

Original Research Article

<https://doi.org/10.20546/ijcmas.2021.1003.267>

## Bacteriological Profile of Surgical Site Infection in a Tertiary Care Centre

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### ABSTRACT

Surgical site infections (SSI), is a commonest nosocomial infection leading to morbidity and mortality amongst hospitalized patients. For proper management of the patients it is very essential to identify pathogen and its antibiotic susceptibility. The aim of study was to identify aerobic bacterial pathogen isolates and detect antimicrobial susceptibility pattern. This was a prospective study carried out on 380 hospitalized patients, who had LSCS and complaint of discharge from operation site within 30 days of surgery from January to December 2020. Two swabs & discharge from operation site were taken by using sterile cotton swabs, culture sensitivity and antibiogram was done. In study time, out of 380 samples, in 234 (61.58%) aerobic pyogenic isolates were detected, GPC, GNB and Candida spp. in 156 (66.66%), 68 (29.05) and 1 (0.42%) case respectively. The predominant isolate among GPC were *CONS* 93 (59.6%) followed by *S.aureus* 60 (38.46%) and *Enterococcus* 3 (1.9%). In GNB most common isolates was *Escherichia coli* 31 (45.6%) followed by *Acinetobacter* 14(20.6%), *Klebsiella* 11(16.18%), *Citrobacter* 7 (10.3%) and *Pseudomonas* 5(7.35%). *Candida* spp. was isolated in 1 case. Vancomycin (91.67%) and Linezolid (91.02%) showed maximum sensitivity among GPC isolates. While in GNB, Piperacillin tazobactam (94.11%) and Gentamycin (89.70%) showed maximum sensitivity. This study shows that *Escherichia coli* and *S.aureus* are the commonest pathogenic organisms associated with the surgical site infection. Isolation of *CONS* in high cases shows breach in asepsis protocols. Appropriate hand hygiene, strict infection control practice will reduce the rate of SSI, cost of treatment and mortality and morbidity of patients.

#### Keywords

SSI, LSCS, BA,  
AST, CLSI

#### Article Info

Accepted:  
25 February 2021  
Available Online:  
10 March 2021

### Introduction

Surgical site infections (SSI), one of the most common causes of nosocomial infections and complication associated with surgery<sup>1</sup>. Surgical Site Infection (SSI) by definition refers to an infection which occurs within 30 days after the surgery or within 1 year when an implant is left in place after the surgery

and involving the incision or deep tissues at the operated site or infections involving organ or body space other than the incision, which was opened or manipulated during an operation<sup>2</sup>. Surgical site infections are frequent; the incidence varies from 0.5 to 15% depending on the type of operation and underlying patient status<sup>3</sup>.

There are some known risk factors associated with the surgical wound infection and disruption. Important amongst them are overweight, increasing age, poor nutrition, diabetes, jaundice, smoking, malignant growth, presence of prior scar or radiation at the incision site, non-compliance with post-operative instructions (such as early excessive exercise or lifting heavy objects), surgical error, increased pressure within the abdomen due to: fluid accumulation (ascites); inflamed bowel; severe coughing; straining; or vomiting, long-term use of corticosteroid medication, other medical conditions such as: diabetes; kidney disease; cancer; immune problems; chemotherapy; radiation therapy<sup>3,4</sup>.

Inappropriate choice of antibiotics increases favoring emergence of pathogenic drug resistant bacteria<sup>5</sup>. Numerous bacteriological studies reveal that gram-positive and gram-negative bacteria both play a role in the infection of surgical wounds<sup>6</sup>.

For proper management of the patients it is very essential to know which pathogen has caused the infection and also its antibiotic susceptibility<sup>7</sup>.

**Aims and objective:** The aim of study was to know prevalence of SSI in post LSCS patients, and to identify aerobic pyogenic bacterial pathogens and to detect their antimicrobial susceptibility pattern.

### **Materials and Methods**

This was a prospective study carried out on 380 hospitalized patients, who had LSCS (Lower segment cesarian section), and complaint of discharge from operation site within 30 days of surgery from January to December 2020 in a tertiary level hospital. After taking written consent their swabs, & discharge from operation site were taken by using sterile cotton swabs, two pus swabs/

wound swabs were collected aseptically from each patient. Gram stained preparations were made from one swab for provisional diagnosis. The other swab was inoculated on 5% sheep blood agar (BA) and Mac Conkey agar (MaC) plates and incubated at 37°C for 48 hours in incubator. Growth on culture plates was identified by its colony characters and the battery of standard biochemical tests<sup>8,9</sup>. Antimicrobial sensitivity testing (AST) was carried out by modified Kirby Bauer disc diffusion method on Muller Hinton agar and results were interpreted in accordance with Clinical Laboratory Standards Institute guidelines<sup>10</sup>.

