

Original Research Article

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## Surveillance of Post-operative Wound Infections Along with their Bacteriological Profile and Antibiotic Sensitivity Pattern at Government Cancer Hospital, Aurangabad, India

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### ABSTRACT

#### Keywords

Post-operative wound infection, Bacterial isolates, ESBL, SSI.

#### Article Info

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Surgical site infections pose a major threat to the morbidity of immunosuppressed patients. They lead to increased hospital stay, delayed recovery, increased treatment cost and a high risk of spread of Nosocomial infections. The present study was conducted to identify the post-operative wound infection rate, to isolate and identify the bacterial pathogens and to determine its antibiotic susceptibility pattern. Total 70 pus samples were collected from patients having post-operative wound infections out of 716 operations performed during January to December, 2016. Samples were processed as per standard guidelines. Out of 70 pus samples, 57 yielded growths of organisms making total 59 isolates. Out of 59 bacterial isolates most common isolate was *Staphylococcus aureus* 13(22.03%) followed by *E. coli* and *Acinetobacter spp.* 12 (20.33%) each and *Pseudomonas aeruginosa* 10 (16.94%), & *Klebsiella spp* 08(13.55%). Out of 44 GNB, 27 (61.36%) were Extended Spectrum  $\beta$  lactamase (ESBL) producer. Out of 13 *S. aureus*, 04 (30.76%) were Methicillin Resistant *Staphylococcus aureus* (MRSA) sensitive to Vancomycin. Post-operative wound infection rate was 9.77%. Most isolates were multi drug resistance. Changing antimicrobial resistance pose challenge in treating pyogenic infections. Appropriate and judicious selection of antibiotic would limit the emerging drug resistant strains in the future to treat these clinical conditions successfully.

### Introduction

Infection is the clinical manifestation of the inflammatory reaction incited by invasion and proliferation of micro-organisms (Abdul *et al.*). Despite modern surgical techniques and the use of antibiotic prophylaxis, surgical site infection (SSI) is one of the most common complications encountered in surgery (Mehta *et al.*, 2013). A surgical site infection is an infection that occurs after surgery in the part of the body where the surgery took place [CDC Healthcare-associated Infections (HAI)]. Surgical site infections (SSIs) are

defined as infections occurring up to 30 days after surgery (or up to one year after surgery in patients receiving implants) and affecting either the incision or deep tissue at the operation site (Owens *et al.*, 2008). Surgical site infections are third most commonly reported nosocomial infection & they account for approximately a quarter of all nosocomial infections. They have been responsible for increasing cost, morbidity and mortality related to surgical operations and continues to be a major problem even in hospitals with

most modern facilities & standard protocols of preoperative preparation and antibiotic prophylaxis.

Reported surgical site infection rate in India has varied from a low of 2.5% to a high of 41.9% over a period of decades. The increasing number of immunocompromised patients and increased use of indwelling devices, as well as widespread use of antimicrobial agents in hospital settings, particularly in intensive care units (ICUs), contributes to antimicrobial resistance among pathogens causing nosocomial infections (Asfia *et al.*, 2015).

Surveillance of post-operative wound infections helps in determining the infection rates, risk factors and in planning the preventive strategies to ensure a quality healthcare in hospital (Bemnet *et al.*, 2011).

Since ours is a newly constructed 100 bedded Cancer hospital, it is very necessary for us to keep a check on Hospital Associated infections from an early stage so that we can analyse and apply preventive measures required to keep these infection rates to their minimum. Hence we conducted this study to measure the post-operative wound infection rate and to isolate and identify the bacterial pathogens and to determine its antibiotic susceptibility pattern.

### **Materials and Methods**

The present study was conducted in the Department of Microbiology, Government Cancer Hospital, Aurangabad during one year period from January to December, 2016. Out of 716 total operations performed, 70 (9.41%) patients having post-operative surgical site infections were included in the study.

**Sample collection:** Pus samples were collected from surgical site wound infections,

using a sterile disposable swab. Care was taken to avoid contamination. Swabs were transported to the Microbiology laboratory and processed as per standard guidelines. Isolates were identified morphologically and confirmed by biochemical reaction (Koneman *et al.*, 2006; Forbes *et al.*, 2007).

Criteria for antimicrobial sensitivity testing were carried out as per Clinical Laboratory standard institute (CLSI). Antimicrobial sensitivity testing was done on Muller Hinton Agar (MHA) by Kirby Bauer's disc diffusion method (CLSI, 2016). Commercially available discs (Hi-media) were used. For Gram-positive organisms, the antibiotics to be tested and reported were chosen from the following (depending on the organism isolated): Penicillin (10 units), Erythromycin (15 µg), Clindamycin (2 µg), Gentamicin (10mcg) & high level (30mcg), Amoxicillin-clavulanate (20/10 µg), Cefoxitin (30 µg), Levofloxacin (5 µg), Vancomycin (30µg/MIC), Linezolid (30 µg), and Co-trimoxazole (1.25/23.75 µg).

