ejpmr, 2020,7(12), 337-340

SJIF Impact Factor 6.222

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

BACTERIOLOGICAL PROFILE OF SURGICAL SITE INFECTION AND ANTIBIOTIC SUSCEPTIBILITY PATTERN IN TERTIARY CARE HOSPITAL

***Dr. D. B. Shanthi MD**

Assistant Professor, Department of Microbiology Government Dharmapuri Medical College Dharmapuri.

***Corresponding Author: Dr. D. B. Shanthi**

Assistant Professor, Department of Microbiology Government Dharmapuri Medical College Dharmapuri.

Article Received on 01/10/2020 **Article Revised on 21/10/2020** **Article Accepted on 11/11/2020**

ABSTRACT

Introduction: Surgical site infections are one of the most common nosocomial infections accounting for 38% of all infections in post-surgical patients. The aim is to find out the incidence rate of surgical site infection in patients undergoing surgery in the departments of Surgery, Orthopedics, Obstetrics and Gynecology and its antibiotic susceptibility pattern. **Materials and Methods:** Under sterile aseptic precautions, Pus exudate was collected using two sterile cotton swabs for aerobic culture and for anaerobic culture pus was aspirated in a sterile syringe and inoculated onto different culture media, The samples were processed under direct microscopic examination of Gram stained smear, preliminary identification by colony morphology and Antibiotic sensitivity testing. **Results:** Out of 220 cases, 137 were male patients and 83 were female patients with infection rate more in Male. Clean wound were 20, Clean contaminated wound were 71, Contaminated wound were 110 and Dirty wound were 19, with infection rate more in Contaminated wound. Elective surgeries were 98 and Emergency surgeries were 122 with infection rate more in Emergency surgeries. Culture positive were 153 and Culture negative were 67. In the culture positive cases, aerobic were 146 and anaerobic were 7. Among the aerobic isolates, staphylococcus was the most common Gram-positive organisms isolated and klebsiella pneumoniae was the most common Gram-negative organism isolated. **Conclusion:** Knowledge about Surgical site infection will help surgeon in diagnosis and treatment, early detection and intervention is a prerequisite in surgical patients. Although surgical wound infections cannot be completely eliminated, a reduction in infection rate to a minimum level could have significant benefits, by reducing burden to patients and their families. Intervention aimed at reducing Surgical site infection would provide cost savings and improve the efficiency of health care system.

INTRODUCTION

Surgical site infections are infections, which occurs after any surgical procedure along the surgical tract. In our population they are the common nosocomial infections. They occur at any level, accounting for 38% of all infections in post-surgical patients. Recent wide spread and indiscriminate use of antibiotics have made it difficult to prevent and control such infections. Increasing number of serious infections were due to long duration complicated surgeries, increase in older age group patients with chronic infections, usage of implants, immunosuppressants drug usage in organ transplant surgeries and newer diagnostic technique results in increased exposure to microorganisms.[1]

Adapting good techniques during surgery plays a significant role in reducing such infections. Infections occurring at surgical site within one month if no implant used or within 1year if implant used in surgery. According to degree of contamination, wounds are classified as[2] Clean wound, Clean contaminated wound, Contaminated wound, Dirty wound. Multiple risk factors and patient related factors also play a very important role in surgical site infections.

The prophylactically administered antibiotics during surgery is one other most important determinant in development of surgical site infections. Hence knowledge about pharmacokinetics of various antibiotics used in perioperative prophylaxis is important in preventing surgical site infections.[3]

Study conducted by CDC have shown that the common pathogen causing infection at surgical site were Staphylococcus aureus followed by Coagulase negative staphylococci, Escherichia coli and Enterococci. Understanding the microbiology of surgical site infections is very important in treating the patients and taking prophylactic measures. The most important measure to decrease the bacterial load in surgical site include adapting aseptic precautions, following antiseptic methods and using antimicrobial prophylaxis.

An extensive study of the organisms causing surgical site infections and their antibiotic susceptibility will be very useful in reducing the incidence of surgical site infections. So this study was done to find out the bacteriological profile of surgical site infections and their respective antibiotic susceptibility pattern. Also to compare the prevalence of surgical site infections and bacteriological profile in all cases and compare the bacteriological profile in different wound classes (ie) clean, clean contaminated, contaminated and dirty.

