

Nosocomial Infections in Surgical Wards

F Shah, M Gandhi, V Mehta, D Udani, M Mundra, N Swadia

Citation

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Abstract

This study was carried out in the Surgical Wards of Guru Gobindsinh Hospital, Jamnagar, Gujarat, India, where 6257 admitted patients fulfilling the criteria were included. Standard definitions by the CDC (Centre for Disease Control) were used. A total of 339 various nosocomial infections were found in 261 patients with an incidence rate of 4.17% over one and a half years. Surgical site infection was most prevalent with 4.1%, followed by urinary tract infections with 0.51%, respiratory tract infections with 0.2% and infusion site infections with 0.5%. The most common organism isolated was *E. coli* with 16.73%, followed by *Pseudomonas* with 14.39%. Surgical site infections were found to be more frequent in patients having longer preoperative stay, longer duration of surgery and emergency surgery. The results of surgery were in line with other studies done elsewhere in the world. This study offers a reliable measure of the incidence of nosocomial infections in a surgical department and confirms the importance of nosocomial infections as heavy burden on the health system.

INTRODUCTION

Nosocomial infections increase patients' morbidity, mortality, length of hospital stay and treatment cost. Therefore, knowledge about the frequency and distribution of nosocomial infections is important to improve infection control measures as well as to develop effective preventive and curative strategies which, in turn, will help us in decreasing incidence, morbidity, mortality and associated treatment cost. The study was carried out in 6257 patients in the surgical wards of Guru Gobindsinh Hospital, Jamnagar, Gujarat, India, between March 2008 and August 2009.

AIMS

- To know the incidence rate of nosocomial infections in surgical wards
- To know the incidence of individual nosocomial infection
- To study the various factors influencing nosocomial infection like preoperative stay, duration of surgery, etc.
- To know the commonest organism causing nosocomial infection
- To develop an effective antibiotic policy to deal with the commonest pathogen causing nosocomial infection

- To assess the magnitude of the problem and to help in developing efficient prevention strategies.

MATERIAL AND METHODS

The study was carried out in 6257 patients admitted in the surgical wards of Guru Gobindsinh Hospital, Jamnagar, between March 2008 and August 2009. Standard definitions by the Centre for Disease Control and Prevention were used. Nosocomial infection was defined as occurrence of an infection at least 48 hours after hospital admission which was not present or incubating at the time of admission. Surgical site infection was classified as nosocomial if diagnosed within 30 days after the surgery. Nosocomial infections were studied under the titles of surgical site infections, urinary tract infections, respiratory tract infections and vascular access infections, with more emphasis on surgical site infections. In all patients admitted preexisting infections were ruled out clinically and by laboratory tests. Results were discussed under the following titles: incidence of nosocomial infections, incidence of various nosocomial infections, percentage of various nosocomial infections among total nosocomial infections, organisms in various nosocomial infections, surgical site infections in open vs. laparoscopic surgery, surgical site infections according to type of wound, surgical site infections according to emergency and elective surgery, surgical site infections according to preoperative stay and

surgical site infections according to duration of surgery, post-operative stay and culture and sensitivity of isolated organisms.

RESULTS

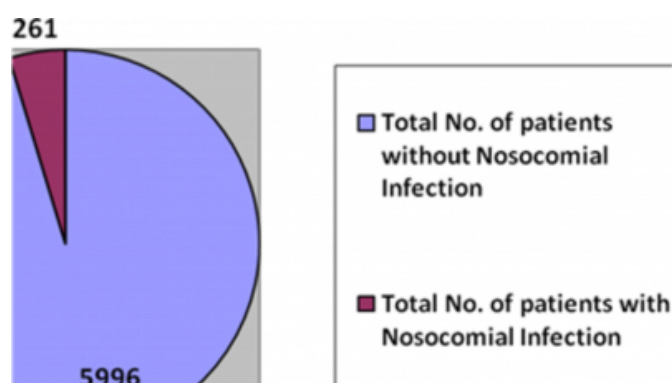
In the present series, we studied 6257 patients admitted and staying for a minimum 48 hours in wards of the department of General Surgery in March 2008 to August 2009. Out of all, 2517 patients were operated for various surgical procedures. We found the following results that are depicted in the following tables.

