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### STUDY ON SURGICAL SITE INFECTIONS CAUSED BY ESBL PRODUCING GRAM NEGATIVE BACTERIA

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**ABSTRACT:** Surgical site infections have been a major problem, because of the emergence of drug resistant bacteria, in particular B-lactamase producing bacteria. Extended spectrum beta lactamase producing gram negative organisms pose a great challenge in treatment of SSI present study is aimed at determining multiple drug resistance in gram negative bacteria & to find out ESBL producers, in correlation with treatment outcome. A total of 120 wound infected cases were studied. Staphylococcus aureus was predominant bacterium-20. Among gram negative bacteria, Pseudomonas species is predominant(14) followed by Escherichia coli(13), Klebsiella species(12), Proteus(9) Citrobacter(4) Providencia(2) & Acinetobacter species(2). Out of 56 gramnegative bacteria isolated, 20 were identified as ESBL producers, which was statistically significant. Delay in wound healing correlated with infection by ESBL producers, which alarms the need of abstinence from antibiotic abuse.

**KEYWORDS:** Surgical site infections, Drug resistance, ESBL production.

**INTRODUCTION:** Surgical site infections (SSI) have been difficult to treat because of emergence of multidrug resistance, especially Beta lactamase production in bacteria. Surgical site infections are important cause of morbidity and mortality following surgeries, and account for additional costs. Betalactam antibiotics are among the most over used antimicrobials, worldwide, and the emergence of resistance to these drugs has resulted in a major clinical crisis. Gram negative bacteria produce a variety of Beta lactamases, becoming resistant to extended spectrum of Cephalosporin's, Monobactams, Carbapenems, and Betalactamase inhibitor combinations. Infections with ESBL producing bacterial strains are encountered singly or in outbreaks, especially in critical care hospitals, resulting in increasing cost of treatment and prolonged hospital stay.<sup>(1)</sup> This study was undertaken to determine the prevalence of ESBL producers in post-operative wound infections and their correlation with patient outcome.

**MATERIALS AND METHODS:** A short study carried out in the department of surgery and department of Microbiology, Siddhartha Medical College, Vijayawada A. P. Patients who underwent Clean and Clean contaminated and Contaminated and Dirty surgeries in an emergency were included. Surgical wound was inspected at the time of first dressing and weekly thereafter for 30 days. Wound infection was diagnosed if any one of the following criteria were fulfilled, serious discharge or Sero-sanguineous and purulent discharge from the wound with signs of inflammation and wound deliberately opened by the surgeon due localized pus collection. Relevant clinical history of the patient was taken. Swabs obtained from infected wound were processed aerobically by standard methods.<sup>(2,3)</sup> Gram Negative Bacilli isolated and were tested for

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ESBL production<sup>(4)</sup> as per CLSI guidelines. Data was evaluated by chisquare (x2) statistical test,  $P < 0.05$  & considered to be significant.

### RESULTS AND DISCUSSION:

<b>Total Post-operative Cases</b>	<b>1062</b>	<b>Percentage</b>
Clinically suspected Infections	120	11.29%
No. of Definite SSI (Culture Positive)	76	7.15%
Culture Negative	44	4.14%

**Table 1: Rate of wound Infections as per cultures**

<b>Type of Surgery</b>	<b>No</b>
Perforation & Perito-nitis	40
Appendectomy	20
Incisional Hernias	15
Resection & Anasto-mosis	25
Hernia operations	10
Cholecystectomy	10

**Table 2: Types of Surgeries in Study group (n=120)**



**Fig. 1: Infected Appendectomy incision**



**Fig. 2: Infected cholecystectomy incision**

<b>Sl. No</b>	<b>Type of wound</b>	<b>No. Studied</b>
1	Clean wounds	45
2	Clean contaminated	34
3	Contaminated	18
4	Dirty wounds	23

**Table 3: Classification of wounds in the study group**

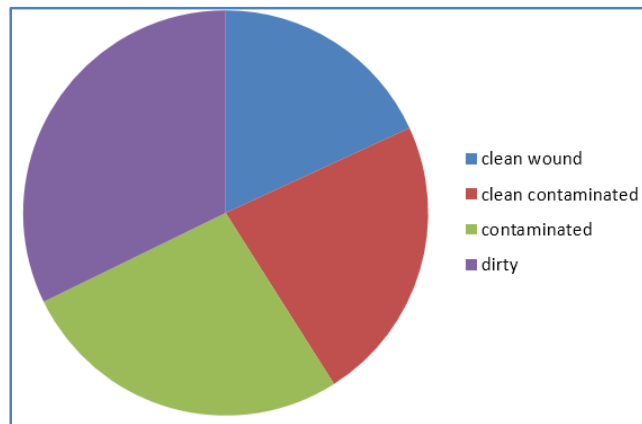
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**Fig. 3: Dirty wound infection in peritonitis**

