% while it was 38% for those diagnosed after discharge. This could be because patients with superficial SSI are less likely to come for follow up.

The percentage of total cases receiving antibiotic prophylaxis was 94.7%. This figure is comparable with 98% reported from Turkey¹⁹ and 90% reported from Israel.²⁰ Mean duration of antibiotic use of 6.3 days nearly equals to 6.4 days reported from Taiwan.²¹ Standard recommendation for surgical prophylaxis is single dose in special circumstances.²² The rational use of antibiotic for SAP was not analyzed. Combination preparation of ampicillin and cloxacillin has been used most commonly for SAP. This drug has been banned by hospital Drugs Therapeutic Committee from 16th February 2005. Recently cephalosporins are being increasingly used for SAP in our hospital (personal observation of the authors).

Culture and sensitivity testing was done only in twelve cases. Most of the treatment was hence empirical. Culture and sensitivity testing may not have been feasible due to cost factor. The low number of isolates makes it difficult to draw firm conclusions.

Our study was hospital record based and this may have had an inherent bias in patient selection. The study was carried out only for six months and in a single department (General Surgery). Culture and sensitivity data could not be extrapolated due to low number of isolates. NNIS risk category and American Society of Anaesthesiologists classification were not included. Antibiotic prophylaxis and treatment were considered together during analysis. Adequacy of follow up could not be assessed.

Conclusion

SSI rate was found to be quite high in comparison to developed countries. Better surveillance systems should be

developed. Moreover hospital guidelines on antibiotic use among surgical patients should be developed and adhered to. Studies for a longer period and among different surgical departments are required. These could provide a better estimate of incidence of SSI and associated risk factors.

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