Figure 1

TABLE 1: INCIDENCE OF NOSOCOMIAL INFECTION

TOTAL ADMISSIONS	TOTAL NO. OF PATIENTS HAVING NOSOCOMIAL INFECTIONS	PERCENTAGE
6257	261	4.17

Figure 2



Nosocomial Infection

Figure 3

Table 2: INCIDENCE OF VARIOUS NOSOCOMIAL INFECTIONS

Total Admissions	Types of Nosocomial Infection	No. of Infected Patients	Percentage
6257	S.S.I.	257	4.10
	UTI	32	0.51
	RTI	13	0.20
	Infusion Site Infection	31	0.49
	Septicemia	6	0.09

A total of 339 nosocomial infections was found in 261 patients.

Figure 4

Pie chart showing the percentage of various nosocomial infections

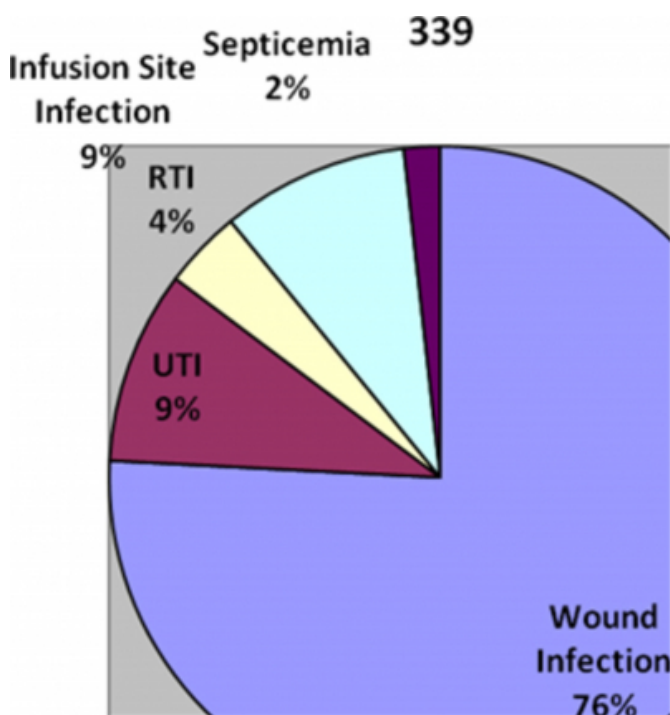


Figure 5

Table 3: PERCENTAGE OF VARIOUS NOSOCOMIAL INFECTION AMONG TOTAL NOSOCOMIAL INFECTION

TOTAL NOSOCOMIAL INFECTIONS	TYPES OF NOSOCOMIAL INFECTION	NUMBER OF PATIENTS	PERCENTAGE
339	S.S.I.	257	76
	UTI	32	9
	RTI	13	4
	Infusion Site Infection	31	9
	Septicemia	6	2

Figure 6

Table 4 SHOWING ORGANISMS IN SURGICAL SITE INFECTIONS

TOTAL NO. OF SURGICAL SITE INFECTIONS	CULTURE	NO. OF PATIENTS	PERCENTAGE
257	E. coli	43	16.73
	Pseudomonas	37	14.39
	Klebsiella	30	12.56
	Coag.-pos. Staph.	5	01.94
	Proteus	4	01.55
	Streptococci	1	00.39
	Negative	137	53.30

Figure 7

Table 5 SHOWING ORGANISMS IN NOSOCOMIAL UTI

TOTAL NO. OF NOSOCOMIAL UTI	CULTURE	NO. OF PATIENTS	PERCENTAGE
32	E. coli	13	40.62
	Klebsiella	8	25.00
	Pseudomonas	4	12.50
	Coag.-pos. Staph.	1	3.12
	Proteus	1	3.12
	Negative	5	15.62

Figure 8

Table 6: SURGICAL SITE INFECTION IN OPEN AND LAPAROSCOPIC SURGERIES

TYPE OF SURGERY	NO. OF SURGERIES	NO. OF PATIENTS WITH WOUND INFECTION	PERCENTAGE
Open	2193	254	11.58
Laparoscopic	324	3	00.92
Total	2517	257	10.21

Figure 9

Table 7: SURGICAL SITE INFECTION ACCORDING TO TYPES OF WOUND

TYPES OF WOUND	TOTAL	INFECTED	PERCENTAGE
Clean	1323	73	5.51
Clean Contaminated	729	79	10.83
Contaminated	356	70	19.66
Dirty	109	35	32.11

Figure 10

Table 8: SURGICAL SITE INFECTION IN EMERGENCY AND ELECTIVE SURGERIES

TIMING	TOTAL	INFECTED	PERCENTAGE
Elective	1847	158	8.55
Emergency	670	99	14.77

Figure 11

Table 9: SURGICAL SITE INFECTION ACCORDING TO PRE-OPERATIVE STAY

PRE-OP STAY	TOTAL	INFECTED	PERCENTAGE
0-1 DAYS	716	60	8.37
2-3 DAYS	907	78	8.59
4-7 DAYS	437	49	11.21
> 7 DAYS	457	70	15.31

