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Original Research Article

Spectrum of all microorganism isolated from surgical site infection and their antimicrobial susceptibility profile

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ABSTRACT

Background: Surgical site infection are the most common nosocomial infection accounting for 14% healthcare associated infection and are estimated to double the post-operative stay and significantly increase the cost of care. Surgical site infection has been considered as the third regularly occurring infection according to national nosocomial infection surveillance system.

Aim: To determine the bacterial agents causing surgical site infection and antimicrobial susceptibility pattern of isolated microorganisms.

Objectives: Isolate and identify pathogens of surgical site infection. To determine antimicrobial resistance and sensitivity pattern of isolated wound microbes. To determine the frequency of pathogens of surgical site infection.

Materials and Methods: Samples were cultured on Blood agar and MacConkey agar then incubated at 37^0 C for 24 hours. Any growth for further confirmed by Gram stain and appropriate biochemical tests, and then Antibiotic sensitivity test was done.

Results: In this study 106 (61.7) were of male and 66 (38.3) were of female total 172 were examined. In our study total 172 patients included in which 142 pathogenic organism were isolated. The most common pathogenic organism found to be *Staphylococcus SPP* 44 isolates (30.99%) followed by *E.coli* 41 isolates (28.87%) *Klebsiella pneumoniae* 23 isolates (16.20%), *Pseudomonas aeruginosa* 18 isolates (12.68%), *Acinetobacter baumanni* 9 isolates (6.34%), *Enterobacter cloacae* 5 isolates (3.52%), *Citrobacter koseri* 1 isolate (0.70%) and *Proteus Mirabilis* 1 isolate (0.70%).

Conclusion: Antimicrobial resistance always pose challenges for clinician for treating wound infection the present study guide clinician about common pathogens and countered in pus sample furthermore it help the clinician to select and treat patients with proper antibiotics and decreased mortality and morbidity.

1. Introduction

Skin prevents infection in many ways because it is our essential immunity and substantially concluded the production of sweat and sebaceous secretions that provide acidic P^H and protection such as fatty acids. Lysozymes has certain properties such as dissolving bacterial cell and antifungal properties.[1]

Nosocomial infection is the common cause of surgical site infection. Common complication of surgery occurrence rates 2 to 20%.[2] Most of the surgical site infection are harmless including only skin or subcutaneous tissue but sometimes can proceed to harmful infection.[3,4]

Patients correlated Factors such as old age, nutritive states, already existing infection or comorbidity or hospital acquired Factors such as poor surgical techniques,

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elongated time period of surgery, preoperative part preparation, instruments of surgery not been sterilized sufficiently rises risk of infection.[5] Sepsis always occurs due to bacterial infection after successful treatment of wound resulting a high morbidity and mortality.[6] It has been seen that coagulase positive *Staphylococcus aureus* found in pus followed by Pseudomonas *aeruginosa* and *Enterobacteriacae. S.aureus* and *Pseudomonas* it accounts for 20-40% of all nosocomial infection. Pus also consist of all many *staphylococcus aureus*, coagulase negative staphylococci, *E. coli, Pseudomonas aeruginosa, Klebsiella pneumonia*, *Enterobacter* species and *Proteus mirabilis*.[7] Infection control has become difficult due to bacterial resistance to antibiotics and resistant of methicillin *S. aureus*, polymicrobic flora and by fungi.[8] Mortality andmorbidity causing bacteria are examined for the susceptibility to antibiotics and their spectrum is being examined for wound infection.[9] Surgical site infection that occurs at an incision site within 30 days after surgery.[10]

1.1. Ethics approval

Ethics approval was obtained from TMMC Moradabad institutional Ethics Committee (TMMC&RC/IEC/18-19/085)

2. Materials and Methods

2.1. Sample collection

Pus samples (Surgical Site Infection) were taken in clean and leak proof sterile container & tubes. Pus sample were processed for routine culture and for antibiotics susceptibility testing during the study Period

2.2. Processing of sample

PUS SAMPLE (Surgical site infection)

1. Pus sample were inoculated in MacConkey and blood Media.
2. All ordinary culture media were incubated at 37^0C for overnight incubation in the incubator.

2.3. Inclusion criteria

1. Patients of more than 18 year of age group.
2. Sign and symptoms suggestive of post- operative wound infection like discharge of pus, pain, tenderness, fever etc.
3. Patients admitted in various surgical units. For more than 48 hrs.[11]

2.4. Exclusion criteria

1. Burn injuries.
2. Patients not given informed consent.
3. Procedure in which healthy skin was not incised such as opening abscess.[12]

2.5. Antimicrobial sensitivity pattern[13]

By using Kirby bauer disc diffusion method according with CLSI guidelines, using antibiotics, and all isolates were tested for antimicrobial sensitivity in mullen hinton agar.