For Gram-negative, the antibiotics for respective organisms were chosen from the following: Ciprofloxacin (5 µg), Levofloxacin (5 µg), Norfloxacin (5 µg), Gentamicin (10 µg), Amikacin (30 µg), Cefpodoxime (30 µg), Cefotaxime (30 µg), Ceftazidime (30 µg), Cefepime (30 µg), Piperacillin+Tazobactam (100/10mcg), Imipenem (10 µg), and Colistin.

Methicillin resistance in *Staphylococcus aureus* (MRSA) was tested using Muller Hinton Agar with Cefoxitin disc (30mcg) by Kirby-bauer disc diffusion methods as per CLSI guidelines. Suspected extended-spectrum beta lactamases (ESBLs) producing Enterobacteriaceae were confirmed by double disk synergy test as per CLSI guidelines.

*Staphylococcus aureus* (ATCC 25923), *E. coli* (ATCC 25922) and *P. aeruginosa*

(ATCC 27853) were used as quality control throughout the study for culture and antimicrobial susceptibility testing.

### Results and Discussion

70 (9.77%) pus samples were obtained out of 716 operations performed. Out of 70 pus samples received for culture and sensitivity in the microbiology central laboratory, 57 (89.47%) cases yielded positive culture while 13 (10.53%) cases had no growth (Figure-1). Among the 57 culture positive pus samples, 55 yielded pure bacterial isolates and 2 yielded mixed infection, so a total number of 59 organisms were isolated out of 70 pus samples. Out of 59 bacterial isolates, 44 were Gram negative bacilli (GNB) and 15 were Gram positive cocci (GPC). Most common bacteria isolated were *Staphylococcus aureus* 13(22.03%) followed by *E. coli* and *Acinetobacter spp.* 12 (20.33%) each and *Pseudomonas aeruginosa* 10(16.94%) &

*Klebsiella spp.* 08 (13.55%) (Table 1). Among the Gram Negatives the most prevalent organisms isolated were *E. coli* (27.27%) and *Acinetobacter spp.* (27.27%) followed by *Pseudomonas species* (22.72%) and *Klebsiella* (18.18%) and Other organisms isolated were *Proteus* and *Serratia* 01 each (Table 2). Among the Gram positives the most prevalent organisms isolated were *Staphylococcus aureus* (86.66) followed by *Enterococcus spp* (13.33%) (Table 3)

Out of 44 Gram negative isolates, 27 (61.36%) were Extended Spectrum  $\beta$  lactamase (ESBL) producer. Resistance to Carbapenems was highest among *Klebsiella* (37.5%) followed by *Acinetobacter spp.* (33.33%) and *Pseudomonas* (30%). Refer Table 4 and 5 for detailed antibiogram of GNB and GPC resp. Out of 13 *S. aureus*, 04 (30.76%) were Methicillin Resistant *Staphylococcus aureus* (MRSA) and sensitive to Vancomycin.

**Table.1** Bacterial profile of pus culture

Sr. No	Organism	Number	%
1.	<i>Staphylococcus aureus</i>	13	22.03%
2.	<i>E. coli</i>	12	20.33%
3.	<i>Acinetobacter spp.</i>	12	20.33%
4.	<i>Pseudomonas aeruginosa</i>	10	16.94%
5.	<i>Klebsiella spp.</i>	08	13.55%
6.	<i>Enterococci spp.</i>	02	3.38%

**Table.2** Gram negative isolates (n-44).

Sr.No.	Gram negative isolates	Total numbers	Percentage%
1.	<i>E. coli</i>	12	27.27%
2.	<i>Acinetobacter spp</i>	12	27.27%
3.	<i>Pseudomonas aeruginosa</i>	10	22.72%
4.	<i>Klebsiella spp</i>	08	18.18%
5.	Others	02	4.54%

Others-*Proteus* and *Serratia*.

