Original Article

Systematic study of surgical site infection in tertiary care centre at rural India

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Abstract

Objective: To find out the most common bacterial pathogens responsible for post-operative wound infection and their antibiotic sensitivity profile. **Materials and Methods:** This prospective, observational study was carried out in patients of postoperative wound infection. Samples from wound discharge were collected using a sterile swab and studied for identification of isolates by Gram stains and culture growth followed by *in vitro* antibiotic susceptibility testing performed by disc diffusion method on Mueller Hinton agar. **Results:** Out of 183 organisms, 126 (68.85%) isolated organisms were gram negative. *Staphylococcus aureus,* 48 (26.23%), was the predominant organism. *S. aureus* was sensitive to rifampicin (89.58%), levofloxacin (60.42%), and vancomycin (54.17%). *Pseudomonas aeruginosa* was sensitive to ciprofloxacin (83.78%), gatifloxacin (51.35%), and meropenem (51.35%). *Escherichia coli* was sensitive to levofloxacin (72.41%) and ciprofloxacin (62.07%). *Klebsiellapneumoniae*was sensitive to ciprofloxacin (63.16%), levofloxacin (63.16%),gatioxacin (63.16%), and linezolid (56.52%). *Proteus mirabilis* was sensitive to ciprofloxacin (75%) and linezolid (62.50). *Proteus vulgaris* was sensitive to ampicillin+sulbactam (57.14%) followed by levofloxacin (50%). **Conclusions:** E.coli is most common organism encounter in this study whole Amikacin is most sensitive antiobioticfound.

Keywords: Antibiogram, antibiotic sensitivity, bacterial resistance, gram negative bacteria, gram positive bacteria.

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INTRODUCTION

Infections that occur in the wound created by an invasive surgical procedure are generally referred to as surgical site infections. Surgical site infections (SSI) are the third most common hospital-acquired infection and account for 14% to 16%of all such infections. 1 For surgical patients, though, SSI are the most common hospital- acquired infection. Several reports have described the substantial cost of these infections in terms of attributable mortality, increased morbidity measured as increased postoperative hospital length of stay, and increased hospital costs.1 Patients who develop SSIs are up to 60% more likely to spend time in an intensive care unit, five times more likely to be readmitted to the hospital, and to have twice the mortality rate compared with patients without an SSI.2 Up to 2%–5% of patients undergoing clean extra abdominal operations and up to 20% undergoing intra-abdominal operations will develop an SSI .SSIs is associated with considerable morbidity and it has been reported that over one-third of postoperative deaths are related, at least in part, to SSI. However, it is important to recognise that SSI can range from a relatively trivial wound discharge with no other complications to a life-threatening condition. Other clinical outcomes of SSIs include poor scars that are cosmetically unacceptable, such as those that are spreading, hypertrophic or keloid, persistent pain and itching, restriction of movement, particularly when over joints, and a significant impact on emotional wellbeing.[3]

MATERIALS AND METHODS

This prospective, observational, hospital-based cohort study**.** was carried out after prior approval by Institutional Ethics Committee. Total 59 patients of either gender in different. age groups admitted to the general surgery wards of tertiary care centre, were enrolled in the study

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between August 2013 and January 2016. In all cases, preoperative, intraoperative, and postoperative. Details were studied. Information was collected in a case record form for age, sex, date of admission, associated co-morbid condition, reason for admission, type of surgery: emergency or planned, procedure, duration of surgery, preoperative and postoperative stay, preoperative antibiotic prophylaxis and type of wound clean, potentially infected and frankly infected wound. All patients were followed up in wards till discharge from the hospital.[10] Samples for wound infections were collected from the patients. with complaints of discharge, pain, swelling, foul smelling, delayed and non-healing wound by using a sterile swab, taking care to avoid contamination of the specimen with commensals from the skin, and were immediately transported to the laboratory. They were studied for identification of isolates by Gram stains and culture growth on nutrient, blood and MacConkey agar. Colonies from nutrient agar were used for biochemical tests and antibiotic sensitivity. On isolation of Gram positive cocci, catalase, and coagulase tests were done. Gram negative bacilli were distinguished using biochemical tests IMViC (indole, methyl red, Voges-Proskauer, citrateuti lization), oxidase and triple sugar iron (TSI) agar tests. After confirmation of the organism, culture growth was tested for *in vitro* antibiotic susceptibility testing performed by disc diffusion method (modified Kirby Bauer method) on Muller Hinton agar.[11]

RESULTS

In the study 59 subjects with postoperative wound infection were included. Mean age of subjects was 37.81 ± 16.2 yrs.

Table 1: Age distribution of subjects

		Frequency	Percent
Age	< 30 yrs	23	39.0
	31 to 40 yrs	11	18.6
	41 to 50 yrs	11	18.6
	> 50 yrs	14	23.7
	Total	**59**	**100.0**

Majority of subjects were in the age group < 30 years (39%), 23.7% in the age group >50 yrs and 18.6% in 31 to 40 yrs and 41 to 50 yrs respectively.

Table 2: Gender distribution of subjects

		Frequency	Percent
Gender	Female	21	35.6
	Male	38	64.4
	Total	**59**	**100.0**

Majority (64.4%) of subjects were males and 35.6% were females in the study.

Table 3: Distribution of subjects according to Diagnosis

		Frequency	Percent
Diagnosis	DUP	19	32.2
	Int Obstruction	11	18.6
	AP	9	15.3
	IP	7	11.9
	Appendicitis	5	8.5
	Meckel's Diverticulum	2	3.4
	Hernia	2	3.4
	Hydrocele	2	3.4
	Traumatic Perforation	1	1.7
	DU	1	1.7
	Total	**59**	**100.0**

In the study majority of subjects had DUP (32.2%), followed by Intestinal obstruction (18.6%), AP (15.3%), IP (11.9%) and other causes.