RESULTS AND ANALYSIS

In the present study 220 clinically diagnosed case of SSIs were studied for a period of one year in all ages and both sexes. Out of 220, clinically diagnosed cases, SSIs rate was more in 21-30 group followed by 41-50 age group. Out of 220 clinically diagnosed cases, 137(62.3%) were males and 83(37.7) were females with male to female ratio 1.65:1 which shows that Males were more affected than females.

Preoperative stay of 4 and above showed high SSIs rate with 66 among 220 patients had SSI, similarly increased in number of pre – operative is directly proportional to incidence of surgical site infections. The same stands with number of post-operative stay days almost all the cases had a post-operative stay day above 3 days. That too it was very high in stay was more than one week. Out of 220 cases, Elective cases were 98 and Emergency cases were 122 with infection rate is more in Emergency cases.

In our study out of 220 cases, 20 cases were Clean wound, 71 were Clean contaminated, 110 were contaminated wound and 19 were dirty wound. P value: < 0.05. With infection rate is more in Contaminated wound.

Table 1: Class of wound.

Sl. No.	Class of Wound	Infected	Percentage
1	I	20	9.1%
2	II	71	32.3%
3	III	110	50%
4	IV	19	8.6%
Total		220	100%

In our study out of 220 cases, Culture positive were 153 and Culture negative were 67. Out of 153 Culture positive cases, 146 were Aerobic isolates and 7 were Anaerobic isolates. Out of 153 Culture positive cases, 134 were Monomicrobial and 19 were Polymicrobial. In our study Klebsiella was most common gram negative organism followed by E.Coli. Whereas staphylococcus aureus is most common gram positive organism identified in our study. Other organisms like proteus, pseudomonas, Citrobacter was also identified.

Out of total 153 culture positive cases, 173 organisms were isolated. Out of 5 culture positive cases in clean wound, a total of 5(2.9%) organisms were isolated. In the clean contaminated wound, out of 40 culture positive cases 15(37.5%) organisms were isolated. Staphylococcus aureus 3(60%) were the predominant organism isolated in clean and clean contaminated wound. In the contaminated wound class, 107(61.9%) organisms were isolated out of 92 culture positive cases. 21 (12.1%) organisms were isolated from Dirty(class IV)cases which were 17 numbers. Klebsiella pneumoniae were the predominant organisms isolated in contaminated and dirty wounds.

Table no. 2: Spectrum of organisms isolated from different classes of wounds.

Class of wound	culture positive cases	Total no of 0rganisms	Percentage
I	5	5	2.9%
II	39	40	23.1%
III	92	107	61.9%
IV	17	21	12.1%
Total	153	173	100%

Almost all Gram negative bacilli were 100% sensitive to Piperacillin / Tazobactam, Cefoperazone Sulbactam and Meropenem. *Klebsiella pneumoniae* isolates showed sensitivity of 60-74% for Amikacin, Gentamicin, Ceftazidime and Ciprofloxacin. Sensitivity to Ofloxacin, Cefotaxime, Cotrimoxazole and Amoxyclav were relatively minimal. Of the 29 *Escherichia coli* isolates, all showed sensitivity of 100% to Amikacin and Gentamycin apart from Piperacillin/Tazobactam, Cefoperazone Sulbactam and Meropenem. 50- 70% sensitivity were seen in ciprofloxacin, cefotaxime and ofloxacin. They were almost resistant to amoxyclav and cotrimoxazole. Among the 25 *Pseudomonas aeruginosa* isolates 70-80% sensitivity to Tobramycin, Ciprofloxacin and Amikacin and Ceftazidimewere seen. Sensitivity to Gentamycin were around 40% and they were least sensitive to Cotrimoxazole and Cefotaxime.

Out of 13 isolates of *Proteus mirabilis*, 9 (69.2%) were sensitive to Gentamicin, Amikacin, and Ceftazidime, 40-60% sensitivity were seen in Ciprofloxacin, Ofloxacin, and Cefotaxime. Out of 6 *Klebsiella oxytoca* isolates, all the 6 (100%) were sensitive to Amikacin, ceftazidime and also to Piperacillin/Tazobactam, Cefoperazone

Sulbactam and Meropenem. Sensitivity to Gentamicin and Ciprofloxacin were only 83.3%. whereas sensitivity to Ofloxacin and Cefotaxime was around 50-60%.