Figure 12

Table 10: SURGICAL SITE INFECTION ACCORDING TO DURATION OF SURGERIES

DURATION OF SURGERY	TOTAL	INFECTED	PERCENTAGE
0-½ HOUR	386	16	4.14
½-2 HOURS	1325	122	9.20
2-4 HOURS	681	97	14.24
> 4 HOURS	125	22	17.60

Figure 13

Table 11: POST-OPERATIVE STAY

TOTAL SSI	POST-OPERATIVE STAY	NO. OF PATIENTS	PERCENTAGE
257	< 5 days	34	13.22
	5 – 10 days	108	42.02
	11 – 15 days	57	22.17
	>15 days	58	22.56

Figure 14

Table 12: CULTURE & SENSITIVITY OF ORGANISMS

CULTURE	NO. OF INFECTED PATIENTS	SENSITIVITY (MAJORITY)
E. coli	43	Ciprofloxacin, Ceftriaxone, Cefotaxime, Amikacin, Cefoperazone, Netilmycin, Cefuroxime
Pseudomonas	37	Ciprofloxacin, Ceftriaxone, Amoxycilave, Cefoperazone Amikacin, Piperacilline-Tazobactam
Klebsiella	31	Ciprofloxacin, Amikacin, Cefoperazone, Piperacilline-Tazobactam
Coag.-pos. Staph	5	Cefoperazone, Ciprofloxacin, Amikacin,
Proteus	4	Ceftriaxone, Cefotaxime, Amikacin, Clindamycin, Levofloxacin
Streptococci	1	Ciprofloxacin, Ceftriaxone, Cefotaxime, Cefoperazone, Cefuroxime

DISCUSSION

Nosocomial infections are an important public health problem, because of their frequency, morbidity, mortality and cost. In this study, a total of 261 patients had nosocomial infections, with 339 different types of nosocomial infections among 6257 patients admitted in general surgical wards staying in hospital for a minimum of 48 hours from March 2008 to August 2009. This study was made about the

incidence of nosocomial infection and its affecting factors.

In this study, the incidence rate of nosocomial infection was 4.17 per 100 patients admitted staying in hospital for a minimum of 48 hours after hospital admission in one and a half year. We found that in most countries 5-10% of patients in hospitals at any time have acquired an infection. The National Prevalence Survey in the U.K. and Ireland showed a prevalence of hospital-acquired infection of 9% (range: 2-29 %).⁽¹⁶⁾

In this study, we found that surgical site infections were the most common nosocomial infections in the general surgical ward followed by urinary tract infection, respiratory tract infection, infusion site infection and septicemia. The incidence of surgical site infections was 4.10%, for urinary tract infection it was 0.51%, for respiratory tract infection 0.20%, for infusion site infection 0.49% and for septicemia 0.09% in one and a half year. We found that in a study of the WHO with 28861 patients (47 hospitals in 14 countries), the overall percentage of nosocomial infection was 8.4 (range 3-21%), with surgical site infections in 0.3 to 3.1%, urinary tract infection in 0.3 to 4.7 %, respiratory tract infection in 1.1 to 4.1 % and others⁽¹⁶⁾, and with a prevalence of nosocomial infection in different wards from 6 to 43% due to different patient populations, invasive procedures and severity of underlying diseases.⁽²⁾

In this study, the most common organism in surgical site infection was E. coli (16.73%) and the second most common was Pseudomonas (14.39%). In a Swiss study we found that surgical site infection represented the leading infection site followed by urinary tract infection, pneumonia and bloodstream infection. The most frequently reported micro-organisms were Enterobacteriaceae (44.28%).⁽²⁾

In this study, the most common organisms in nosocomial urinary tract infection were E. coli (40.62%), Klebsiella (25%), Pseudomonas (12.5%), Coagulase-positive Staphylococci (3.12%) and Proteus (3.12%). In 15.62% the urine culture was negative. We found that the most common organisms in nosocomial urinary tract infection were E. coli, Gram-negative bacilli, Enterococci and Candida.⁽⁴⁾

In this study, the number of nosocomial surgical site infections in laparoscopic surgery was 0.92% and in open surgery it was 11.58%. So nosocomial infection in laparoscopic surgery was very low in incidence compared to open surgery.