Table 4: Microorganism isolated from the wound

		Frequency	Percent
Microorganism	E.coli	20	33.9
	Pseudomonas	10	16.9
	Klebsiella	7	11.9
	Staphylococcus	7	11.9
	Proteus	6	10.2
	Acinetobacter	5	8.5
	Streptococci	4	6.8
	Total	**59**	**100.0**

In the study most common organism isolated for the post-operative wound was E coli (33.9%), followed by Pseudomonas (16.9%), Klebsiella (11.9%), Staphylococcus (11.9%), Proteus (10.2%), Acinetobacter (8.5%) and Streptococci (6.8%).

Table 5: Antibiotic sensitivity and resistance

	Sensitive	Percentage	Resistance	Percentage	Effectiveness
A	+28	47.5%	-31	52.5%	-3
AK	+41	69.5%	-18	30.5%	23
AM	+29	49.2%	-30	50.8%	-1
C	+30	50.8%	-29	49.2%	1
CA	+28	47.5%	-31	52.5%	-3
CB	+31	52.5%	-28	47.5%	3
CE	+38	64.4%	-21	35.6%	17
CF	+17	28.8%	-42	71.2%	-25
CP	+10	16.9%	-49	83.1%	-39
CT	+29	49.2%	-30	50.8%	-1
DO	+20	33.9%	-39	66.1%	-19
PB	+30	50.8%	-29	49.2%	1
PC	+19	32.2%	-40	67.8%	-21
E	+21	35.6%	-38	64.4%	-17
G	+24	40.7%	-35	59.3%	-11

DISCUSSION

Age: Surgical site infection most commonly found in age group < 30 years. Same results were found in Wexford General Hospital Surgical Site Infection (SSI) data report in 2009. 25

Gender: In our study, we found that male patients were more prone for surgical site infection (64.4%) than females which are 35.6%. Our study findings are comparable with study conducted by Naveen *et al*.27

Type of Surgery: In present study the number of cases with postoperative wound infection in elective surgery are 16 accounting for 27.1% and for emergency surgery are 53 cases accounting for 72.9%. the reason of postoperative would infection being most common in emergency surgery is most probably that the most patients being operated for emergency surgery had hollow viscus perforation with contamination of peritoneal cavity causing contamination of wound.

Organism: Most common organism encountered in postoperative wound infection in this study is E. Coli, in 20 cases accounting for 33.9%. the second common organism in this study is pseudomonas, in 10 cases accounting for 16.9%. The least common organism was streptococci. The reason for E. Coli being most common organism is that majority of patients getting postoperative wound infection, have undergone surgery for hollow viscus perforation and E. Coli being the most common organism found in intestinal flora, might have contaminated the wound.

Author	Agrawal *et al* [38]	Tripathi and Roy[39]	Our study
Most common organism	E coli	Staphylococcus Aureus	E coli

Antibiotic sensitivity: In our study the common sensitive antibiotics are Amikacin, carbenicillin, ceftriaxone, polymyxin-B. The common resistant antibiotics are cephalexin, ciprofloxacin, Erythromycin, Gentamicin. The reason for sensitivity of the antibiotics in our series is probably due to their broad spectrum and less routine use due to unavailability of oral preparation, cost. Therefore less commonly prescribed as outpatient. The reason for resistance of31 antibiotics in our series is probably due to their more common use in outpatient department and indoor patients for prolonged period. Kowli *et al*30, shows gentamycin, Cloxacillin, cotrimoxazole Chloramphenicol more ensitive antibiotic postoperatively for gram positive aerobes and cephaloridine, Gentamycin, Kanamycin sensitive against gram negative aerobes. Tripathy and Roy39 observed that organisms were less sensitive to penicillin, tetracycline, ampicillin and erythromycin in that order of descending magnitude as compared to cotrimoxazole, gentamycin and chloramphenicol.

Author	Kowl *et al* 30	Tripathi and Roy 39	Our study
Antibiotic sensitivity	Cloxacillin Cotrimoxazole Chloramphenicol Cephaloridine Gentamicin Kanamycin -	Co-trimoxazole Chloramphenicol Gentamicin	Amikacin Carbenicillin Ceftriaxone Polymyxin B
Antibiotic resistance		Penicillin Tetracycline Ampicillin Erythromycin	Cephalexin Ciprofloxacine Erytromycine Gentamycine

CONCLUSIONS

1. Majority of patients belonged to age group of <30 years which account for 39%.
2. The wound infection was more common in males (64.4%) than females (35.6%).
3. Out of 59 cases, 19 cases were having duodenal ulcer perforation accounting for 32..2%.
4. Most of the patients presented with discharge through the wound. The most common type of discharge was 78%. Total 46 cases presented with discharge.
5. Out of 75 cases, in 64 cases dressing was changed on alternate day accounting for 85.3%.
6. 35 cases out of 59 have undergone surgery which is classified as dirty accounting for 59.3%.
7. Out of 59 cases 10.2% cases received preoperative antibiotics, 6. 8% received perioperative antibiotics.
8. 20.3% cases had preoperative both. In 74.6% cases, hair removal was done by shaving 59.3% cases skin was prepared > 24 hrs before surgery.
9. In 33.9% cases E. Coli was the micro-organism found on culture.
10. More sensitive antibiotics are amikacin, ceftriaxone, carbenicillin, cetotaxime, polymyxin-B, piperacillin. More resistant antibiotics are cephalexin and erythromycin.84

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