E-ISSN 2250-0944
ISSN 2250-1150
doi: 10.31838/ijprt/16.01.261

Research Article

Clinical Profile and Management of 172 Cases of Surgical Site Infections at Gmc Baramulla (J&K)

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Received: 28.12.25, Revised: 19.01.26, Accepted: 23.02.26

ABSTRACT

Background: Surgical site infections (SSIs) are the third most common infections among hospitalized patients in our country [1]. These account for 14% to 16% of nosocomical infections in all hospitalized patients [2] and a substantial cause of morbidity and mortality among such patients [3].

Objectives: To study the incidence and risk factors involved leading to SSIs among hospitalized patients in North Kashmir and to identify the service areas in our hospitals which need to be strengthened to decrease the incidence of SSIs.

Methodology: A five year prospective study of SSIs from December 2020 to November 2025 was undertaken in the Department of General Surgery, Govt. Medical College Baramulla, Kashmir. The involved host factors, wound factors and surgery related factors were studied. Culture sensitivity tests of surgical sites were done by standard methods and antibiotics were prescribed accordingly.

Results: Elective clean surgeries showed less chances of SSIs compared to emergency and potentially infected ones. Prolonged surgical time (more than 2.0 hours) was significantly associated with occurrence of SSIs. Escherichia coli was the most common organism grown on culture in 33.72 % patients followed by Staphylococcus aureus in 26.74% patients and Pseudomonas aeruginosa in 19.77% patients.The overall incidence of SSIs among the patients studied was found to be 8.00%

Conclusion: The results obtained from our study revealed that in order to decrease the incidence of SSIs in our setup, we have to focus on intensive preoperative preparation of patients, decrease the surgical time, focus on optimization of poor risk patients and to undertake a regular surveillance of SSIs.

Keywords: Ssis, Nosocomial, Risk Factors, Surgery, Organisms, Morbidity, Incidence, Surveillance.

INTRODUCTION

Incisional SSIs and organ space SSIs. Results were statistically Surgical site infections (SSIs) are the third most frequently reported nosocomial infections in hospitalized patients [1] and constitute 14% to 16% of all such infections [2]. Among surgical patients, SSIs are the most commonly observed nosocomial infections constituting 38% of all these infections [2] and are thus a significant cause of morbidity and mortality. Of all the cases of SSIs, the infection remains confined to the incision in two third of cases and in nearly one third of the cases, organs and spaces accessed during the operation are involved [3,4]. SSIs have an adverse effect on patients as well as the hospital since it increases the durations of hospital stay of the patient and consequently results in economic losses to both. Host factors, wound factors and surgery related factors are involved in the incidence of SSIs in operated patients [5-7].

The current prospective study of 172 cases of SSIs at Govt. Medical College Baramulla, Kashmir was undertaken with an objective to find the incidence and risk factor involved in causation of SSIs and to design preventive measures and antibiotic policy for surgical patients.

MATERIALAND METHODS

The present study was conducted in the Department of General Surgery of Govt. Medical College Baramulla which is a tertiary health care referral institute of North Kashmir. Of the total number of 2150 cases operated in the Department of General Surgery of our hospital during a 5 year period from December 2020 to November 2025, 172 patients were found to have surgical site infections of different grades and constituted our study group. Associated co morbid conditions like diabetes mellitus, poor nutritional status, underlying debilitating illnesses etc. were studied in each patient of this study group and their correlation with the incidence of SSIs analysed.

Various parameters like the type of surgery (elective or emergency), preoperative preparation of patients and antibiotic prophylaxis, duration of surgical procedure and presence or absence of drain were recorded and analysed and their relation with the incidence of SSIs studied. Swabs taken from infected wounds were cultured by classical methods and antibiotic sensitivity done by Kirby Bauer Disk Diffusion Technique and the results interpreted as per Centre for Laboratory and Clinical Standards (CLSI) guidelines .CDC (Centre for Disease Control and Prevention 1999) criteria were adopted for classification of surgical site infections into superficial incisional SSIs, deep. analysed and p test at 95% confidence level (p less than 0.05) used as a criterion to find statistical significance of various parameters affecting SSIs.

