

STUDY OF CLINICO BACTERIOLOGY OF POST OPERATIVE WOUND INFECTION

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Abstract:

Introduction: Globally, surgical site infections (SSI) are known to be most common nosocomial infections in hospitalized patients after urinary tract infection. There are many studies which showed surgical site infection rates are reported globally as it range from 2.5% to 41.9% resulting in high morbidity and mortality. Surgical infections are those which caused infection as a result of a surgical procedure or those that require surgical intervention as part of their treatment which are characterized by breaking of anatomic defense mechanisms and are associated with greater morbidity, significant mortality, and increased cost of care. Though increasing the advance technology in surgical sciences post operative wound infection remains one of the common complications which surgeons encounter. If this problem is not evaluated and treated in timely then it can have significant sequel. The cutaneous or mucosal barrier, entrance of microbes into the host tissue is the initial requirement for infection. In SSI patient stays in hospital may be double the length of time and also increase the costs of health care. The main extra cost may be related to re-operation, extra nursing care and interventions, and drug treatment costs.

AIM: The main aim of this study was to estimate the frequency of SSI with reference to factors contributing to it and the antimicrobial susceptibility pattern in surgery wards.

Material and Methods: For this study patients were included as they were admitted in the surgical wards and the surgical emergencies that underwent surgical procedure in this hospital. The surgical procedures were classified as planned (elective) surgeries, emergency surgeries and clean, clean-contaminated surgeries, contaminated and dirty patients were divided accordingly. The discharged of infected wound were collected in sterilized container or the pus swab were collected aseptically procedure and send to microbiology laboratory for further process. By consulting with microbiologist the result were recorded.

Result: On the base of surgeries were done total 452 cases were performed. Out of 452 cases there were 132 cases in emergency out of which 29 get infected and in 320 elective cases 20 got infected. The overall rate of surgical site infection (SSI) was 10.8%. The occurrence of SSI in emergency cases (22%) was found to be higher compared to elective cases (6.3%). Out of total cases send for the culture and sensitivity, organism cultured gram negative organism predominate and commonest was Escherchia coli, followed by Klebsiella, Pseudomonas and Staphylococcus aureus. E.coli and Klebsiella from emergency cases showed resistance to ciprofloxacin (83%) and ceftriaxone (83%) and elective cases showed resistance of 70 % to ciprofloxacin and 40% to ceftriaxone. Therefore it was found that occurrence of SSI is significantly more in emergency cases.

Conclusion: In this study rate of surgical site infection (SSI) was 10.8% whereas in clean 5.6%, in Clean and Contaminated 7.3% , in contaminated 21.2% and in dirty 25.9%. In gram negative bacteria E.coli were most commonly isolated bacteria followed by Pseudomonas and Klebsiella and in gram positive bacteria Staphylococcus aereus were most common isolated bacteria. Therefore antibiotics sensitive to the gram negative and pram positive bacteria should be initiative for establishing improved hospital antimicrobial policy and antimicrobial prescribing guidelines.

Keywords: Surgical Site Infection, Post-operative wound infections, Antimicrobial resistance

Introduction

Globally, surgical site infections (SSI) are known to be most common nosocomial infections in hospitalized patients after urinary tract infectionⁱ. Out of all nosocomial infection about 20% to 25% are infected by nosocomial infectionⁱⁱ. There are many studies

which showed surgical site infection rates are reported globally as it range from 2.5% to 41.9% resulting in high morbidity and mortality^{iii,iv}. Each year about 2% to 5% of the 16 million people undergoing surgical procedures which develop surgical site infection with more recent data putting it at two-thirds of patients who undergo

operations^{v, vi, vii, viii}. Surgical infections are those which caused infection as a result of a surgical procedure or those that require surgical intervention as part of their treatment which are characterized by breaking of anatomic defense mechanisms and are associated with greater morbidity, significant mortality, and increased cost of care^{ix}. In 1992 US CDC revised definition of surgical site infection to prevent confusion between the infection of surgical incision and infection of traumatic wound. Although SSIs are not associated with a high case fatality rate, but also they may caused morbidity and huge economic burden in the form of prolonged hospital stay, readmission and procedures. Therefore septic surgical wound is considered a remarkable expensive luxury^x. Though increasing the advance technology in surgical sciences post operative wound infection remains one of the common complications which surgeons encounter. If this problem is not evaluated and treated in timely then it can have significant sequel. The cutaneous or mucosal barrier, entrance of microbes into the host tissue is the initial requirement for infection^{xi}. Many studies in India have consistent shown higher rates ranging from 20-38%. The variability in estimate is consistent with the difference in the characteristics of the hospital populations, the underlying diseases, difference in clinical procedures, the extent of infection control measures and in addition the hospital environment^{xii, xiii}. In many SSIs, pathogens that responsible for infection originate from patient's endogenous flora. The causative pathogen depends on the type of surgery; the most commonly isolated organisms are *Staphylococcus aureus*, coagulase negative *Staphylococci*, *Enterococcus spp* and *E. coli*^{xiv}. In SSI patient stays in hospital may be double the length of time and also increase the costs of health care. The main extra cost may be related to re-operation, extra nursing care and interventions, and drug treatment costs. This increase indirectly loss of cost may loss of productivity; patient dissatisfaction and litigation, reduced quality of life have been studied less extensively. There are many studies which showed that Bacteriological infection for SSIs are universal and etiological agents involved may vary with geographical location, between surgeons, between various procedures, from hospital to hospital or even in different wards of the same hospital^{xv}. The main aim of this study was to estimate the frequency of SSI with reference to factors