**Table.3** Gram positive isolates (n-15)

Sr. No.	Gram positive isolates	Total numbers	Percentage
1.	<i>Staphylococcus aureus</i>	13	86.66%
2.	<i>Enterococci spp</i>	02	13.33%

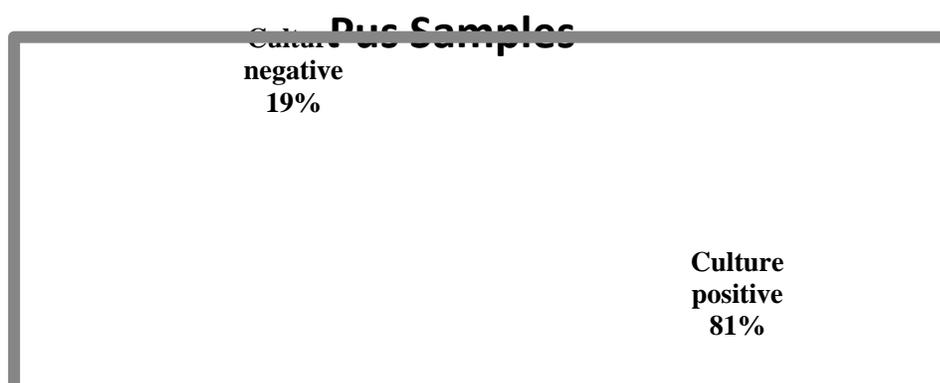
**Table.4** Resistance to antibiotics among common Gram negative isolates (%)

Sr. No.	Gram negative isolates	Amino glycosides	Fluoro quino lones	3 <sup>rd</sup> Generation Cephalo sporins	Piperacillin+ tazobactam	Cefepime	Imepenem
1.	<i>E.coli</i>	66.6	66.6	76.6	41.6	50	16.6
2.	<i>Acinetobacter spp</i>	83.3	91.6	83.3	58.33	50	33.3
3.	<i>Klebsiellaspp</i>	75	87.5	75	50	62.5	37.5
4.	<i>Pseudomonas aeruginosa</i>	40.0	60.0	60.0	2530.0	50	30.0

**Table.5** Antibigram of *Staphylococcus aureus*

Name of Antibiotic	<i>Staphylococcus aureus</i> N=13	
	R	S
Erythromycin	61.53%	38.47%
Clindamycin	38.46%	61.54%
Fluoroquinolones	61.53%	38.47%
Cefoxitin	30.76%	69.24%
Amoxy-Clav	53.84%	46.16%
Linezolid	0%	100%
Cotrimoxazole	59.28%	40.72%
Vancomycin	0%	100%

**Fig.1** Pie chart showing culture positivity among pus sample



According to WHO guidelines of hospital acquired infections, Surgical Site Infection contributes to 0.5% to 15% of total burden to HAI. In our study, 70 (9.7%) cases developed SSI, this finding was consistent with findings of Mehta *et al.*, (2013) and Asfia *et al.*, (2015). Similar rates were obtained by Varsha *et al.*, (2012) and Sule *et al.*, (2002). Other studies Khalid *et al.*, (2010) and Mohammed *et al.*, (2013) have reported quite a high incidence of SSI. In the present study *S. aureus* (22.3%) was the most common isolate which is comparable with Mehta *et al.*, (2013), Chauhan *et al.*, (2015) and Raghav *et al.*, (2014). The second most common organism isolated in our study was *E. coli* and *Acinetobacter spp.* (20.33%). Similar results with *E. coli* were also seen by Chauhan *et al.*, (2015) and Basu *et al.*, (2009). A study conducted at Karnataka (Kapoor *et al.*, 2014) has shown similar prevalence of *Acinetobacter* (22.2%). Overall, there has been an increase in the prevalence of multi drug resistant organisms (MDRO) in the last decade globally, which is much more in India compared to Western populations (Basu *et al.*, 2009). Our study showed a very high percentage of resistance among organisms to betalactam antibiotics, combination of betalactam/ betalactamase inhibitors. Of major concern was the observation that there was a very high prevalence of ESBL among the GNB's (61.36%). Same trend was observed by Kapoor *et al.*, (2014) and Mathur *et al.*, (2002).

Resistance to carbapenems was seen to be prevalent in *Klebsiella* (37.5%) followed by *Acinetobacter spp* (33.33%) and *Pseudomonas* (30%), the resistance to carbapenems at our institute was lower than that seen by Vivek *et al.*, (2016), but higher than the findings depicted by Santosh *et al.*, (2016). The problem of antibiotic resistance is fortunately not as high among the Gram-positive organisms. We did not encounter any

vancomycin resistance among staphylococci, and MRSA rates have been approximate 30.76% which was comparable to other studies.

In conclusion, SSI causes considerable morbidity among surgical patients. In Cancer patient's immunosuppression can play a major role in developing these infections. Appropriate active surveillance and infection control measures should be introduced during preoperative, intra-operative, and postoperative care to reduce infection rates. Irrational use of antibiotics should be stopped. Our ability to successfully treat infections due to these increasingly resistant organisms demands a multifactorial approach combining continued research and development of novel classes of antibacterial agents, more prudent use of existing agents and an increased emphasis on more effective infection control measures.

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