Wound type	No Tested	Culture Positives	Percentage
Clean wounds	45	22	48.88%
Clean Contaminated	34	21	61.76
Contaminated	18	13	72.22
Dirty wounds	23	20	86.95
Total	120	76	

**Table 4: Culture Positives in relation to type of wounds**



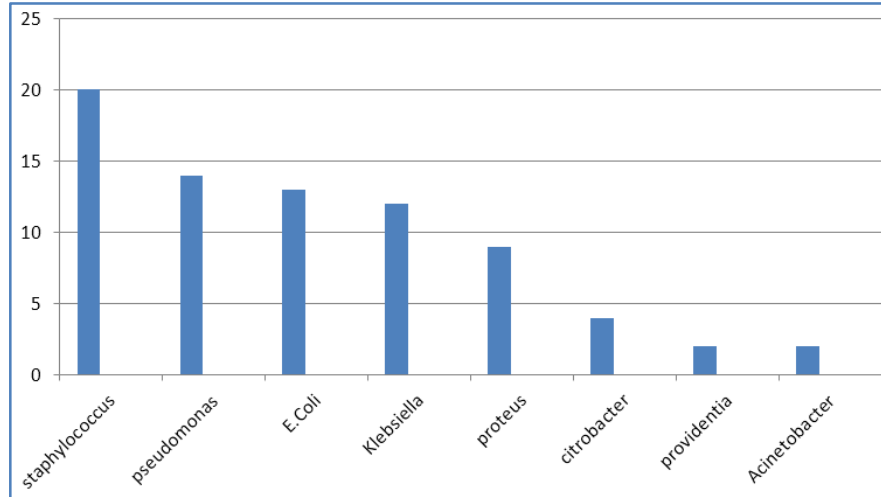
**Diagram 1: Pie diagram showing culture positivity in relation with type of wound**

Sl. No	Organism	No
1	Staphylococcus	20
2	Pseudomonas species	14
3	Escherichia coli	13
4	Klebsiella species	12
5	Proteus species	9
6	Citrobacter species	4

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7	Providencia species	2
8	Acinetobacter species	2

**Table 5: Types of Organism isolate (n=76)**



**Diagram 2: Bar diagram showing type of organism isolated**

Organism	Total tested	Positive for ESBL Production	Percentage
Pseudomonas	14	6	42.85%
Escherischia coli	13	5	38.46%
Klebsiella	12	6	50%
Proteus	9	2	22%
Citrobacter	4	1	25%
Providencia	2	0	-
Acinetobacter	2	0	-
Total	76	21	27.63%

**Table 6: ESBL producing gram negative bacilli**

Regarding antibiotic sensitivity pattern, majority of Staphylococcal isolates showed of high level drug resistance. Among the gram negative bacteria tested most of isolates showed the following observations-Majority of Pseudomonas aeruginosa were sensitive to Imipenem, Gentamycin, Piperacillin-Tazobactam, Amikacin, Ciprofloxacin, tetracycline, cotrimoxazole and Ceftazidime/Clavulanic acid and all are resistant to Amoxicillin. Escherichia coli & Klebsiella are sensitive to Imipenem, Gentamycin, Amikacin, Ciprofloxacin, Tetracycline and Cotrimoxzole, Ceftazidime/Clavulanic acid, Ceftazidime, cefuroxime. Some of the Citraobacter isolates were resistant to Ceftazidime and Amoxicillin.

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Delayed wound healing and prolonged hospital stay was observed in patients infected with drug resistant bacteria including ESBL producers.

**DISCUSSION:** The incidence of Surgical Site Infection in India ranges from 4-30%.<sup>(4,5,6)</sup> In this study the Surgical Site Infection rate was 11.29%. The predominant organisms are Staphylococci (15%), Pseudomonas (14%), E. coli (13%), and Klebsiella (12%). This prevalence is in correlation with the study of Anthony. Aetal<sup>(7)</sup> where as in the study of A. Ramesh et al<sup>(8)</sup> the prevalence of pseudomonas & E. coli was low. Adegoke et al also observed high incidence of Pseudomonas aeruginosa (20%).<sup>(9)</sup>

As per this study the SSI rate is very high in Contaminated & Dirty wounds, hence as far as possible sterile precautions are very much important in both Pre & Post-Operative conditions.