contributing to it and the antimicrobial susceptibility pattern in surgery wards.

Material and Methods:

This study was conducted in department of General Surgery in collaboration with the Dept. of Microbiology at Vedanta Institute of Medical Sciences Dahanu, Palghar, Maharashtra. For this study patients were included as they were admitted in the surgical wards and the surgical emergencies that underwent surgical procedure in this hospital. The surgical procedures were classified as planned (elective) surgeries, emergency surgeries and clean, clean-contaminated surgeries, contaminated and dirty patients were divided accordingly.

The surgical sites were keeping observed at frequent intervals on days 3/5, 7 and 10, and further whenever required, for clinical evidence of infection. All the patients having surgery were carefully assessed for sign of infection in surgical site till the day of discharge and followed up as an outpatient basis once a week for 30 days. The discharged of infected wound were collected in sterilized container or the pus swab were collected aseptically procedure and send to microbiology laboratory for further process. By consulting with microbiologist the result were recorded.

Result:

On the base of surgeries were done total 452 cases were preformed. Out of 452 cases there were 132 cases in emergency out of which 29 get infected and in 320 elective cases 20 got infected. The overall rate of surgical site infection (SSI) was 10.8% as shown in table no 1 below.

Table 1: Distribution of cases based on the case scenario

Type Of Class	No. Of Cases	No. Of SSI	Percentage
Emergency	132	29	22.0
Elective	320	20	6.3
Total	452	49	10.8

The occurrence of SSI in emergency cases (22%) was found to be higher compared to elective cases (6.3%). Out of total cases send for the culture and sensitivity, organism cultured gram negative organism predominate and commonest was *Escherchia coli*, followed by *Klebsiella*, *Pseudomonas* and *Staphylococcus aureus*. *E.coli* and *Klebsiella* from emergency cases showed resistance to ciprofloxacin (83%) and ceftraixone (83%) and elective cases

showed resistance of 70 % to ciprofloxacin and 40% to ceftriaxone. Therefore it was found that occurrence of SSI is significantly more in emergency cases.

Table 2: SSI in different class of wounds

Class Of The Wound	No Of Cases (Emergency +Elective)	No Of SSI	Percentage
Clean	124 (0+124)	7	5.6
Clean Contaminated	218(16+202)	16	7.3
Contaminated	52(45+7)	11	21.2
Dirty	58(48+4)	15	25.9

The occurrence of SSI in emergency cases (22%) was found to be higher compared to elective cases (6.3%). Out of total cases send for the culture and sensitivity, organism cultured gram negative organism predominate and and commonest was Escherichia coli, followed by Klebsiella, Pseudomonas and Staphylococcus aureus. E.coli and Klebsiella from emergency cases showed resistance to ciprofloxacin (83%) and ceftriaxone (83%) and elective cases showed resistance of 70 % to ciprofloxacin and 40% to ceftriaxone. Therefore it was found that occurrence of SSI is significantly more in emergency cases.

Out of all cases in which SSI occurred 30 were deep SSI and 19 were superficial SSI. The incidence of deep SSI was more in contaminated dirty groups than in

the clean and clean contaminated groups as shown in table no 3 below.

Table 3: Distribution of infected cases based on degree of SSI

Cases	Superficial SSI	Deep SSI	Total
Clean	4	3	7
Clean Contaminated	7	9	16
Contaminated	3	8	11
Dirty	5	10	15
Total	19	30	49

During the increasing the time of surgery the number of SSI is also increased. The surgeries in the abdominal and perineal regions show more infections rate. Also surgeries on limbs show increased infection rate due to decreased blood supply. Surgery with clean and well perfuses area of head, neck and thorax show decreased infection rate. When procedure wise risk of SSI was analyzed, the risk was found to be higher in the contaminated cases and emergency surgeries.