3. Observation & Results

Total samples 172 were collected out of which 106(61.7%) male and 66 (38.3%) Female patients. In our study out of 172 patients included in which 142(82.55%) were pathogenic isolates, 9(12.5%) were non -pathogenic and 21(12.20%) were no growth. Isolation of pathogenic organism shows most prevalent organism *Staphylococcus spp* 44 (30.99%), *E.coli* 41(28.87%), *Klebsiella pneumoniae* 23(16.19%), *Pseudomonas aeruginosa* 18(12.68%), *Acinetobacter baumanni* 9(6.34%), *Enterobacter cloacae* 5(3.52%), *Citrobacter koseri* 1(0.70%), *Proteus mirabilis spp* 1(0.70%).

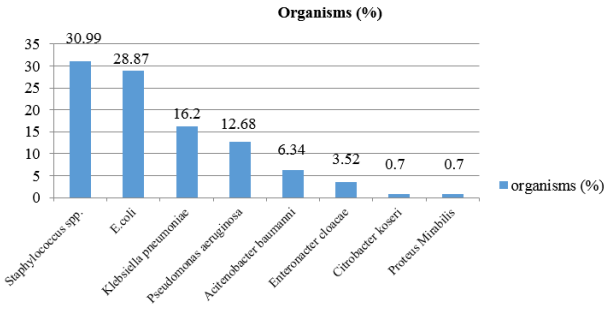

Fig. 1: Isolated organisms

4. Discussion

The present study was conducted in TMU medical college research center Moradabad, UP. Infection that occurred at the site of surgery is known as Surgical site infection.

During the period from December 2018 to September 2019 out of 172 wound swab from recruited patients after informed written consent were obtained.

In this study 106 (61.7) were of male and 66 (38.3) were of female total 172 were examined. Grish S. Sharanathe, S.A. Gadgil (2020)[14] showed in their study male patient was 686 (46%) while the females was 805 (54%). In another study Siddesh B, Sirwar, Nazneen Fatima (2018)[15] found the rate of surgical site infection 139 males and 102 females patients.

The higher rate of infection in males than females was also observed by Leela Rani Kasukurthy, Madhumati Bathala (2020)[16] 108 were males (60%) 72 (40%) were females. Arundhati Jamatia, Debasish Roy et al (2017)[17]

observed in their study that 229 were males subject 130 were females subject. C.M. Divyanshanthi et al (2014)[18] found 156 males and 140 females in their study.

Majority of subject were found males population as compared with females population.

Study of Saranya K. Lakshmi et al (2020)[19] the common age group of 41-61 year (42.2%).

The predominant bacteria isolate recovered in the study included *Staphylococcus SPP* 44 isolates (30.99%) followed by *E coli* 41 isolates (28.87%) *Klebsiella pneumoniae* 23 isolates (16.20%), *Pseudomanas aeruginosa* 18 isolates (12.68%), *Acinetobacter baumanni* 9 isolates (6.34%), *Enterobacter cloacae* 5 isolates (3.52%), *Citrobacter koseri* 1 isolate (0.70%) and *Proteus Mirabilis* 1 isolate (0.70%). out of 142 total positive isolates in which gram positive isolate frequency 30.99% and gram negative isolates frequency 69.01%.Singh A et al (2019)[20] found in their study that *Staphylococcus SPP* 66 isolates (36.1%) were predominant bacteria isolates followed by *E coli* 44 isolates (24.0%) and then *Klebsiella pneumoniae* 26 isolates (14.2%). Sahar Mudassar et al (2018)[21] found that *Staphylococcus spp* 46(4.2%) was the commonest followed by Pseudomonas aeruginosa (19%). Das Munmun et al (2017)[22] found that *staphylococcus aureus* was the common isolates (41.93%), many study has reported *staphylococcus aureus* is the commonest isolate from surgical site infection.

In the present study Resistant antibiotic in gram positive bacteria are Penicillin (86.36%), followed by Ampicillin (81.81%), followed by Amoxicillin (77.27%), Norfloxacin (65.90%), Erythromycin (56.81%), linezolid (40.90%), Clindamycin (36.36%) and in gram positive bacteria sensitive antibiotics are Vancomycin (90.99%) followed by Rifampicin (79.54%) Gentamycin (68.18%), Linezolid (59.09%). Prasanta Kumar Panda, et al (2020)[23] found in their study *staphylococcus aureus* was predominant isolates sensitive to vancomycin (100%).

In the present study gram negative microorganism *E.Coli* sensitive to Tigecycline (100%), Colistin (100%) followed by Amikacin (58.53%) Gentamycin (48.78%) and Ceftariaxome (100%), Ceftazidime (80.48%) are resistant. Rama Bastola et al (2017)[24] found that *E.coli* was resistant to Ceftriaxome and Ceftazidime and sensitive to Amikacin and Gentamicin.