### **Results and Discussion**

In study time, out of 380 samples, in 234(61.58%) aerobic pyogenic isolates were detected, GPC, GNB and *Candida* spp. in 156(66.66%), 68(29.05) and 1 (0.42%) case respectively. The predominant isolate among GPC were *CONS* 93 (59.6%) followed by *S.aureus* 60(38.46%) and *Enterococcus* 3(1.9%). In GNB most common isolates was *Escherichia coli* 31(45.6%) followed by, *Acinetobacter* 14(20.6%), *Klebsiella* 11(16.18%), *Citrobacter* 7(10.3%) and *Pseudomonas* 5(7.35%). *Candida* spp. was isolated in 1 case. Vancomycin (91.67%) and Linezolid (91.02%) showed maximum sensitivity among GPC isolates. While in GNB, Piperacillin tazobactam (94.11%) and Gentamycin (89.70%) showed maximum sensitivity.

Most of the SSIs are hospital acquired and vary from hospital to hospital. Some studies has been reported the prevalence rate of SSIs 2.5% to 41.9%<sup>11,12</sup>. In this study the prevalence of SSI was 37.1% which was high due to prolonged pre and post operative hospital stay leads to colonization with antimicrobial resistant micro - organisms and directly affects patient's susceptibility to

infection either by lowering host resistance or by providing increased opportunity for ultimate bacterial colonization. The rates of SSIs increased with the increasing duration of preoperative hospitalization in almost every documented study<sup>12</sup>. Other studies done previously in India showed SSI rate ranging up to 49.50%<sup>13</sup>. However in comparison to the Indian hospitals the rate of infection

reported from other countries is quite low, for instance in USA it is 2.8% and in European countries it is reported to be 2-5%<sup>14</sup>. The lack of attention towards the infection control measures, inappropriate hand hygiene practices and overcrowded hospitals can be the major contributory factors for high infection rate in Indian hospitals.

**Table.1** Profile of organism isolated

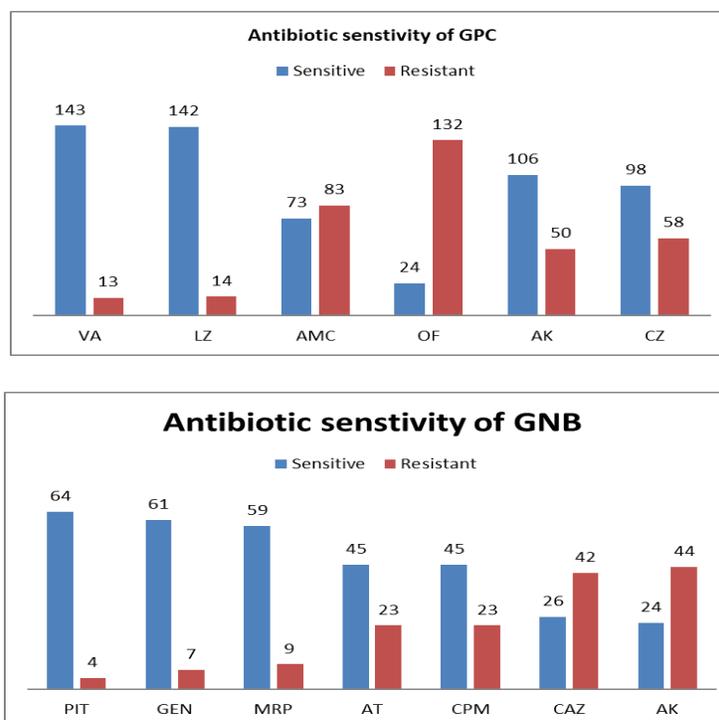
Organism	Isolates (n)	%
<i>Staphylococcus albus</i>	93	39.74
<i>Staphylococcus aureus</i>	60	25.64
<i>Escherichia coli</i>	31	13.25
<i>Acienatobacter</i>	14	5.98
<i>Klebsiella</i>	11	4.7
<i>Citrobacter</i>	7	2.9
<i>Pseudomonas</i>	5	2.1
<i>Candida</i>	1	0.42
Others	9	3.84
<b>Total</b>	<b>234</b>	<b>100</b>