RESULTS

In the study of 172 patients with SSIs, over a period of 5 years from December 2013 to November 2018 who underwent different elective and emergency surgical procedures, 98(56.98%) patients were males and 74(43.02%) patients were females. There was not a statistically significant difference observed between the two groups (Table 1).

The analysis revealed diabetes mellitus in 12(6.98%) patients with blood sugar level between 150 to 200 mg percent in immediate post- operative period (less than 48 hours), nicotine use in 46 (26.74%) cases, use of steroids in 4 (2.32%) patients and protein calorie malnutrition with haemoglobin level less than 8mg percent in 24(13.95%) patients. 20 (11.63%) patients had post-operative hospital stay of more than two weeks. In total the association of underlying co-morbid conditions with SSIs was observed in 106(61.63%) patients and the association was statistically significant ($p < 0.001$) (Table2).

Preoperatively, 130(75.58%) patients received either a single dose of antibiotics (for elective surgery) or were on a course of antibiotics (for emergency procedures or elective cases with underlying infections) while 42(24.42%) patients did not receive any preoperative antimicrobial prophylaxis (AMP). The corresponding incidence of SSIs in respective groups is shown in (Table 3). The association of SSIs with no use of antibiotic prophylaxis was found to be statistically significant.

Out of the total number of 172 cases with SSIs, 54(31.39%) were elective cases and 118 (68.60 %) were emergency surgical procedures. The number of emergency cases operated was nearly twice the number of elective cases operated. The higher incident of SSIs in emergency surgical procedures was statistically significant ($p<0.001$) (Table 4).

Of the 172 patients with SSIs who were operated as elective or emergency procedures, 54(31.39%) were clean surgeries, 12(6.98%) were clean contaminated surgeries, 100(58.64%) were contaminated procedures and 6(3.49%) operations belonged to dirty infected groups.

The classification of surgical wounds was done as per the CDC guidelines (Garner JS and Simmons BP)[6,7] and the association of SSIs with contaminated wounds was found to be statistically significant (Table5).

The duration of operative procedure was 0 to 1 hour in 14(8.41%) cases,1 to 2 hours in 56(32.59%) cases and more than 2 hours in 102(59.30%) cases. The association of longer duration of surgeries with the incidence of SSIs was observed to be found statistically significant (Table 6).

Intra operatively, drain was placed in 138(80.23%) operated cases and in 34(19.77%) cases no drain was used during operative procedure. The incidence of SSIs was thus found to have a significant correlation with placement of drain during surgery (Table 7).

Of 172 wound swabs taken from total number of 72 patients with SSIs, 34 (19.47%) wounds from 34 patients yielded no growth on aerobic and anaerobic culture media and showed no organisms on direct smear examination as well. The remaining culture swabs from 138 patients revealed Escherichia coli (E. coli) in

58 (33.72%) cases, Staphylococcus aureus in 46 (26.74%) cases and Pseudomonas aeruginosa in 34 (19.77 %) cases (Table 8).

DISCUSSION

Of the total number of 2150 cases operated in the Department of General Surgery of our institution, 172(8.00%) were found to have surgical site infections during the study period. The incidence observed is in agreement with the observation of Anvikar et al [8] and Lilani SP et al[9] though infection rates varying from 18% to 28.8% have been reported in other series.[10-14]

In our study group, 98(56.98%) patients were males and 74(43.02%) were females. There was a marginal increase in the incidence of male patients compared to the female patients but the results were not statistically significant (Table 1). In some studies, [10] preponderance of female patients has been seen but, overall, sex is not a predetermining factor for surgical site infections [15]

