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Clinico-Bacteriological Profile of Surgical Site Infections: Interim Results of a Prospective Study in Southwestern India

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Abstract: ***Background: Post-operative wound infection is one of the major causes for increased postoperative morbidity.[1] Such infections represent delayed healing, cause discomfort and anxiety for patient, longer stay in the hospital and add to the cost of health care services significantly.Most of these are superficial and readily treated with a regimen of local care and antibiotics. Determination of etiologic agent is important in choosing the correct antibiotics. The treating surgeon must have knowledge about the causative organisms and their antibiotic susceptibility. This observational study was undertaken to estimate the proportion of post-operative wound infections, the factors associated with the occurrence of post-operative wound infections and their antibiotic sensitivities in general surgery units of a tertiary care teaching hospital. Methods: All patients undergoing elective surgery in general surgery units of a tertiary care teaching hospital. Patients undergoing emergency surgery or patients who had primarily infected cases like Necrotising soft tissue infections, abscess,etc were excluded.All patients included in the study were evaluated by clinical features suggestive of post-operative wound infections and culture and sensitivity testing of their discharge was done.Patients undergoing surgery were followed up on outpatient/ inpatient basis till 10 post-operative days and assessed for post-operative wound infections. Results: We analysed 728 cases in elective setting out of which 66 got infected. The overall rate of surgical site infection was 9.06%. Escherichia coli was most frequently isolated organism (28%) followed by Pseudomonas aeruginosa (24%). The antibiotic sensitivity pattern of these organisms was also studied.***

Keywords: Surgical site infection, Wound, Southampthon Grading, Post operative wound infections, Infections

1. Introduction

Surgical site infections are defined as infections that occur 30 days after surgery with no implant, or within 1 year if an implant is placed and infection appears to be related to surgery. Development of such infections represent delayed healing, cause anxiety and discomfort for patient, longer stay in the hospital and add to the cost of health care services significantly.[2] Also they are likely to have an important role in the development of antimicrobial resistance. Most of these are superficial and readily treated with a regimen of local care and antibiotics. Determination of etiologic agent is important in choosing the correct antibiotics. A working knowledge of the most likely causative organism and the prevailing antibiotics sensitivity and resistance pattern will be of great help in treating such infections.[3] In most post-operative wound infections the causative pathogens originate from endogenous flora of the patients skin, mucous membrane or hollow viscera.[4]S.aureus, Klebsiella species, E.coli, Proteus speices, Streptococcus species, Enterobacter species, Pseudomonas species and CONS (Coagulase negative Staphylococci) were reported as the most common pathogens.[5]

In 1992 the US CDC revised its definition of wound infection, creating the definition of surgical site infection to prevent confusion between the infection of surgical incision and infection of traumatic wound.[6]

While the global estimate of SSI have varied from 0.5-15% [7], studies in India have consistent shown higher rates ranging from 20-38%.[8,9]

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. Hence this observational study has been undertaken to estimate the proportion of post-operative wound infections, the factors associated with the occurrence of post-operative wound infections and their antibiotic sensitivities in general surgery units of a tertiary care teaching hospital in southwestern India.

2. Material and Methods

A hospital based prospective observational analytical study has been undertaken in the general surgery unit of a tertiary care hospital from August 2018 with a target of analysing 1000 cases. As per literature, 11.7% of patients who undergo surgery develop post-operative wound infections[10]. Minimum sample required with 95% confidence interval and 2% absolute margin of error is 992. So, 1000 patients who will undergo surgery during the study period will be included in the study.

The study group comprises of patients undergoing surgeries in general surgery units of a tertiary care teaching hospital

Inclusion Criteria

Consecutive patients who will undergo clean elective surgery in general surgery units of a tertiary care teaching hospital who will give consent for participation in the study.

Exclusion Criteria

1) Patients undergoing emergency surgery
2) Primarily infected cases like Necrotising soft tissue infections, abscess, etc
3) Patients not consenting for the study
4) Patients who were Clean contaminated/ Contaminated or Dirty surgical cases.

All patients included in the study were evaluated by clinical features suggestive of post-operative wound infections.The infections were graded as per Southampton Grading System[11] for Post-Operative wound infection. Swabs of the exuding wounds were tested for microbial culture and sensitivity. All Swabs were from the same brand of a single manufacturer and single lot.All the swabs were processed in the same Laboratory for growth of micro-organisms and antibiotic sensitivity was checked.All the antibiotic sensitivity will be tested as per the Latest CLSI (Clinical and Laboratory Standards Institute) Guidelines. Cultures were taken by the Streaking method. Antibiotic Sensitivity will be tested by the Kirby Bauer Disc Diffusion Method.

