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## STUDY OF SURGICAL SITE INFECTIONS AND ANTIBIOTIC SUSCEPTIBILITY PATTERN OF ISOLATES AT A TERTIARY CARE HOSPITAL IN AMRITSAR

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Surgical site infections are the third most frequently reported nosocomial infections accounting for 14-16% of all the infections in hospitalised patients. Methodology: Two

s. Methodology: Two hundred swabs/pus specimens from the patients developing surgical site infections at Guru Nanak Dev Hospital, GMC, Amritsar were processed in the Department of microbiology during JanNov2015, by standard methods and antibiotic susceptibility testing of all the isolates was done by using Kirby Bauer disc diffusion technique. Results: Of the 153 organisms isolated, the most common was *Staphylococcus aureus* (47.7%), followed by *Pseudomonas aeruginosa* (16.99%), *Escherichia coli* (14.37%), *Klebsiella pneumoniae* (9.15%), miscellaneous gram negative rods (9.14%) and *Streptococcus pyogenes* (2.61%). About 30% of the *Staphylococcus aureus* isolates were found to be methicillin resistant. Conclusion: We should clearly understand and identify this as a problem and devise a system to track, analyze and monitor these.

### Surgical site infections (SSI) and their management in the operating room

One hundred and fifty three organisms were isolated from the 200 specimens processed. One hundred and five specimens yielded growth of single organism while two isolates were present in rest of the twenty four cases. The most common pathogen isolate was, *Staphylococcus aureus* (47.71%), followed by *Pseudomonas aeruginosa* (16.99%), *Escherichia coli* (14.37%), *Klebsiella pneumoniae* (9.15%), *Streptococcus pyogenes* (2.61%) and miscellaneous gram negative rods (9.14%) including *Acinetobacter baumannii*, *Proteus mirabilis* and *Citrobacter diversus* (Table 1)

Table 1. Pathogens isolated from Surgical site infections

Pathogen	Number of isolates	Percentage (%)
<i>Staphylococcus aureus</i>	73	47.71
<i>Pseudomonas aeruginosa</i>	26	16.99
<i>Escherichia coli</i>	21	14.37
<i>Klebsiella pneumoniae</i>	14	9.15
<i>Streptococcus pyogenes</i>	4	2.61
Miscellaneous gram negative rods	15	9.14

Surgical site infections (SSI) are the third most frequently reported nosocomial infections accounting for 14-16% of all the infections in hospitalised patients. Among surgical patients SSI are the most common nosocomial infections<sup>1</sup>. These remain a complication of surgical procedures resulting in increased morbidity, mortality and cost<sup>2</sup>. The risk of developing a surgical site infection depends upon the balance between factors determining the number of bacteria contaminating the site and the factors determining the resistance of the site against infection<sup>3,4</sup>. One of the major problems faced by the surgeons these days is to deal with the post surgical infections, as most of these are being caused by multiple resistant bacteria. Gram positive cocci and Gram negative bacilli are being implicated in most of such cases<sup>5,6</sup>. The problem of infected surgical sites can only be tackled properly if all these are examined bacteriologically and feed back given to the surgeons well in time, so that they can treat these with appropriate antibiotics<sup>7</sup>. Not only this but, the microbiologist should provide them the guidance regarding proper use of prophylactic antibiotics. But, according to the cure, prevention of surgical site infections by adopting basic principles of asepsis is the key to the solution of this problem<sup>8</sup>.

### Material and Methods:

Two hundred wound swabs/pus specimens collected from patients developing surgical site infections during a period from January 2015 to November 2015, were included in the study. Most of our patients were young males (n=80). Rest were females (n=38) and children (n=11). The age range was between 4-65 years and had undergone different kinds of surgery including general surgery (n70), gynecological/obstetric surgery (n48) and orthopedic surgery (n11). Pus swabs/specimens were collected from infected surgical sites by standard technique using commercially available sterile stick swabs. The specimens were immediately transported to the Department of Microbiology, GMC, Amritsar for bacteriological study. All the specimens were inoculated onto blood and MacConkey's agar within two hours of collection. The agar plates were incubated at 37°C aerobically and were examined for the presence of any growth after 24 hours. Those plates showing no growth were incubated for another 24 hours. The isolates were identified by colonial morphology, Gram's stain and conventional biochemical tests. Antibiotic susceptibility pattern of the isolates was studied using Kirby Bauer method<sup>9</sup>. Mueller Hinton agar (Difco) was used for antibiotic susceptibility testing. *Staphylococcus aureus* ATCC 25932, *Escherichia coli* ATCC 25922 and *Pseudomonas aeruginosa* ATCC 27853 were included as control strains.