Apart from Piperacillin / Tazobactam, Cefoperazone Sulbactam and Meropenem Acinetobacter *baumannii was* sensitive to Ceftazidime and Ciprofloxacin and showed very low sensitivity to all other antibiotics. Out of 2 *Citrobacter freundii isolated,* 50% sensitivity was for amoxyclav and Ceftazidime. 100% sensitive to Gentamicin, Amikacin, Ofloxacin, Cotrimoxazole, Amoxyclav and all other antibiotics.

Coming to Gram positive organisms all the Gram-positive bacilli showed 100% sensitivity to Linezolid and Vancomycin. Out of 49 isolates, 41 were Staphylococcus *aureus* and showed 70-80% sensitivity to Erythromycin and Doxycycline. 40-50% sensitivity was for Ciprofloxacin, Cotrimoxazole and Amoxyclav. Least sensitivity to Cefotaxime, Ampicillin, Gentamycin and Ofloxacin was also encountered.

Of 7 *Staphylococcus epidermidis* isolates, 70-80% were sensitive to Doxycycline, Erythromycin and Amoxyclav. Cotrimoxazole, Gentamycin, Ofloxacin, Ciprofloxacin and Cefotaxime showed 20-40% sensitivity. The Only isolate of *Enterococcus faecalis* was 100% sensitive to Cotrimoxazole, Doxycycline and Erythromycin and also to Linezolid and Vancomycin.

DISCUSSION

The present study was done on patients who underwent surgery in the various departments in Dharmapuri Medical College Hospital, Dharmapuri. The total number of cases included in the study was 220, out of which 20 were clean cases, 71 were clean contaminated cases, 110 were contaminated cases and 19 were dirty cases.

In our study SSI was found to be more in 20-30 age group, comparable to that of Gayathree Naik et al[4]., who showed high SSIs rate in 20-30 age group and it was due to more no of cases admitted for surgery in this age group.

While studying the sex distribution of SSI, it was found that out of 220 cases, 137 (62.3%) were males and 83 (37.7%) were females. This correlates with the study conducted by Anand Saxena et al.[5]

While studying the correlation between SSI and pre-operative stay, it was found that, longer preoperative hospitalization is associated with increased incidence of wound infection ie, patients who were hospitalized for more than 5 days showed higher infection rate of 30% when compared to those of lesser stay. Similar findings have been observed by Patel et al.[6] Also in ours study it was found that infection rate was more after 1 week of surgery which correlates with that of Chia JYH who stated that, infection rate was more after the 5th post-operative day.[7]

Among the 220 cases Emergency cases (55.5%) were having higher infection rate when compared to Elective cases, which showed an infection rate of 44.5%. Kamat et al., also observed increased incidence of SSIs in Emergency cases.[8]

In the study of SSIs in various wound classes, Varsha Shahane et al[9]., noted the profound influence of wound contamination from analysis of wound categories, in which the SSIs rate in Contaminated and Clean contaminated wound was higher when compared to Clean wounds. They noted an infection rate of 12.3% in Contaminated wound, 8% in Clean contaminated wound, 4.6% in Clean wound. Jido et al., noted a SSI rate of 5.4% in Clean wound, 35.5% in Clean contaminated wound and 77.8% in contaminated wound.[10] Our study showed that infection rate was 9% in Clean cases, increased to 32.3% in Clean contaminated wound and 50% in contaminated wound.

The culture results of our study showed that, Out of 220 cases 153 (69.5) were culture positive and 67 (30.5) were culture negative which correlates with that of Lilani SP study[11], in which out of 17 cases, 14 (82.36%) were culture positive and 3 (17.64%) were culture negative. Soleto et al[12]., also showed 75.6% culture positivity and in the study of Gayathree Naik et al[4]., out of 300 samples 216 (72%) were culture positive.

Among the 153 culture positive cases, 137 were monomicrobial and 19 were polymicrobial. Similar spectrum of polymicrobial organisms were isolated by Giacometti et al., Human endogenous flora contaminating the wound frequently causes polymicrobial infection.[13] In our study commonest association was between Klebsiella pneumoniae and Pseudomonas aeruginosa 6(31.6%).

