



International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR)

ISSN:2347-6567

IJAMSCR | Volume 6 | Issue 4 | Oct - Dec - 2018
www.ijamscr.com

Research article

Medical research

Bacteriological profile of postoperative wound infection in orthopaedic surgery from deep and superficial wounds

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ABSTRACT

Postoperative wound infection is a major trouble in the surgical specialties, which leads to increased mortality, morbidity and economic burden. In most post-operative SSIs the causative pathogens originate from the normal flora present in the patient's skin, mucous membranes or from the hollow viscera. Objectives of the present study were to study the frequency of various types of bacteria. The study was carried out in Raja's dental college and hospital, Thirurajapuram, Kavalkinaru, Tamilnadu. The samples from the 35 post-operative patients were evaluated for the study. Samples were taken from the patients during the period of surgical wound dressing before the wound was cleaned with antiseptic solution. The swab was examined by Gram staining and inoculated onto plates of MacConkey agar and 5% Sheep blood agar by rolling the swab over the agar and streaked. These plates were incubated at 37° C for 24-48 hours. The present microbiological study has determined the predominating bacteria responsible for the post-operative wound infections. There was predominance of commonly isolated bacterial species were *S. aureus*, *P. aeruginosa* and *E. coli*.

Keywords: Postoperative wound, Bacteriological profile, *S. Aureus*, *P. Aeruginosa* and *E. coli*.

INTRODUCTION

Post operative infections have always been a feature of human life. Sepsis in modern surgery continues to be a significant problem for health care practitioners across globe. Patients that are undergoing surgery or with any surgical procedure and represent a significant burden contributing to morbidity and mortality and increased cost to health services around the world (Merkow et al., 2015). [13] Surgical procedures are at a risk of acquiring infections at the site of incision as a result of the same surgical procedure. Surgical Site

Infections (SSIs) are real risks associated with any surgical procedure and represent a significant burden contributing to morbidity and mortality, and increased cost to health services around the world (Anderson et al., 2012). [1]

SSIs remain one of the critically serious problems in post-operative complications, constituting approximately 20% of all of health care-associated infection. Although surgical site infection is a relatively serious problem in our health institution, there are scanty published reports on the bacterial pathogens that are involved in SSIs

in our local hospitals (Gottrup et al., 2005). [6] Post operative wound infection or SSIs are defined as infection that occurs at incision site within thirty days after surgery. SSIs may be defined as invasion and the multiplication of microorganism in body tissue which may be clinically in apparent or result in local cellular injury because of competitive, toxins, intracellular replication or antigen-antibody response (Gregory et al., 2009). [7]

SSIs accounts for 15% of all nosocomial infections and among surgical patients, represents the most common nosocomial infection. Most post operative wound infection are hospital acquired, varies from one hospital to another and they cause significant post-operative morbidity, mortality and prolonged hospital stay, leading directly or indirectly to an enormous increase in the hospitalization cost and to the emergence of new health hazards for the community. (Jenna et al., 2015). [8]

Several factors lead to SSIs such as interaction of patient- or host related factors, procedure-related factors, the presence of foreign bodies and tissue trauma associated with the procedure, microbial properties and inappropriate use of antimicrobial prophylaxis (Mahata et al., 2013). Thus the aim of the present study is to identify risk factors with surgical site infection and to determine the bacteriological profile from surgical site infections.

MATERIALS AND METHODS

This study was conducted at Raja's dental college and hospital, Tamilnadu from period of July to November 2018 with the aim of evaluating the rate of surgical site infection in the hospital and also the various factors contributing the infection. After obtaining informed consent from all the subjects, their detailed clinical history was assessed with regard to age and sex distribution, lifestyle pattern and various risk factors.

The wounds showing clinical evidence of infection with purulent discharge were proposed for bacteriological examination. Samples for wound infections were collected from the patients with complaints of discharge, pain, swelling, foul smelling, delayed and non-healing wound. Pus samples were collected with the aid of 2 sterile disposable cotton swabs One swab was used to make smear for detection of pus cells and

microorganisms. Other swab was used to inoculate onto Blood agar and MacConkey agar media and incubated at 37°C for 24 hours. After incubation Identification of bacteria from positive cultures was done with standard microbiological technique which included Gram staining and biochemical reactions (Koneman et al., 2006).

RESULTS AND DISCUSSION

A total 35 patients having wound infection were included in this study, out of which 22 (62%) were male patients and 13 (38%) were female patients. Majority of patients were found between the age group 21-40 (31.4%). Whereas almost equal distribution between the age group of 41 to above 60 (25.7%) and least cases were below 20 years. The prevalence of wound infection was not significantly affected by age. Similar results were obtained in the study carried out by Chia-Hsiao et al. (2004) and Khorasani et al (2006). It was found that SSI was prevalent mostly in the working age group. People in age group 20-40 years are thought to be more leisurely active age which may explain why most wound patients were of this age group. Above 70 years old, people are generally less actively involved in various types of work, so may be less prone to accidents and resulting wound infections.