The results of predisposing conditions like diabetics mellitus in 12(6.98%) patients, anaemia with haemoglobin level less than 8 gm% in 24(13.95%) patient smoking in 46(26.74%) patients, steroids use in 4(2.32%) patients and hospital stay of more than 4 weeks in 20(11.63%) patients observed in our study group are statistically significant. The underlying mechanism for SSIs in such cases may be that such factors decrease the immune status and also increase postoperative hospital stay which steeply increases the risk of SSIs in such cases [15]. Extra hospitalisation adds to the risk of acquiring SSIs as has been confirmed by several studies [11-14]. However in a few studies [16] factors like diabetes mellitus have been observed not to have any significant association with the occurrence of SSIs.

Preoperative antibiotics administration resulted in a significant decrease in the incidence of SSIs in our series with group specific incidence of SSIs found to be 24.42% (Table 3). The use of preoperative antibiotics has been found to result in a significant decrease in the incidence of SSIs in other series [13,14]. The marginal decrease in SSIs in some studies has been explained by the fact that prophylactic antimicrobials were more frequently given to patients who are poor risk from the stand point of susceptibility to infections and those associated with other comorbid conditions, thus resulting in an insignificant change in incidence of SSIs in patients who received preoperative antibiotics than those who did not [8,15].

The incidence of SSIs in our study group in case of emergency surgeries (68.60%) was found to be more than elective surgeries (31.40%). In the studies conducted by Beck WC et al and Cruse PJE et al [16], emergency cases have been seen to land up in SSIs more than elective ones. The observations made in our series could be explained by the fact that the number of emergency surgeries in our series was more than elective surgeries performed and the former were more associated with underlying comorbid conditions.

The rate of SSIs was maximum in contaminated cases (58.14%), minimal in clean wounds (31.39%) and moderate in other types of cases performed like clean contaminated wounds (6.98%). In the study conducted by Anvikar et al [8] , the percentage of infection rate was 10.6% and 4.00% in clean contaminated and clean cases respectively; in the studies conducted by Lilani et al, [9] 22.02% and 3.04% respectively and in the studies done by Berard F et al [15] 10.60% and 3.20% respectively.

In our study results, the rate of SSIs was found to be proportionately related to the duration of operative procedure. The rate of SSIs cases has been found to be 59.30% in cases where surgery lasted for more than two hours, 32.59% in cases lasting for 1 to 2 hours and 8.41% in cases lasting for less than 1 hour (Table 6). Prolonged operative time leads to prolonged tissue trauma, more blood loss, stress of prolonged anaesthesia and more exposure of operation site to infection [16]. Studies conducted by Shea et al [17] , Dellinger EP et al [18] , Altemier WA et al [19], Mayhall[20] , Zacharias A et al [21] and Smilanich RP et al [22] have observed a similar correlation. Public Health Laboratories Services (PHLS) studies in England [15] have led to a similar conclusion.

Intraoperative placement of drain has been found to have a significant association with SSIs in our study results (Table 7) .The association may partly be explained by the fact that drains are more likely to be used in contaminated or dirty wound and in emergency or prolonged surgeries which increases the probability of wound infection and such patients constituted a major portion of our study group. Lilani SP et al [9] have observed the incidence of SSIs in drained wounds as 22.4% and in those without a drain as 3% while Khan MA et al [10] observed the incidence of SSIs in drained and undrained wounds as 28.50% and 7.50% respectively.