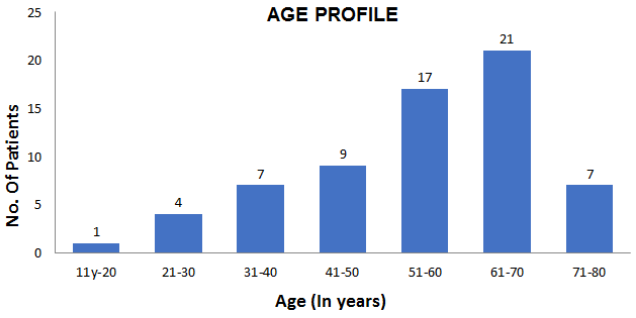
Patients undergoing surgery were followed up on outpatient/ inpatient basis till 10 post-operative days and assessed for post-operative wound infections. Informed consent was taken from each patient included in the study.

Analysis of various variables in the study will be done after collection of all relevant data, using appropriate inferential procedures like Unpaired t-test and X^2 test.There are no therapeutic interventions involved in the study.

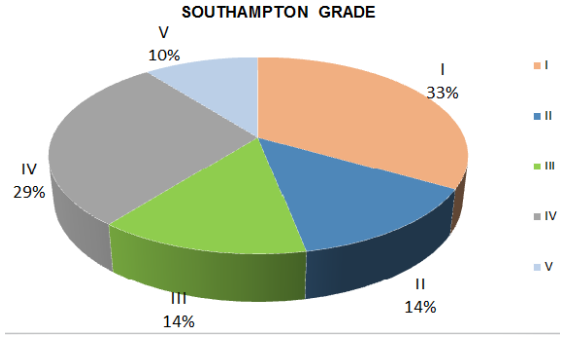
3. Results

Total of 66 of the 728 cases analysed till now had post operative wound infection (9.06%).

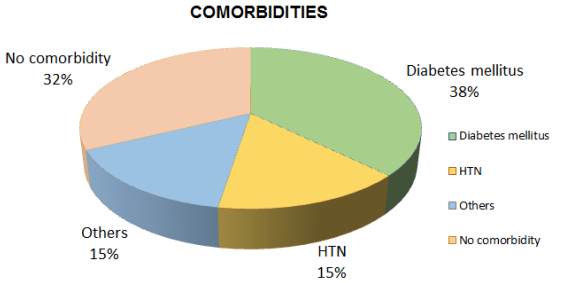
	Males	Females	Total
Total patients	392	336	728
Post Op Infection	40	26	66
Percentage	10.20%	7.73%	9.06%



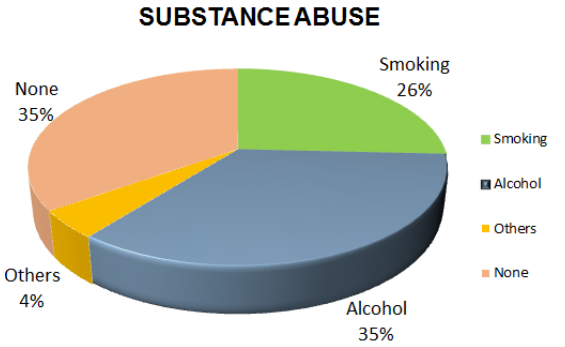
The patients in the age group 61-70years had the maximum number of post operative wound infections followed by those in 51-60years group.



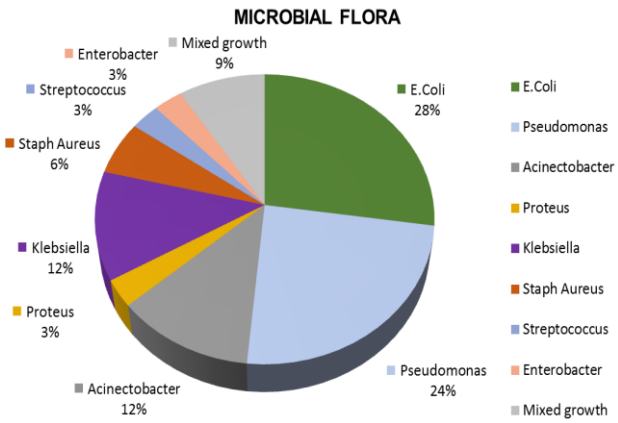
All the surgical site infection wounds were graded as per the Southamptom Grading System[11] for surgical site infection. It was observed that 33% of the infected wounds were Grade I.



It was observed that 38% of the patients have SSI in wounds of electively done surgeries which depicts a strong association between Diabetes and chances of SSI.



Thirty five percent of the patients who had post operative wound infections had history of frequent alcohol use.