In the present study gram negative microorganism *Klebsiella pneumoniae* resistant to Ampicillin (100%) followed by Amoxycillin (100%), Centriaxone (95.65%) and Cefuroxime (95.65%) and sensitive to Ertapenem (95.65%), Ciprofloxacin (34.44%), Amikacin (17%). Pooja Patel et al. (2019)[25] found that *Klebsiella pneumoniae* sensitive to Ciprofloxacin (40.0%).

Pseudomonas resistant to Ampicillin/Amoxycillin (100%), Amoyxcillin/Clavulanic acid (100%) followed by Tigecycline (66.66%), Ertapenem (55.55%) and sensitive to Tigecycline-Clavunic Acid (100%), Piperacillin-tazobactum (100%) followed by Cefeperazone/sulbactum (94.44%), Amikacin (94.44%), Imepenam (94.44%).

Kunal Kishor et al. (2015)[26] reveled that Pseudomonas sensitive to Penicillin, Piperacillin Tazobactum (100%) in our study is already reported.

Out of 172 multidrug resistance isolates, 26.76% were MRSA, 43.66% Were ESBL and 41.54% were MBL isolates. Higher rate of ESBL production was seen in *E.coli*. Subha M. et al.[27] related that in our study in this study MRSA 100% and 25% ESBL.

5. Conclusion

The aim of this study Spectrum of all Microorganism isolated from surgical site infection was carried out on patient suffering with post-operative infection in Teerthanker Mahaveer hospital. In this study total 172 patients were included in which 82.55 were pathogenic isolates, 12.5 were non -pathogenic and in 12.20 there was no growth. We observed that higher Surgical site infection occur in the age group of 41-61 year. Most common Pathogenic organisms found to be *Staphylococcus aureus*. The *Staphylococcus SPP* 44 isolates (30.99) followed by *E coli* 41 isolates (28.87) *Klebsiella pneumoniae* 23 isolates (16.20), *Pseudomanas aeruginosa* 18 isolates (12.68), *Acinetobacter baumanni* 9 isolates (6.34), *Enterobacter cloacae* 5 isolates (3.52), *Citrobacter koseri* 1 isolate (0.70) and *Proteus Mirabilis* 1 isolate (0.70). Out of 142 total positive isolates in which gram positive isolate frequency 30.99 and gram negative isolates frequency 69.01.

In this investigation the most prevalent Antibiotic Sensitivity pattern for gram positive bacteria was Vancomycin and Amikacin whereas gram negative bacteria were more Susceptible to Gentamicin and colistin.

Out of 172 multidrug resistance isolates, 26.76 were MRSA, 43.66 Were ESBL and 41.54 were MBL isolates. Higher rate of MRSA *Staph.aureus* production seen in Higher rate of ESBL production was seen in *E.coli*.

