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Original Research Article

A Study on Surgical Site Infection, their Bacteriological Profile and Antimicrobial Susceptibility Pattern in Tertiary Care Hospital, Rajkot, Gujrat

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Abstract

***Introduction*:** Surgical site infection is defined as infection occurring within 30 days after surgical operation and affecting either incision or deep tissues at the operation site. SSIs cause substantial morbidity and mortality. This study was aimed at obtaining the incidence of SSI and to evaluate the risk factors as well as to formulate an antibiotic policy. ***Aims and Objectives*:** To determine the incidence, risk factors and the bacteriological profile for SSI and their antimicrobial susceptibility patterns at PDUMC, Rajkot. ***Materials & Method*:** Total of 872 pus samples from surgical ward were studied from January 2022 to June 2022. The isolates were identified by colony morphology, Gram's stain and conventional biochemical reactions. Antibiotic sensitivity testing was done by Kirby-Bauer disc diffusion method as per CLSI guidelines 2021. ***Results*:** Total 272 microbial pathogens were isolated. Out of these, 28(10.29%) were Gram-positive Cocci, 244(89.70%) were Gram-negative Bacilli whereas 64 showed polymicrobial growth. Out of total Gram negative isolates, 108(44.26%) showed Klebsiella species followed by Pesudomonas aeruginosa 72(26.50%). Out of total Gram positive isolates, Staphylococcus aureus 16(57.14%) is the predominant pathogen followed by Coagulase Negative Staphylococci 12(42.85 %). ***Conclusion*:** The study gives an insight into bacterial pathogens and their antibiotic sensitivity patterns isolated from surgical site infections. Surveillance of SSI helps in early detection, appropriate use of antibiotics & to reduce the rate of SSI.

Keywords: Nosocomial infection, Surgical site infections (SSI), Antibiotic sensitivity testing, Gram positive bacteria, Gram negative bacteria.

INTRODUCTION

- Surgical site infection is defined as an infection occurring within 30 days after a surgical operation (or within 1 year if an implant is left in place after the procedure) and affecting either incision or deep tissues at the operation site. These infections may be a superficial or deep incisional infection or infections involving organ or body space [1].
- Infections occurring in the wound are major barriers for healing which causing impact on patients, may prolong the hospital stay and effects the quality of life [2]. Wound healing requires a healthy environment for normal healing process and with minimal scar formation. Surgical site infections (SSI) constitute a major public health problem worldwide and are the second most frequently reported nosocomial infections.
- SSIs causing substantial morbidity, mortality, increased cost of treatment and severe psycho-social consequences to the patents and families [3]. Infection is usually caused by exogenous and endogenous micro- organisms that enter the operative wound during the surgery. Recently Gram negative organisms are also noted as cause of SSI.
- The present study was aimed at obtaining the incidence of SSI in our set up and to evaluate the risk factors as well as to formulate an antibiotic policy for patients admitted for any surgery in our hospital.

AIMS AND OBJECTIVES

- To determine the incidence, risk factors and the bacteriological profile for SSI and their antimicrobial susceptibility patterns at PDUMC, Rajkot.

MATERIALS & METHOD

- This retrospective study was conducted at the Department of Micro-biology of tertiary care hospital, Rajkot, Gujarat for a period of 6 months (January-2022 to June-2022). A total of 872 samples were collected from the clinically suspected SSI patients through swab and transported immediately to the microbiology laboratory for processing.

Processing [4]

- The pus samples were subjected to gram stain and culture on Blood Agar and MacConkey (MAC) agar plates and incubated at 37^{o} C for 24-48 hours. The bacterial pathogen grown was identified by conventional bacteriological methods.

Identification of bacterial pathogen:

- Provisional diagnosis was made on the basis of colony morphology of the organisms on Blood Agar and MacConkey Agar subsequently. Gram staining and hanging drop were performed from the growth on agar plates. Confirmation of bacterial pathogen was done by performing various biochemical tests using conventional methods.

Antimicrobial susceptibility testing:

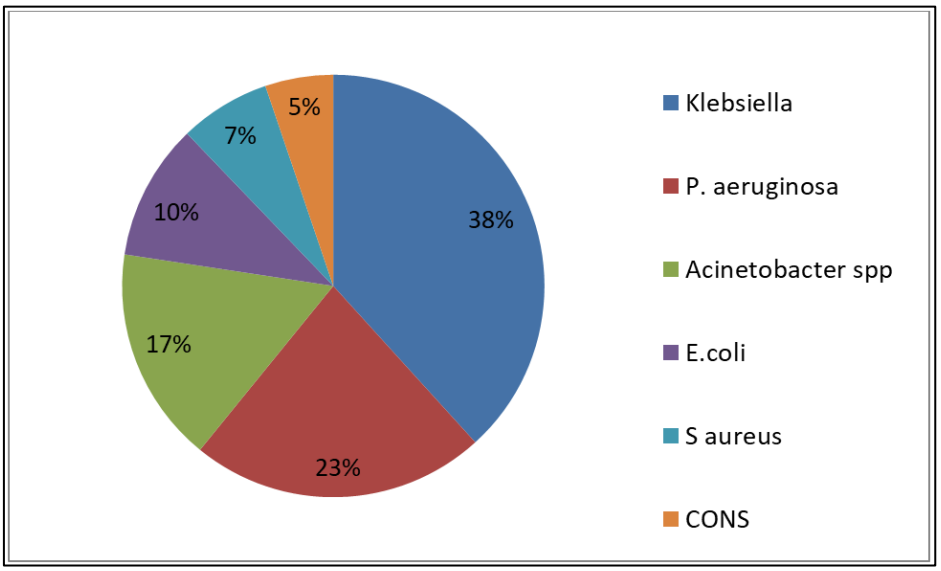
- Antimicrobial susceptibility of isolates was performed by Kirby-bauer disc diffusion method according to CLSI- 2021 guidelines. Lawn culture was done on Muller-Hinton agar and antibiotics disc were placed and incubated at 37^{o} C for overnight. The interpretation of zone size was measured using a ruler or Vernier caliper and sensitivity and resistance was noted according to CLSI-2021 guidelines [5].

RESULTS

- A total 872 pus samples received from surgical ward, which were suspected for SSI. Out of these 872 clinically suspected cases of SSIs, bacterial pathogens were grown, cultured, and identified in 272 (31.19%) cases. The remaining 600 (68.81%) pus specimens were reported as sterile. Out of 272 culture positive specimens, 126 (46.32%) were males and 194 (53.68%) were females. Maximum infection rate was observed from orthopedics, followed by obstetrics & gynecology and general surgery.

- **Bacteriological profile**

Total 272 microbial pathogens were isolated. Out of these, 28 (10.29%) were identified as Gram-positive Cocci, 244 (89.70%) as Gram-negative Bacilli. Out of 272 positive samples 64 showed poly-microbial growth. Gram negative organisms were more frequently isolated than Gram positive organisms. Out of total Gram negative isolates, 108 (44.26%) showed Klebsiella species followed by Pesudomonas aeruginosa 72 (26.50%), Acinetobacter spp.52 (19.27%) and E.coli 32 (12.04%) respectively. Out of total Gram positive isolates, Staphylococcus aureus 16 (57.14%) is the predominant pathogen followed by Coagulase Negative Staphylococci 12 (42.85 %).



Percentage of pathogens isolated from SSI samples

- **Antibiotic susceptibility pattern**

Antibiotic susceptibility pattern showed that the most effective antibiotic for Gram-positive bacteria was Vancomycin and the least effective antibiotics for Gram-positive were Ampicillin and Penicillin. For Klebsiella spp. most effective antibiotic was meropenem and Tetracycline. For Acinetobacter spp. Meropenam, Gentamycin and levofloxacine were found to be most effective (Table-1), In P aeruginosa, polymixin B and Colistin is most sensitive drug (Table-2). The study reveals that most of patients suffered from infections were due to MDR bacteria.

- **Risk factors**

The risk factors looked for in the patients of SSIs were abdominal surgery, diabetes, smoking, elderly adult, other medical problems or diseases, surgery that last >2 h, over-weight, carcinoma, emergency surgery, and weak immunity.

Table-1

Drug	Klebsiella Drug Sensitivity	Acinetobactor Drug Sensitivity
Ampicillinesulbactum	25.40%	50%
Ceftazidimclavunic acid	16.21%	16.25%
Cafotaxime	5.40%	6.25%
Ceftazidime	5.40%	6.25%
Cefepime	16.21%	18.75%
Meropenem	81 %	87.50%
Gentamicin	29.72%	56.25%
Amikacin	32.43%	37.50%
Levofloxacine	21.62%	43.75%
Ciprofloxacine	13.51%	12.5%
Tetracycline	48.64%	6.25%
Cotrimoxazole	29.72%	31.25%
Piperacillin-Tazobactum	48.64 %	37.50%

Table-2

Drug	P. aerugenosa Drug Sensitivity
Polymixin B	100 %
Colistin	100 %
Imipenem+EDTA	95.45 %
Imipenem	59.09 %
Amikacin	27.27 %
Gentamicin	27.27 %
Levofloxacin	27.27 %
Ciprofloxacin	31.81 %
Astreonam	50%
Piperacillin-Tazobactum	50%
Cefepime	18.18%
Meropenem	63.63%

CONCLUSION

This study gives insight into bacterial pathogens and their antibiotic sensitivity patterns isolated from Surgical Site Infections. This study finding would help to reduce the stress of surgery in high risk patients by thoroughly examination & investigation. Also utmost post-operative care and efforts to boost their immunity would help in decreasing further occurrence of SSIs. The prolong use of antibiotics should be avoided as this is leading to development of resistant micro-organisms which are more difficult to get rid of. Periodic surveillance of SSI will guide the Infection Control Committee in laying down strict guidelines to further decrease the SSI incidence in our setup, which is a indicator of health care in a given system.

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