Of the 153 culture positive cases, 146 were aerobic isolates and the commonest organism was staphylococcus aureus 41 (24.7%), followed by Klebsiella pneumoniae 39 (23.5%), Escherichia coli 29 (17.5%), and other organisms. In the present study, predominance of Staphylococcus aureus in SSIs is consistent with report from other studies. Lilani et al[11] reported that Staphylococcus aureus was the common organism isolated from post-operative wound infection.

On the whole, Gram negative bacilli were the predominant organisms isolated (117 isolates)70.5%. Among the Gram-negative bacilli. Klebsiella pneumoniae were the most commonly isolated organisms. In the study conducted by Anvikar et al[14]., Klebsiella pneumoniae (26.8%) and Staphylococcus aureus (25%) were the two most common organisms isolated which is in accordance with our study.

The antibiotic sensitivity pattern of isolated organisms in our study had a variety of responses to various drugs. Gram positive organisms are highly sensitive to Linezolid and Vancomycin and Gram negative organisms to piperacillin tazobactam and cefoperazone sulbactam and Meropenem which was similar to many previous studies.[14]

CONCLUSION

Knowledge about Surgical site infection will help surgeon in diagnosis and treatment, early detection and intervention is a prerequisite in surgical patients. Although surgical wound infections cannot be completely eliminated, a reduction in infection rate to a minimum level could have significant benefits, by reducing burden to patients and their families. Intervention aimed at reducing Surgical site infection would provide cost savings and improve the efficiency of health care system.

BIBLIOGRAPHY

1. Ananthanarayan R, Paniker CKJ, editors. In: Textbook of microbiology. 8th ed. Hyderabad: Universities press, 2009; 1.
2. Culver DH, Horan TC, Gaynes RP, Martone WJ, Jarvis WR, Emori TG, et al. Surgical wound infection rates by wound class, operative procedure, and patient risk index. National Nosocomial Infections Surveillance System. Am J Med, 1991; 91(3B): 152-7.
3. Page C.P., et al, 'Antimicrobial Prophylaxis for surgical wounds; Guidelines for clinical care' Arch surg, 1993 Jan; 128: 79-88.
4. Gayathree Naik, Srinivas R, Deshpande, study on surgical site infection caused by Staphylococcus aureus with special search for Methicillin resistance isolates.
5. Anand saxena, mahendra pratap Singh, Swagata Brahmchari, Malay Banerjee. Surgical site infection among postoperative patients of tertiary care centre in Central india-A prospective study, Asian J of biomedical and Pharmaceutical sciences, 2013.
6. Patel Sachin M, Patel Mitesh H, Patel Sangeeta, Soni Sumeeta T, Kinari wala Dipa M, Vegad Mahendra M, Surgical site infections: Incidence and risk factors in a tertiary care hospital, Western India. National journal of community medicine, April-June 2012; 3: 2.
7. Chia JYH, Tan KW, Tay L. A survey of postoperative wound infections in obstetrics and gynaecology-The Kandang Kerbau hospital experience. Singapore Med J., 1993; 34: 221-4.
8. Kamat US, Fereirra AMA, Kulkarni MS, Motghare DD. A prospective study of surgical site infections in a teaching hospital in Goa. Indian J Surg, 2008; 70: 120–4.
9. Varsha Shahane et at., Surgical Site Infections, A One Year Prospective Study in Tertiary Care Center, Arch Surg, 1973; 107: 206-9.
10. JidoTA, Garba ID, surgical site infection following caesarian in Kano, Nigeria, Ann of medical sciences Research Jan-June 2012: 1, issue 1.
11. Lilani SP, Jangale N, Chowdhary A, Daver GB. Surgical site infection in clean and clean-contaminated cases. Indian J Med Microbiol, 2005; 23(4): 249-52.
12. Soleto et al a study of post operative wound infection, J Clin Microbiology.
13. Giacometti A, Cirioni O, Schimizzi AM, Del Prete MS, Barchiesi F, D'Errico MM, et al. Epidemiology and microbiology of surgical wound infections. J Clin Microbiol, 2000; 38(2): 918-22.
14. Anvikar AR, Deshmukh AB, Karyakarte RP, Damie AS, Patwardhan NS, Malik AK, et al. A one year prospective study of 3280 surgical wounds. Indian J Med Microbiology, 1999; 17(3): 129-32.