The prevalence rate of ESBL production in this study was 35.71%, which is in line with the statement of C. Rodrigues et al (53%)<sup>(10)</sup> but the prevalence rate is observed by Priya Dutta & Kanungo et al,<sup>(11,12)</sup> were 12.6% & 20.5% respectively. This variability may be due to the difference in the methods used for detection of ESBLs and also different antibiotic policies prevalent in use in that particular Hospital.<sup>(13,14)</sup>

The drug resistance and morbidity are seen in mostly in patients with systemic disorders like Diabetes mellitus, Hypertension, Anemia etc.

The study revealed high incidence of ESBL production, multi drug resistance because of inappropriate usage of antibiotics. High end antibiotics were required for treatment but same time most of the patients are diabetic, hypertensive in whom Nephropathy in common and drugs like Amikacin etc. are nephrotoxic agents.

**CONCLUSION:** The study concludes that SSI rate is high among postoperative cases of emergency surgeries. Risk factors like Diabetes, Hypertension are enhancing the morbidity. Emergence of beta lactamase producers like pseudomonas, E. coli, Klebsiella spp and others further worsened the condition. The wound sepsis rate is increased when the wound is closed by Primary closure during contaminated operations (Knighton et al). Hence timely reporting of presence of ESBL producing gram negative bacteria in post-operative wounds is very essential for reducing the Post-Operative Wound infection. Stringent precautions are to be taken to avoid availability of over the counter antibiotics and indiscriminate use of Antibiotics. Strict antibiotic policies are to be implemented at state and National level for better patient management.

### REFERENCES:

1. Rubeena Hafeez, Maleeha Aslam, Farzana Mir, M. Tahir, Iffat Javaid and Aasama N Ajmal,- "Frequency of Extended Spectrum Beta lactamase producing Gram Negative bacilli among Clinical Isolates"-Biomedica Vol. 25, July-Dec, 2009. Bio-19 Doc, P112-115.
2. Koneman EW, Allen SD, Janda WM Et al-editors "color atlas and text book of Diagnostic Microbiology, 2006, 6<sup>th</sup>, ed, 624—662, Philadelphia, Lippincott, Raven.
3. Mackie Mac cartney Practical Medical Microbiology, 14<sup>th</sup> Edition, Elsevier publications, chapter 7-tests for identification of bacteria pp-31-131.

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4. Clinical Laboratory Standards Institute—performance Standards for Antimicrobial Susceptibility Testing, Twenty first informational Supplement,: Supplemental Table,2A-S1.Scening and confirmatory Tests for ESBLs in Klebsiellapneumonia, Klebsiellaoxytoca, Escherichia coli, and Proteus mirabilis for Use With Table 2A,M 100-S 21,Vol 31 NO.1: pg 48-49
5. Rao A.S, Harsha M—Post operative Woynd Infections. j.-Indian Medical Association; Feb16, 1975; 16(4): pg.90-93
6. Tripathy BS, Roy. N.—“Post-operative wound sepsis”-Indian Journal of Surgery. 1984; 47: pg. 285-288.
7. Anvikar AR, Deshmukh, Karyakarte. R. P, Danle A. S., Malik AK. A one year prospective study of 3280 Surgical wounds, 1MM. 1999; 47: pg: 129-132.
8. A.Ramesh, Ms. R Dharani, “Surgical Site infections in a teaching hospital, Clinico-Microbiological and Epidemiological profile”-Int, Journal Biol. Med. Res., 2012; 3 (3); 2050-2053.
9. Adegoke et al, Studies On Multiple Antibiotic Resistant Bacteria Isolated From Surgical Site infection, Scientific Research and Essays Vol. 5(24), pp3876—3881, 18 Dec, 2010.
10. C. Rodrigues, P.J Joshi, S. H. Jani, M. Alphonse, R. Radha Krishnan, A. Mehta. Detection of Beta Lactamases in Nosocomial Gram Negative Clinical Isolates- IJMM, 2004, 22(4)-247-250.
11. PriyaDatta, ArchnaThakkur- Jpn. J. Infect. Dis 57.146 – 149, 2004. Prevalence of clinical strains resistant to various beta lactams in a Territory Care Hospital in India.
12. Reba KanungoAswin. A. Aantha Kumar. A. Kumar and S. Badrinath Detection of ESBL produces- among surgical wound infections and Burns patients in JIPMER. IJMM 2000,18 (4) -160-165.
13. Jerestin B Hansotia, VandanaAgarwal, A.A Pattak and A.M. Saojii. ESBL.
14. A.Subba, S.Anandham, BSV. Alavandi.ESBL Production and Multi drug Resistance in Kleb. Spp isolated from children under five with intestinal and extra infections.

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