### Results

Streptococcus pyogenes %	Staphylococcus aureus %	Antibiotic	Gram positive cocci
-	86.3	Amikacin	
-	45.2	Gentamycin	
-	65.75	Ciprofloxacin	
0	49.31	Cotrimazole	
-	30.1	Methicillin	
100	100	Vancomycin	
100	54.79	Cephalexin	

In case of *Pseudomonas aeruginosa* only 8 isolates (30.7%) were gentamicin sensitive. Quite a few strains were also found resistant to piperacillin tazobactam, ciprofloxacin and ceftazidime. Antibiotic susceptibility pattern of all the Gram negative rods (GNRs) studied is shown in (Table 3).

**Table 3. Antibiotic susceptibility pattern (Percent sensitive) Gram negative rods (GNRs)**

Miscellaneous GNRs	Klebsiella pneumoniae	Escherichia coli	Pseudomonas aeruginosa	Antibiotic
50	42.8	54.5	50	Amikacin
57.1	50	36.3	30.7	Gentamycin
28.6	50	40.9	53.8	Ciprofloxacin
71.42	50	50	50	Ceftazidime
64.2	64.2	40.9	69.2	Ceftriaxone
71.42	42.8	63.6	73	Sulbactam-ceftriaxone
64.3	71.4	72.7	61.5	Piperacillin – tazobactam
57.1	57.1	72.7	84.6	Imipenem

#### Discussion

Surgical site infection can be defined as the presence of pus along with signs of inflammation in the surgical wound margins. Predisposing underlying conditions for surgical site infections include immune suppression, irradiation, steroid administration, diabetes mellitus and malnutrition<sup>10</sup>. The risk of infection after surgery depends upon the factors including the type and length of surgical procedure; age, underlying conditions and previous history of the patient; skill of the surgeon; diligence with which infection control procedures are applied and the type and timing of preoperative antibiotic prophylaxis<sup>11</sup>. Most of the patients included in the study were young males with minimal predisposing factors except that six of these were diabetic. So the factors most probably operative in causing infections in our patients were related to the surgical team or surgical environment. *Staphylococcus aureus* is considered to be the leading pathogen in such post surgical wound infections followed by the members of the enterobacteriaceae<sup>12</sup>. But in our study the *Pseudomonas aeruginosa* was the second commonest isolate after *Staphylococcus aureus*. Otokunfor TV and

In case of *Staphylococcus aureus* 30% of the isolates were found resistant to methicillin. Antibiotic susceptibility pattern of gram positive cocci (*Staphylococcus aureus* and *Streptococcus pyogenes*) to other antibiotics are shown in (Table 2)

**Table 2. Antibiotic susceptibility pattern (Percent sensitive) Gram positive cocci**

9.15	14	Klebsiella pneumoniae
3.92	6	Acinetobacter baumannii
2.61	4	Protobacterales
2.61	4	Citrobacter koseri
2.61	4	Streptococcus pyogenes
1.53	1	T

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DatuboBrown DD also have found similar isolates in most of the patients included in their study<sup>13</sup>. Most of our isolates were found resistant to the commonly used antibiotics. This is a matter of great concern because treatment of such infections warrants newer and costly antibiotics. The incidence of methicillin resistant Staphylococcus aureus (MRSA) in our study is about 30%. MRSA infections cannot be treated by beta lactamase resistant penicillins and not even by the cephalosporins<sup>14</sup>. Treatment of these infections is possible either by the Fluroquinolones (if the isolate is found sensitive) or by the vancomycin only<sup>15</sup>. More than 50% were sensitive to ceftriaxone and ciprofloxacin which are thus the minimal choice to treat Pseudomonas aeruginosa infections. Maximum sensitivity of Pseudomonas was seen to Imepenem, sulbactam-ceftazidime and piperacillin tazobactam. But an empirical treatment to be really effective against such isolates will have to include either amikacin or one of the carbapenems alone or in combination. Even the Escherichia coli, Klebsiella pneumonia and the other Gram negative isolates in our study are showing fairly high antibiotic resistance. In view of such highly resistant organisms causing wound infections in our hospital, it will become very difficult to treat these cases. So the only hope lies with prevention of such surgical site infections. To achieve this goal we will have to return to the preventive measures including fundamental principles of asepsis. Individual patient risk factors must be identified and modified whenever possible. In addition to the skin asepsis and perioperative prophylactic antibiotics, care and attention to the theatre environment is also very important<sup>16</sup>. Last but not the least, surgical expertise and theatre discipline are the essential components against surgical site infections.

## استنتاج

We should clearly understand and identify the SSI as a problem and devise a system to track, analyze and monitor these. Hospital infection control committees should meet regularly and make recommendations at all levels for prevention of such incidents. Otherwise it will be impossible to overcome the serious issues of economic loss and high hospital morbidity and mortality caused by SSI.

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