Escherichia coli

S. No.	Antibiotic	Percentage
1	Gentamycin	100
2	Amikacin	100
3	Netilmycin	88.9
4	Imipenem	77.8
5	Meropenem	77.8

Pseudomonas

S. No.	Antibiotic	Percentage
1	Imipenem	100
2	Meropenem	100
3	Amikacin	87.5
4	Pip-Taz	75

Staphylococcus

S. No.	Antibiotic	Percentage
1	Netilmycin	100
2	Linezolid	100
3	Chloramphenicol	100
4	Tetracycline	50

Klebsiella

S. No.	Antibiotic	Percentage
1	Amikacin	100
2	Pip-Taz	100
3	Cefoperazone + Sulbactum	75

Culture sensitivity testing of the discharging wounds revealed that E. coli and Pseudomonas were the most common organisms in the infected wounds. Acinetobacter is a common contaminant in the hospital samples and seen to be the third most common organism to grow in our culture testing.

S. No.	Day of detection	No. of cases	Percentage
1	POD 1	8	12.1
2	POD 3	19	28.8
3	POD 7	35	53.0
4	POD 10	4	6.1

It was observed in the present study that 8 (12.1%) of wound infections were detected on Post-operative Day 1 (POD 1) while 19 (28.8%) and 35 (53.0%) wound infections were detected on POD3 and POD 7 respectively. 4 (6.1%) wound infections was detected on POD10.

	Number	% of SSI Cases	% of total cases
Procedures	35	53.03%	4.80%

Thirty patients with SSI had to undergo atleast one more surgical procedure (eg. secondary suturing, debridement, etc) for the wound to heal which added to the overall morbidity, length of hospital stay and cost of treatment.

4. Discussion

Infections of the surgical wounds are one of the most common hospital acquired infection (HAI) and are an important cause of morbidity and mortality. The delay in recovery and subsequent increased length of hospital stay also has economic consequences[12]. The prophylactic use of antimicrobial agents to reduce the postoperative infection is widely practised. The objective of preoperative antibiotic prophylaxis is to prevent postoperative infections[13]. Rational use of antibiotic is extremely important as injudicious use can adversely affect the patient, cause emergence of antibiotic resistance and increase the cost of health care[14,15].

The study of Roy S[16] was carried out to know frequently isolated bacterial microorganism in the post-operative wound infections. The ages of the patients were in the 20-50 years. The author noted that S. aureus was observed in maximum number of patients followed by P.aerugenosa and E.coli.

Kochhal N et al[17] cross sectional study assessed the incidence, risk factors and associated pathogens of Surgical Site Infection. The rate of infection in patients in the age of 61 to 70 years and 51-60 years was 10%.

Negi V et al[18] in a cross-sectional study determined the incidence of SSIs and the prevalence of aerobic bacterial pathogens involved with their antibiogram. The mean age of the patients was 43.8 years (range 14 to 85 years) and the peak incidence of SSI was observed in age group >50 years (51.8%). Males (74.6%) were more commonly affected than females (25.5%) and the sex ratio male: female was 2.9:1.
It was observed in the present study that the incidence of post-operative wound infections in our study was 12.5%. This is concordant to the studies of AnandS et al[19], Kochhal N et al[92] and Negi V et al[18].

AnandS et al[19] found overall rate of surgical site infection (SSI) was 11.7%. The occurrence of SSI in emergency cases (23.8%) was found to be higher compared to elective cases (7.4%).

Kochhal N et al[17] found overall infection rate was 6%. Surgical site infection rate was 4.65% (2/43) in clean operative wounds and 7.02% (4/57) in clean contaminated operative wounds.

Negi V et al[18] in a cross-sectional study determined the incidence of SSIs and the prevalence of aerobic bacterial pathogens involved with their antibiogram. The authors found out of 768 patients, 137 (17.8%) were found to have SSIs.

Eight (12.1%) of wound infections were detected on Post-operative Day 1 (POD 1) while 19 (28.8%), 35 (53.0%) and 4 (6.1%) wound infections were detected on POD 3, POD 7 and POD 10 respectively. This is consistent with the studies

of Bhadauria AR et al[20], Matin ASMR[21] and Haddad V et al[22].

53.03% of the patients had to undergo atleast one more surgical procedure for the wound to heal which added to the cost of morbidity, hospital stay and cost of treatment.

Although SSIs are not associated with a high case fatality rate, they cause significant morbidity and huge economic burden in the form of prolonged hospital stay, readmission and procedures. Hence a septic surgical wound is considered a remarkable expensive luxury.[6]

5. Conclusion

Knowledge about the bacteriological profile and their antibiotic susceptibility pattern of post-operative wound infections can serve as a useful tool for the clinicians to start empirical treatment of patients at the earliest, according to local pattern and emerging multidrug resistance and also to give importance to strict infection control practices and periodic surveillance.

6. Conflicts of Interest

The authors declare no conflict of interest.

7. Disclosures and Funding

None

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