In our study results gram negative bacilli (enterobacteriacae) have been found to be dominating infecting organisms (Table 8).Similar results have been observed in the studies of Anvikar AR et al [8], Tripathy BS et al[12] Kamath N et al [13] and Lilani SP et al [9] .Staphylococcus aureus has been found to be dominating organism in other studies. [9-11,14] In our study, the infecting organisms belonging to enterobacteriacae showed highest sensitivity to amikacin (74%) followed by gentamicin (62%) and very low sensitivity to cephalosporins and fluoroquilones (14% and 26% respectively). In the studies conducted by Anvikar AR et al[8] , Lilani SP et al [9] , Rao AS et al [11] , Tripathy BS et al [12] and Prabhakar H et al [14] , penicillins have shown a very poor culture sensitivity while gentamicin has shown maximum sensitivity against both gram positive cocci and gram negative bacilli . In the study done by Rao AS and Harsha M [11] , first generation cephalosporins have been found to be effective against both the groups while in the studies conducted by Kamath N et al [13] , Harvey JM et al [23] , Flanders et al [24] and Lewis RT et al [25] ,vancomycin and linezolid have been found to be effective against Staphylococcus aureas similar to the results of our present study.

Thus the result of our study have shown that an increased risk of surgical site infection is directly related to compromised immunity, decreased pre-operative antibiotic prophylaxis, increased duration of surgery (more than two hours), use of drains during surgery and operations on contaminated cases.

CONCLUSIONS

From the results of our study it has been concluded that in order to decrease the rate of SSIs, we should adopt the following measures in hospital setup:

1. A thorough examination and workup of surgical patients with underlying comorbid conditions to optimise their status before surgery as far as possible.
2. Use of preoperative antibiotic prophylaxis as a routine in patients planned for surgery.
3. Measures to decrease the duration of surgery without compromising patient safety.
4. Regular surveillance of SSIs to guide the infection control committee to form a modus operandi to decrease the incidence of such infections in future.

- **Financial Support and Sponsorship –** Nil
- **Conflicts of Interest –** There are no conflicts of interest.
- **Ethical Issues-**None

Table1: Sexwise distribution of cases with SSIs

Male Patients		Female Patient	s	Total	
No	%	No	%	No	%
98	56.98	74	43.02	172	100

Table 2: Underlying Comorbid conditions in patients with SSIs

	Underlying Comorbid Conditions	Number	%
1.	Diabetes mellitus (blood sugar >200 mg)	12	6.98
2.	Nicotine use	46	26.74
3.	Steroid use	4	2.32
4.	Protein calorie malnutrition (Hb<8gm%)	24	13.95
5.	Post-operative hospital stay>4 weeks	20	11.63
6.	No underlying comorbidity	66	38.38
	Total	172	100

Table 3: Prophylactic antibiotic use in patients with SSIs

Antibiotics used in patients		No Antibiotic use	
Number	%	Number	%

130	75.58	42	24.42

Table 4: Relationship of type of surgical Procedure with SSIs.

Elective Surgeries		Emergency Surgeries	
54	31.40	118	68.60

Table 5: Relationship of Nature of Surgeries and SSIs

Nature of Surgeries	Number (%)
Clean Surgeries	54 (31.31)
Clean Contaminated Surgeries	12 (6.98)
Contaminated Surgeries	100 (58.14)
Dirty Infected Surgeries	6 (3.49)
Total	172 (100)

Table 6: Relationship of Duration of Surgical Procedure and SSIs.

Organism Grown	Number (%)
No Growth	34 (19.77)
E. coli	58 (33.72)
Staphylococcus aureus	46 (26.74)
Pseudomonas aeruginosa	34 (19.77)

Table 7: Relationship of Intraoperative Placement of Drain and SSIs.

Drain placed	Number (%)
YES	138 (80.23)
NO	34 (19.77)

Table 8: Wound Swab Results in 172 Patients of SSIs.

Organism Grown	Number (%)
No Growth	34 (19.77)
E. coli	58 (33.72)
Staphylococcus aureus	46 (26.74)
Pseudomonas aeruginosa	34 (19.77)

Figure1. Culture Plates Showing Growth of Different Organisms.

Figure 2: Culture Plate Showing Colonies of Pseudomonas Aeruginosa.

Figure 3: Culture Plate Showing Colonies of E. Coli

Figure 4. Culture Plates Showing Colonies of Staphylococcus Aureus

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