According to the culture report gram negative bacteria and gram positive bacteria were isolated. Out of total bacteria isolated Escherichia Coli were found more common followed by Pseudomonas, Klebsiella and Staphylococcus aureus. In emergency cases out of total cases 3 were Gram positive and 17 were Gram negative bacteria and in elective cases out of total cases 4 was Gram positive and 13 were Gram negative bacteria as shown in table no 4 below.

Table 4: Distribution of bacterial isolate among emergency and elective cases

Class of wound	No. of cases (emergency)	No. of cases (elective)	No. of SSI (emergency)	No. of SSI (elective)	Organisms	No. of SSI (emergency)	No. of SSI (elective)
Clean	0	124	0	8	E.coli	0	1
					Pseudomonas	0	0
					Staph. aureus	0	4
					Klebsiella	0	1
					Sterile	0	2
Clean Contaminated	16	202	5	12	E.coli	0	3
					Pseudomonas	1	1
					Staph. aureus	2	0
					Klebsiella	1	1
					Sterile	1	7
Contaminated	45	7	7	4	E.coli	4	3
					Pseudomonas	0	0
					Staph. aureus	0	0
					Klebsiella	1	1
					Sterile	2	0
Dirty	48	4	15	3	E.coli	7	2
					Pseudomonas	1	0
					Staph. aureus	1	0
					Klebsiella	2	0
					Sterile	5	0

Discussion:

SSI largely depends upon the kind of operation performed, the types of work load and the hospital environment^{xvi, xvii}. Surgical site infections remain as major problem of patients as safety despite of improvements in surgical practice and infection control techniques. SSI observed higher frequency in surgery department due to higher number of emergency procedures conducted in the department as well as substantial number of surgeries had dealt with gastrointestinal and urinary systems, which contributed to clean contaminated wound. As increasing in the age there is also increase of SSI owing to the decreased immune competence and increase risk of SSI with increasing age showed by various studies and also in this study. In developing countries like Latin America, Middle East countries the Indian subcontinent, rate of infections are much higher than western countries.

According to the studied of Razavi SM et al^{xviii} showed Tehran estimated an infection rate of 8.4 % while the Indian studies showed higher infection rates like a study done by Subramanian et al^{xix} reported an infection rate of 24.8 %. There are similar studies as study of teaching hospital in Goa showed infection rate of 24%^{xx} while this study showed as overall infection rate is 10.8%. And distribution of SSI occurrence based on wound class was clean (5.6%), clean contaminated (7.3%), contaminated (21.2%) and dirty cases (25.9%) which showed the similar increasing trend of infection as the degree of contamination increased. Because of different in characteristics in patients as different surgical procedure and hospital environment may show this, but increasing of SSI after clean procedure was striking.

There are many studies on wound infection carried out in different countries like USA by Horan et al^{xxi}, Turkey by Kaya et al^{xxii}, Pakistan by Sangrasi et al^{xxiii}, India by Kamat et al^{xxiv} the rate of SSI was 4.75%,12.8%,13%,30.7% respectively which was similar to this study. In this study occurrence of SSI in emergency cases (22%) was found to be higher compared to elective cases (6.3%) which is similar to the study of Sorensen et al^{xxv}. according to the study of Anbumani et al^{xxvi} showed among isolated bacteria 559 (49.6%) were gram positive cocci and 558 (49.5%) gram negative bacilli while negligible number 9 (0.8%) were gram positive bacilli and most frequent isolated organism were Staphylococcus aureus (37%),

Pseudomonas aeruginosa (15%) and *Escherichia coli* (12%) which is lower than this study and opposite of the isolated bacteria than this study. In this study isolated bacteria showed a strong resistance pattern to many antibiotics.

E coli and *Klebsiella* isolated from emergency cases showed resistance to antibiotics ciprofloxacin, ceftriaxone and sensitive to antibiotics like carbapanum, Amikacin and netilmicin while elective isolates showed a resistance of 70% to ciprofloxacin and 40% to ceftriaxone which is similar to the study conducted at Goa.

Conclusion:

In this study rate of surgical site infection (SSI) was 10.8% whereas in clean 5.6%, in Clean and Contaminated 7.3%, in contaminated 21.2% and in dirty 25.9%. In gram negative bacteria *E.coli* were most commonly isolated bacteria followed by *Pseudomonas* and *Klebsiella* and in gram positive bacteria *Staphylococcus aureus* were most common isolated bacteria. Therefore antibiotics sensitive to the gram negative and gram positive bacteria should be initiative for establishing improved hospital antimicrobial policy and antimicrobial prescribing guidelines.

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