Majority of patients were from low socioeconomic status (65%). Out of 35 patients 22 male patients had smoking habit (59.1%) and 40.9% were non-smokers. The infection were most common in alcoholic (77.2%) subjects. 57.1% were non-obese and 42.9% were obese. Diabetes were more risk of 57.1% of subjects. Certain host factors are known to increase the likelihood of postoperative wound infections such as advanced age, malnutrition, obesity, operative infection. Advance in anaesthetic technique and post-operative care allow surgical treatment in older patients. Conversely, poor nutrition and general condition were still common in aged patients (Neumayer et al., 2007). The patients with deep wound infection are on average older than the main group significantly, presenting that increased age is a related risk factor. Which is comparative as most of patients were from low socio-economic status, many of them was alcoholic with increased risk of diabetes (Culver et al., 1991).

Out of 35 bacterial isolates (Table 1), 17 (48.57%) were Gram positive and 18 (51.42%) were Gram negative. Among Gram positive isolates, *Staphylococcus aureus* (42.9%) and *Streptococci* (5.7%) were the most frequently isolated species and *Klebsiella* spp. (25.7%) was the most frequently Gram negative isolates followed by *P. aeruginosa* (14.3%) and *E. coli* (11.4%). The microbiology of post-operative wound infection in implants has changed very little over time for the emergence of resistant organisms.

Staphylococcus aureus was the most commonly isolated in this study accounting for 44%. It was similarly most common in various other reports worldwide. The relative rates however vary from centre to centre. At Zaria, North Central Nigeria, Udobi et al (2013) isolated *Staphylococcus aureus* in 85.25% of patients while the National Orthopaedic Hospital Lagos, found it accounted for 71.4% of his isolates, while in Classen et al (1992) in USA noted that it occurred in 16.3% of their cases.

Table.1 Microorganisms Isolated from Infected Wounds

S.No	Name of the Organisms	Number of patients	Percentage
1	<i>Staphylococcus aureus</i>	15	42.9%
2	<i>Klebsiella</i>	9	25.7%
3	<i>Pseudomonas</i>	5	14.3%
4	<i>E.coli</i>	4	11.4%
5	<i>Streptococcus</i>	2	5.7%

In this study we found that Gram-negative bacteria namely *Klebsiella*, *E.coli* and *Pseudomonas* were predominant pathogens along with Gram-positive bacteria. There are many studies with similar findings and there is a changing trend towards the Gram-negative organisms becoming highly prevalent. However, some studies still reveal that *S. aureus* is predominant pathogen followed by Gram-negative bacteria. Therefore majority of the organisms isolated from surgical sites after orthopaedic surgery, in our study notes were infection in Gram positive and Gram negative bacteria. The predominate isolates were *S. aureus*, *Pseudomonas* spp followed by *E.coli* and *Klebsiella* spp, *Enterobacter* spp.

Mehata et al (2013) showed that high rates of Gram-negative bacteria are found in HAI. In the study carried out by Jenna et al, (2015) *Pseudomonas aeruginosa* was isolated as the predominant species (33.9%) followed by *E. coli*, *Klebsiella* spp., *S. aureus*, *Proteus* spp. A similar result was obtained in the study of Nutanbala et al (2011) on postoperative wound infection, where Similarly, the study carried out by Mawalla et al

(2011), in Tanzania, demonstrated the predominance of Gram-negative bacterial isolates in SSIs, *P. aeruginosa* being the commonest isolated organism followed by *S. aureus*, *Klebsiella pneumoniae*, *P. mirabilis* and *Acinetobacter baumannii*.

CONCLUSION

Post operative wound infection are major health care associated complication with increased morbidity and mortality and increased cost to health services around the world. Various risk factors associated with SSIs and the variation in the pattern of microbial agents has worsen the condition. In the present study conducted in Sree Raja's Dental College and hospital, Thirurajapuram, kavalkinaru, Tamilnadu was concluded that the males of middle age group from low socio-economic status were more effected than female with risk factors such as smoking, alcohol consumption, obesity, diabetes. The predominant bacterial strains isolated was *S. aureus*, *P. aeruginosa*, *E. coli*, *Streptococci*. Hence the study concludes to follow up the precautions to minimize

the risk factors leading to post-operative wound infections. Since inappropriate treatment of may leads to the antibiotic resistance. The data in the

present study may be valuable guide for choosing the effective therapy against the isolates from postoperative wound infections.

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How to cite this article: Premchandran, G. Shanthi and S Selvakumar. Bacteriological profile of postoperative wound infection in orthopaedic surgery from deep and superficial wounds. *Int J of Allied Med Sci and Clin Res* 2018; 6(4): 918-921.

Source of Support: Nil. **Conflict of Interest:** None declared.