**Table.2** Antibiotic sensitivity pattern of Gram Positive Cocci isolates in SSI

Antibiotics n(156)	Sensitive	Resistant
VA	143	13
LZ	142	14
AMC	73	83
OF	24	132
AK	106	50
CZ	98	58

**Table.3** Antibiotic sensitivity pattern of Gram Negative Bacilli (GNB) isolates in SSI

Antibiotics n(68)	Sensitive	Resistant
PIT	64	4
GEN	61	7
MRP	59	9
AT	45	23
CPM	45	23
CAZ	26	42
AK	24	44



In this study, out of 234 isolates 141 were pathogenic isolates were detected. Overall pathogenic predominance isolates were 68(51.90%) Gram negative bacilli (GNB) followed by 63(44.68%) Gram positive cocci (GPC), others 10(7.09%) correlating with another study where gram negative bacilli predominated with 73.1%<sup>15</sup> and gram positive cocci prevalence rate ranging from 4.6% to 54.4%<sup>16</sup>. This could be attributed to diverse habitat of Gram negative bacteria including inanimate surfaces in hospitals, multidrug resistant patterns portrayed and possible contamination during surgery<sup>17</sup>.

In our study, 60(25.64%) *S.aureus* and 31(45.6%) *Escherichia coli* among GPC and GNB commonest pathogenic organisms associated with the surgical site infection were detected. *Escherichia coli* was the predominant isolate in studies by several authors with isolation rates of 23.1%, 42.3%<sup>15,18</sup>. This correlates with other studies where the isolation rates for *Staphylococcus aureus* were as follows 21.51%<sup>17</sup>, 26.2%<sup>19</sup>, Among these studies few have

*Staphylococcus aureus* as their predominant isolate<sup>19</sup>. Infection with *S. aureus* is most likely associated with endogenous source as it is a member of the skin and nasal flora and also with contamination from environment, surgical instruments or from hands of health care workers<sup>20,21</sup>.

*Staphylococcus aureus*, gram positive cocci, is a major human pathogen and a predominant cause of SSIs worldwide with a prevalence rate ranging from 4.6% to 54.4%<sup>16</sup>. In the present study predominance of *S. aureus* 60(25.64%) was seen and this finding was consistent with reports from other studies<sup>11,19,20</sup>.

Antibiotic susceptibility results revealed that a high degree of resistance for majority of the bacterial isolates. For gram positive bacteria vancomycin (91.67%), linezolid (91.02%) and Amikacin (67.9%) were found to be the most effective antibiotics. While in GNB, Piperacillin tazobactam (94.11%), Gentamycin (89.70%) and Meropenam 59(86.76%) showed maximum sensitivity

whereas in Narula, *et al.*,<sup>22</sup> the antibiogram of Gram-positive isolates including *Staphylococcus aureus* showed maximum susceptibility to vancomycin (100%), linezolid (92.86% to 100%), and amikacin (78% to 100%), whereas they were highly resistant to ampicillin (88.9% to 100%) and amoxicillin-clavulanic acid (80% to 100%).

The antibiogram of Gram-negative isolates showed resistance to amoxicillin-clavulanic acid and cephalosporins, moderate susceptibility to fluoroquinolones and aminoglycoside, and good susceptibility to carbapenems.

The development and spread of resistant bacterial strains has emerged as a global problem. The appearance of multi drug resistant (MDR) strains over the past decades has been regarded as an inevitable genetic response to the strong selective pressure imposed by antimicrobial chemotherapy which plays a crucial role in evolution of antibiotic resistant bacteria.

**Limitation:** The limitation of our study was that, anaerobic bacterial profile and fungal cultures were not done on the wound swabs obtained from SSIs.

In conclusion this study shows that *Escherichia coli* and *S.aureus* are the commonest pathogenic organisms associated with the surgical site infection. Isolation of CONS in cases shows breach in asepsis protocols. Appropriate hand hygiene, strict infection control will reduce the rate of SSI, cost of treatment, mortality and morbidity.

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#### **How to cite this article:**

Usha Verma, Vishakha Ashopa, Eshank Gupta, Anita Gupta, Parmeshwar Lal, P. C. Gupta and Prabhu Prakash. 2021. Bacteriological Profile of Surgical Site Infection in a Tertiary Care Centre. *Int.J.Curr.Microbiol.App.Sci*. 10(03): 2120-2125.  
doi: <https://doi.org/10.20546/ijcmas.2021.1003.267>