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Full Length Research Article

POST SURGICAL WOUND INFECTIONS: BACTERIOLOGICAL PROFILE AND ANTIBIOTIC SENSITIVITY PATTERN FROM A TERTIARY CARE HOSPITAL; COIMBATORE TAMIL NADU

***Shreeram, A., Deshpande, R., Someshwaran, K. and Gnanaprakash**

Karpagam Faculty of Medical Sciences and Research (Dr. M.G.R. Medical University) Coimbatore, Tamil Nadu, India -641032

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ABSTRACT

The distribution of various pathogens causing wound infection was evaluated in Othakkalmandapam, Coimbatore district, Tamilnadu. A total of 150 cases were studied. Out of this 21 positive wound swab specimens were collected and cultured, of which all samples showed bacterial growth. Seven different species of bacteria were isolated. *E. coli* (45%) and *Staphylococcus aureus* (53.8%) were the most common organisms followed by *Staphylococcus epidermidis* (28.5%), *Klebsiella pneumonia* (23.8%), *Pseudomonas aeruginosa* (14.28%), and Proteus mirabilis (9.52%). The antibiotic susceptibility test of the bacterial isolate was performed by Kirby-Bauer disk diffusion method. Majority of the bacterial isolates showed wide resistance to the antimicrobials employed. High rate of multiple antibiotic resistances was observed in both Gram positive and Gram negative bacterial species recovered

Key words: Culture, Bacterial Isolate, *Staphylococcus.*

INTRODUCTION

A wound is a breach in the skin and the exposure of subcutaneous tissue following loss of the skin integrity which provides a moist, warm and nutritive environment that is conductive to microbial colonization and proliferation (Shittu *et al*., 2002). A surgical wound may get infected by the exogenous bacterial flora which may be present in air of Operation Theater or by any endogenous flora. The introduction of antiseptic principles in surgical practice revolutionized the scope of surgery (Polk *et al*., 1971). One of the major problems faced by the surgeons these days is to deal with post-surgical wound infection as the most of these are caused by multidrug resistant bacteria (Bergogne *et al*., 1993). The microbiology of post-surgical wound infections in all surgical services has changed very little over the years. *Staphylococcus aureus* is the single most commonly encountered organism. Others included aerobic gram negative organisms such as *Escherichia Coli, Pseudomonas* species, *Proteus* species and *Enterococcus* (Nandi *et al*., 2005). The relative rates of each vary from one hospital study to another. The factors which strongly predispose to wound infections include preexisting illness, length of operation, wound class and wound contamination (Dellinger *et al*., 1997). The potential sources of postoperative infections are patient, hospital environment, food, other patients, staff, infected surgical instruments, dressings and even drugs and injections.

Corresponding author: Shreeram, A.,
Karpagam Faculty of Medical Sciences and Research (Dr. M.G.R. Medical University) Coimbatore, Tamil Nadu, India -641032.

The pathogens isolated from infections differ depending on the underlying problem, location and type of surgical procedure (Razavi *et al*., 2005). The control of post-operative infection has become more challenging due to widespread bacterial resistance to antibiotics and the knowledge of the causative agents of post-operative infection has therefore proved to be helpful in the selection of empiric antimicrobial therapy and on infection control measures in health care institutions (Nitin Goel and Nikhil Payal, 2013).

MATERIALS AND METHODS

This was a retrospective study of pus samples from post-operative infections over a period of 1 year from November 2014 to October 2015, a total of 150 operated cases admitted in Karpagam Faculty of Medical Sciences & Research, Othakkalmandapam, Coimbatore -32 formed the basis of this study. Patients were selected from the department of Surgery & Orthopedics. Formerly infected conditions were excluded (Howe, 1954). Patients included in this study were specified into 2 groups; a) Planned (Elective) surgeries and b) Emergency surgeries. Details of the patient age, sex, diagnosis, date of surgery, preoperative stay, antibiotics taken preoperatively and post operatively, past history were noted as clinical history (Onche and Adedeji, 2004). Patients with diabetes mellitus, obesity, carcinoma and patients on drugs such as steroids or cytotoxics were excluded (Howe, 1954). Wounds were inspected at frequent intervals for clinical evidence of infection. Wounds were considered uninfected if they had healed by primary intention.

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 (Nutanbala *et al*., 2011). Pus samples were collected with the help of 2 sterile disposable cotton swabs (Anantha *et al*., 2014). One swab was used to make smear for detection of pus cells and microorganisms (Shittu *et al*., 2002). Other swab was used to inoculate onto Blood agar and MacConkey agar media and incubated at 37^0C for 24 hours (Koneman *et al*., 2006). 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; Forbes *et al*., 1998). The antibiotic sensitivity test of all isolates was performed (according to CLSI guidelines) by modified Kirby Bauer's disc diffusion method on Mueller Hinton agar or Blood agar medium using antibiotic discs of Hi media Laboratories Pvt. Limited, India (Nitin Goel and Nikhil Payal, 2013).

Fig. No. 1 Staphylococcus aureus on Blood Agar

Fig. No. 2 E.coli on MacConkey Agar

RESULTS

Total 150 patients having wound infection were included in this study, out of which 95 (63.33%) were male patients and 55 (36.66%) were female patients. Out of 150 samples, 21 (14%) samples showed growth of aerobic bacteria whereas 129 (86%) were sterile. Among 21 positive samples, 15 (71.4%) samples were from male patients and 6(28.5%) samples were from female patients. Out of 21 positive samples 12 (57.1%) showed mixed infection and total 33 bacteria were isolated. Out of 33 bacterial isolates, 13 (39.3%) were Gram positive and 20 (60.6%) were Gram negative.