The percentages of surgical site infections according to the

surgical site classification in this study were: 5.51% in clean, 10.83% in clean contaminated, 19.66% in contaminated and 32.11% in dirty contaminated wounds. We found that the theoretical degree of contamination proposed by the National Research Council (USA) over 40 years ago relates well to the infection rates in our study (clean surgery 1 to 2%, clean contaminated surgery less than 10%, contaminated surgery 15 to 20% and dirty surgery less than 40%).⁽¹⁷⁾

In this study, surgical site infection in elective surgery was seen in 8.55% and in emergency surgery in 14.77%. We found 16% of surgical site infection in emergency surgery in a Swiss university hospital study.⁽²⁾

Surgical site infections also increase with hospital stay and are more common in those patients who stay in hospital for more than 7 days.

Surgical site infections also increase with duration of surgery: we found 4.14% surgical site infections in surgeries completed in less than half an hour, 9.20% in surgeries completed in half an hour to two hours, 14.24% in surgeries completed in two to four hours, and 17.6% in surgeries completed in more than four hours.

Surgical site infections increased with duration of surgeries and pre-operative hospital stay. We found that surgical site infection can be decreased by shortening the pre-operative stay in hospital.⁽⁸⁾

The length of postoperative stay increases due to SSI: 42.02% of patients with surgical site infections stay in hospital for 6 to 10 days and 22.56% for more than 15 days.

The most common organisms isolated from surgical site infections and UTI were *E. coli*, *Pseudomonas*, *Klebsiella*, Coagulase-positive *Staphylococci*, *Proteus* and *Streptococci*. These organisms were usually sensitive to Ciprofloxacin, Ceftriaxone, Cefotaxime, Amikacin, Cefoperazone, Netilmycin, Cefuroxime and Piperacilline-Tazobactam. From the above observation we found that patients need antibiotics according to culture and sensitivity.

SUMMARY & CONCLUSION

In this study, 261 patients were infected with 339 different types of nosocomial infections among 6257 patients admitted in the general surgical ward and staying in hospital for a minimum of 48 hours after hospital admission, and follow-up was done up to September 2009.

Based on this study, we found that surgical site infection is a more common nosocomial infection in general surgical wards than urinary tract infection, infusion site infection, respiratory tract infection and septicemia.

The incidence of nosocomial infection in general surgical wards is 4.17 nosocomially infected patients per 100 admissions during the period of one and a half year.

The most common organism in surgical site infections in the general surgical ward is *E. coli*. The most common organism in urinary tract infection in the general surgical ward also is *E. coli*.

Laparoscopic surgeries have a lower incidence of nosocomial infections than open surgery.

Clean wounds have less chance of nosocomial infection than clean contaminated, contaminated and dirty wounds.

Nosocomial infection is less common in elective surgery than in emergency surgery.

Nosocomial infections can be decreased by shortening pre-operative hospital stay and duration of surgery.

Patients with nosocomial infections need antibiotics according to culture and sensitivity.

We concluded from our study, that the incidence of nosocomial infections in general surgery wards, especially surgical site infections, was influenced by preoperative stay, duration of surgery, type of wound and type of surgery (elective and emergency or open and laparoscopic surgery) .

So the incidence of nosocomial infections can be decreased by shortening the pre-operative stay, decreasing contamination at the wound site, doing laparoscopic surgery wherever feasible and shortening the duration of surgery.

Our study gives important information on the incidence of nosocomial infections and various factors influencing it. Such a study will help us to develop effective preventive and curative strategies which, in turn, will help us in decreasing the incidence of nosocomial infections and its associated morbidity and mortality, and the high economic burden.

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Author Information

Franal H. Shah, M.S., D.N.B.

Assistant Professor of Surgery, Department of General Surgery, M.P. Shah Medical College and Guru Gobindsind Hospital

Mona D. Gandhi, M.D.

Associate Professor of Obstetrics and Gynecology, Department of Obstetrics and Gynecology, M.P. Shah Medical College and Guru Gobindsind Hospital

Vikram P. Mehta, M.S.

Assistant Professor of Surgery, Department of General Surgery, M.P. Shah Medical College and Guru Gobindsind Hospital

Dhaval L. Udani, M.S.

Assistant Professor of Surgery, Department of General Surgery, M.P. Shah Medical College and Guru Gobindsind Hospital

Mahaveer Prasad Mundra

Third Year Resident in General Surgery, Department of General Surgery, M.P. Shah Medical College and Guru Gobindsind Hospital

Niyati N. Swadia

Second Year Resident In General Surgery, Department of General Surgery, M.P. Shah Medical College and Guru Gobindsind Hospital