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8. Conflicts of Interest

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References

1. Admassie M, Tsige E, Isolation. Isolation, Identification and Antibiotic Susceptibility Pattern of Bacteria Isolated from Wounds of Patients Attending at Arsho Advanced Medical Laboratory. *Sci J Clin Med*. 2018;7(2):20–4.
2. Mezemir R, Seid A, Gishu T, Demas T, Gize A. Prevalence and root causes of Surgical site infections at an academic trauma and burn center in Ethiopia: a cross-sectional study. *Patient Saf Surg*. 2020;14:3. doi:10.1186/s13037-019-0229-x.
3. Ahmed MI. Prevalence of nosocomial wound infection among postoperative patients and antibiotics patterns at teaching hospital in Sudan. *Am J Med Sci*. 2012;4(1):29–34.
4. Simone BD, Sartelli M, Coccolini F, Ball CG, Brambillasca P, Chiarugi M, et al. Intraoperative surgical site infection control and prevention: a position paper and future addendum to WSES intra-abdominal infections guidelines. *J Emerg Surg*. 2020;15(10):1–23.
5. Zambouri A. Preoperative evaluation and preparation for anesthesia and surgery. *Hippokratia*. 2007;10(1):13–21.
6. Yadav UNR, Pant ND, Yakha JK, Tripathi PP, Poudel A, Lekhak B, et al. Bacteriological profile and antimicrobial susceptibility patterns of bacteria isolated from pus/wound swab samples from children attending a tertiary care hospital in Kathmandu. Nepal. *Int J Microbiol*. 2017;p. 2529085. doi:10.1155/2017/2529085.
7. Agaba P, Tumukunde J, Tindimwebwa VJ, Kwizera A. Nosocomial bacteria Infections and their antimicrobial Susceptibility patterns among patients in Uzandan intensive care units : a cross Sectional study. *B M C Res Notes*. 2017;10:349. doi:10.1186/s13104-017-2695-5.
8. Hope D, Ampairel, Oyet C, Muwanguzi E, Hillary T. Apecu O R. Antimicrobial resistance in pathogenic aerobic bacteria causing surgical site infection in Mbarara regional referral hospital, South western Uganda. *Med lab Sci*. 2019;9:17299. doi:10.1038/s41598-019-53712-2.
9. Mohammed A, Endrisseid M, Gebrecherkos T, Tirunch M, Moges F. Bacterial Isolates and their Antimicrobial Susceptibility pattern of Wound Infections Among Inpatients and Outpatients Attending the University of Gondar Referral Hospital, Northwest Ethiopia. *Int J Microbiol*. 2017;5(1):8–12.
10. Lalithambigai J, Kasvitha A, Priyadharsini RI, Rajesh KR. Postoperatvie wound infection and their antimicrobial susceptibility pattern in a tertiary care hospital in Salem India. *IJRPP*. 2014;3(1):46–52.
11. Negi V, Pal S, Juyal D, Sharma MK, and NS. Bacterialogical Profile of Surgical Site Infections and Their Antibiogram: A Study from Resource Constrained Rural Setting of Uttarakhand State, India. *J Clin Diag Res*. 2015;9(10):17–20.
12. Sawdekar H, Sawdekar R, Wasnik VR. Antimicrobial susceptibility patteren of bacterial isolates from wound infection and their sensitivity to antibiotic agents. *Int J Res Med Sci*. 2015;3(2):433–9.
13. Patel JB, Patel R, Satlin M, Mazzulli T, Weinstein MP, Richter S, et al. Performance Standards for Antimicrobial Susceptibility Testing. *Clin Lab Stand Inst*. 2017;1(37):132–3.
14. Sharnath GS, Gadgil SA. Bacteriological profile of surgical site infection and its resistogram in Sangli district Maharashtra. *Med J DY Patil Vidyapeeth*. 2020;13(5):441–6. doi:10.4103/mjdrdypu.mjdrdypu_298_19.
15. Sirwar SB, Fatima N. Bacterial Spectrum in surgical wound infection, its susceptibility pattern and biofilm formation among isolates. *IP Int J Med Microbiology and Trop Dise*. 2018;4(2):64–8.
16. Kasukurty LR, Bathala M. Bacteriological Profile of surgical site infections- A study in a tertiary care hospital. *J Evid Based Med Healthc*. 2020;7(32):1612–6.
17. Jamata A, Roy D, Shil R, Prabhakar P. Bacteriological profile and antimicrobial resistance patterns isolated in pus sample at Agartala government medical college. *Aisan J Pharma Clin Res*. 2017;10(1):335–7.
18. Divyashanthi CM, Kumar S. Study of prevalence and antimicrobial susceptibility pattern of bacterial isolates in A tertiary care hospital. *Int J Phar Pharm Sci*. 2014;7(1):18–9.
19. Lakshmi SK, Gowda HN, Anuradha K. Antibiotics susceptibility pattern of organisms causing surgical site infection. *Int J Basic Clin*. 2020;9(9):1405–11.
20. Singh A, Verma V. Antibiotic sensitivity pattern of pathogen, Isolated, from pus culture. A tertiary care hospital case study. *J Nepalgunj Med Coll*. 2019;17(2):70–2.
21. Mudassar S, Khan SW, Ali M, Mahmood F. Aerobic Bacteriological Profile and Antimicrobial Susceptibility Pattern of Pus isolates in a Teaching Hospital. *Int J Contemp Med Res*. 2018;5(4):1–3.
22. Munmum D, Hirak JR. Microbiology profile of wound infection and their antimicrobial susceptibility pattern in a peripheral tertiary care hospital of eastern India. *TSSN*;2017(2):759–65.
23. Panda PK, Kumar R, Raj P, Khusro P. Bacteriological profile and antimicrobial susceptibility pattern of bacteria isolated from surgical site infection of patients attending a tertiary care hospital. *ISSN*. 2020;7(2):335–9.
24. Bastola R, Parajuli P, Neupane A, Paudel A. Surgical Site infections: Distribution Studies of Sample, Outcome and Antimicrobial Susceptibility Testing. *J Med Microb Diagn*. 2017;6(1):2–7.
25. Patel P, Patel H, Nerukar AB. Antimicrobial susceptibility patter of organisms causing surgical site infection in a tertiary care hospital, Valasad, South Gujarat. *Indian J Microbial Res*. 2019;6(1):71–7.
26. Kishor K, Singh K, Dar FA. A study of microbiological analysis and its sensitivity pattern of postoperative wound infections. *Int J Curr Microbial App Sci*. 2015;4(4):402–7.
27. Subha M, Srinivasagam M. Microbial Profile and Antimicrobial Susceptibility pattern of Pus culture isolates from a teaching Tertiary care Hospital, South India. *Int J Curr Microbial App Sci*;7(04):1149–53.

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