Among Gram positive isolates, *Staphylococcus aureus* 7 (53.8%) and *Coagulase negative staphylococci* 6 (46.1%) were the most frequently isolated species and *E.coli* 9 (45%) was the most frequently Gram negative isolate.

Table 1. Sex wise Distribution

Sex	Total number of cases	No. of infected cases	Percentage
Male	95	15	15.78%
Female	55	6	14.54%

Among the total of 150 cases, the highest rate of infection was seen in 70-79 age group.Emergency surgeries had higher infection rate 13 (61.9%) compared to elective ones 8 (38%). Highest infection rate was observed in abdominal surgeries 12 (17.4%) and lowest was in inguinal surgeries 1 (3.30%).

Table 2. Site wise distributions of cases

Site	Total No. of cases	No. of infected cases	Percentage
Head & Neck	10	--	--
Abdomen	70	12	17.14%
Inguinal operations	30	1	3.30%
Orthopedic surgeries	40	8	20%

Antibiotic sensitivity of Gram positive isolates showed 100% sensitivity to Vancomycin and Linezolid. 92% were sensitive to Cefoxitin and 3 Methicillin Resistant *Staphylococcus aureus* were isolated. Gram Positive isolates showed 68% and 70% sensitivity to Cotrimoxazole and Erythromycin respectively. All the Gram negative isolates 100% were sensitive to Imipenem and ceaperazone/ Sulbactum. 84% of the isolates were sensitive to Ofloxacin 65% to Ciprofloxacin. They showed 78% sensitivity to Cefepime and 89% to Ceftazidime.

DISCUSSION

In this study, total 150 patients from post-operative cases formed the study group. Many of the patients were from small villages in Othakkalmandapam, Coimbatore. The infection rate from this population was 14%.This rate was probably due to the low socioeconomic status of the patients, usually associated with malnourishment and anemia, which can lower the general resistance. The post-operative sepsis rate as reported by different workers all over the world has differed considerably despite employing different statistical controls. Out of total 150 patients, 89 (59.33%) were male patients and 61 (40.66%) were female patients. The incidence of post-operative infection was more common in males than in females. A study carried out in three hospitals (Federal Medical Centre, Owerri, Imo State University Teaching Hospital, Orlu and General Hospital, Okigwe) by Ohalete *et al* also supported the result who reported that the males (59.3%) were more prone to wound infection than females (40.7%). The study showed that, there was an increase in rate of infection with increasing age and maximum rate was observed in age group of 70-79 years. Subramaniam *et al* have reported higher rate of infections at extreme age. Coagulase positive *Staphylococci* (53.8%) were the predominant Gram positive bacteria isolated. High isolation rate of this bacterium with post-operative wound infections was reported by the Public Health laboratory Service report and by Dineen *et al* and Thurn *et al*.

Among Gram negative bacteria, *E.coli* (45%) was the predominant bacteria. Sengupta *et al* reported that *E.coli* is next to *Pseudomonas* as a causative organism in such infections A number of reports on wounds infection from different parts of the world indicated that both organisms were the most frequent isolates from different types of sepsis including wound (Mohammed *et al.,* 2011; Manjula*et al.,* 2007; Thanni *et al*., 2003 and Glacometti *et al*., 2000).

In the determination of the susceptibility of these *Staphylococcus aureus* on sixteen selected antibiotics by agar diffusion technique showed that *Staphylococcus aureus* tend to be resistant to a wider spectrum of antibiotics. This finding is in agreement with the work of Adcock *et al.,* (1998), Sani *et al.,* (2013) and CDC (1999) who reported that clinical Staphylococci are resistant to multiple antibiotics. In this study, 71% of the *E.coli* isolates were resistant to ampicillin, cefaclor, doxycycline and amoxicillin, 87.5% to erythromycin, cefuroxime, cefotaxime and cefazolin. Sensitivity pattern of *E.coli* in our study as compared to others were ciprofloxacin (97%), cefazolin (92%) (Weber *et al.,* 2009*)*, ceftazidime (91%) ofloxacin (97%) (Kaufman *et al.,*1998). So, reduced antibiotic sensitivity pattern noted for *E. coli* suggests its importance for hospital acquired infection.

Conclusion

The most common isolate in post-operative infection was *Staphylococcus aureus* followed by, *E.coli, Pseudomonas species, Enterococcus species, Klebsiella species, Enterobacter species* and others. Ampicillin / Sulbactum (AS) and Linezolid (LZ) were the most effective antibiotics for Gram positive bacteria and Lomifloxacin followed by Netilline and Gentamicin were the most effective antibiotics for Gram negative bacteria. There is an alarming increase of infections caused by antibiotic-resistant bacteria. Lack of uniform antibiotic policy and indiscriminate use of antibiotics may have led to emergence of resistant bacterial strains. Particularly pseudomonas resistances to third generation antibiotics are real threat to control hospital acquired infection. In our study oral drugs ofloxacin, ciprofloxacin, injectable drugs amikacin, gentamycin and tobramycin shows good sensitivity against gram negative organisms. In addition, regular antimicrobial susceptibility surveillance is essential for area-wise monitoring of the resistance patterns. An effective national and state level antibiotic policy and draft guidelines should be introduced to preserve the effectiveness of antibiotics and for better patient management. This study suggests that if one could not wait the culture results in wound infection, ampicillin, amoxicillin, doxycycline, cefaclor and erythromycin are quite ineffective to treat these infections.In conclusion extensive and exhaustive studies are needed to explore the various problems in the area of nosocomial infections. The use of antibiotics must be confirmed with antibiotic sensitivity testing of the isolates to prevent the emergence of drug resistant strains. The battle for complete elimination of post-surgical wound infections will continue and with adequate surveillance and with proper coordination of microbiologists, this battle would definitely be won.

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