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Original article

Surgical site infections in a teaching Hospital. Clinio Microbiological and Epidemiological profile

[*a]A. Ramesh, [b]Ms. R. Dharini

[*a]*Assistant Professor, Department of Microbiology,*
[b]*Medical Student Vinayaka Mission's Medical College & Hospital (VMMCH),Karaikal-609 609. Puducherry UT.*

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ABSTRACT

Purpose: To identify organisms causing surgical site infection (SSI), their antibiotic profile and anociated risk factors. Methods: A total of 50 cases from general surgery unit were considered for the study. Data was collected in a structured proforma. Organisms were identified by conventional methods and associated patient risk factors were also analysed. Antibiogram was done for all culture positive samples. Results: A high rate of SSI was noted in or study ie., 66% common isolates were Staphylococous aureus and Klebsiella pneumonia. Underlying risk factors were diabetes mellitus and hypertension. Conclusion: The prevalence of SSI and multi drug resistance is high in our hospital. Ameliorating the risk factors and practising effective infection control process and proper antibiotic cycling may curtail the rates of infection.

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1.Introduction:

Surgical site infection (SSI) may be defined as “invasion and multiplication of microorganisms in body tissue which may be clinically in apparent / result in local cellular injury because of competitive metabolism, toxins, intracellular replication or artigen-anti body response” [1]. They are classified as being either incisional or organ space [2]. Nosocomial infection are an important public health problem with a variation of prevalence rate [3].

SSI and rates of antibiotic resistance are high. This study aims at the types of isolates, their antibiotic resistance pattern in our institute and we also analysed the underlying risk factors. Since the prevalence rate of SSI vary from region to region this is the first study of its kind conducted in our hospital.

2.Materials and Methods:

The material for the present study was obtained from patients in the surgery department of Vinayaka Missions Medical College and Hospital, Karaikal who had undergone operations and developed signs & symptoms of post-operative wound infections.

* Corresponding Author : Dr. A. Ramesh
Assistant Professor,
Department of Microbiology,
Vinayaka Mission's Medical College & Hospital (VMMCH)
Karaikal-609 609
Puducherry UT.
E.mail: rameshtrichy1970@yahoo.co.in

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2.1.Inclusion Criteria

- Cases of Clean and Clean contaminated surgeries conducted in the General surgery department.

2.2.Exclusion Criteria

Procedures in which healthy skin was not incised, such as opening of an abscess.

- Burn injuries and donor sites of split skin grafts.
- Contaminated and dirty surgeries.

2.3.Collection of material

- The wounds were examined for signs/symptoms of infection in the post operative period. When infection was clinically suspected, the area around the surgical wound was cleaned with saline. The exudates was collected from the depth of the wound using two sterile cotton swabs.

2.4.Methods:

A total number of 50 samples were collected from the patients and a structured proforma was used to collect the data samples were subjected to Gram stain and culture using blood agar and Mac conkey agar. Isolates were identified by conventional identification methods. Antibiogram was performed on the isolates using the modified Kirby Bauer method [CLSI]. Commercially available antibiotic disk obtained from Hi- media laboratory ltd. were used. The antibiotic disks were placed on the inoculated plate using a pair of sterile forceps and gently pressed to ensure even contact. The plates were incubated at 35^0c.

Antibiotics used are amikacin, gentamycin, imipenam, ceftriaxone, ciprofloxacin, linezolid, Novabocin, cefepime, oxacilin. amoxyclav, clindamycin, nalidixic acid, ceftazidime with clavulanic acid, cefpirome, cefuroxime, vancomycin, cefazolin, cloxacillin, cephalexin, ofloxacin, teicoplanin, piperacillin.

After 16 -18 hours incubation, the diameter of zone of inhibition was measured with a scale, recorded in mm & interpreted as sensitive or resistant, in accordance to the indications of disk manufacturers.[4-6].

3.Results

A total number of 50 cases of surgical site infection were enrolled in the study. Among the study subjects 31 were male (62%) and 19 were female (38%).

Among the cases studied 30 (60%) clean surgery cases and 20 (40%) clean contaminated Surgery cases of which 40 were elective surgery (80%) and 10(20%) were emergency surgeries. A total of 42 surgeries (84%) lasted for upto one hour & the remaining 8 cases (16%) lasted for upto2 hours.

Most common surgical diagnosis made on the patients were as follows; hernia 15 (30%) diabetic foot 12 (24%), and the most common surgical procedures performed were hernioplasty 15 cases (30%), amputation 10 cases (20%).

3.1.Microbiological Profile.

A total number of 50 samples were collected of which 33 had growth & 17 had no growth, 66% and 34 % respectively. Among the positive samples, Gram positive cocci Gram negative bacilli were isolated [DIAG. 1]. The distribution of Gram negative bacilli is depicted in DIAG 2.

Underlying risk factors were also analyzed which yielded that, diabetes mellitus (18)cases & systemic hypertension were most commonly seen in these patients with equal prevalence and the combination of these two diseases were seen in seven cases. Other parameters included were smoking and alcoholism. [DIAG-3]

Among the cases 18 of them did not have any underlying risk factor. Among 18 cases with underlying diabetes all organisms isolated in the study were represented. [DIAG – 4]

When the duration of surgery was analysed 8 cases were being done for 60 min. to 120 minutes. Among them 6 cases were culture positive. The most common isolates were Klebsiella pneumonia & Staphylococcus aureus. In one case both the organisms were isolated.

When the criteria of emergency surgery was considered a total of 10 cases was recorded , 2 of them were culture negative among the remaining 8 cases 5 were Klebsiella pneumoniae ,3 were Staphylococcus aureus.

The comparision between clean surgery & clean contaminated surgeries in our cases reveal the following results.

Among the total clean surgeries (30) 16 had no growth culture positive were predominantly Staphylococcus aureus (9) and Klebsiella pneumoniae (5). In case of clean contaminated surgeries (20) no growth was minimal (1) and culture positives were 19 cases predominantly Staphylococcus aureus (10) and Klebsiella pneumoniae (6).

3.2.Antibiogram Susceptibility Pattern

Among the 19 Staphylococcus aureus isolates studied , 16 of them were susceptible to amikacin, gentamycin, vancomycin, ciprofloxacin, & ofloxacin, indicating a high percentage of methicillin resistant Staphylococcus aureus. (MRSA)

Among the 16 Gram negative bacilli studied all the isolates were susceptible to imipenam, amikacin. These two findings indicates that there is a high prevalence of MRSA and extended Spectrum beta lactamases (ESBL) in our hospital.

The susceptibility pattern only to higher end antibiotics is a cause of concern from the hospital point of view as well as from patients' perspective.

Diagram 1:Characteristics of Study sample

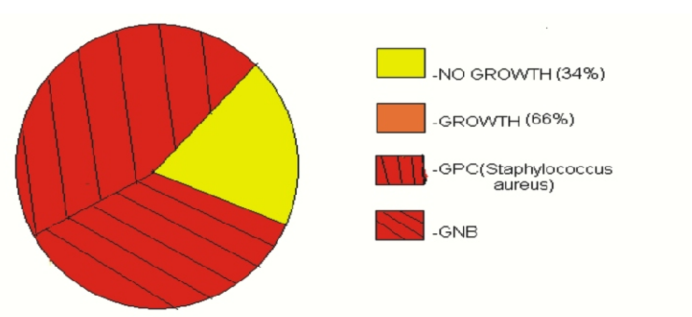
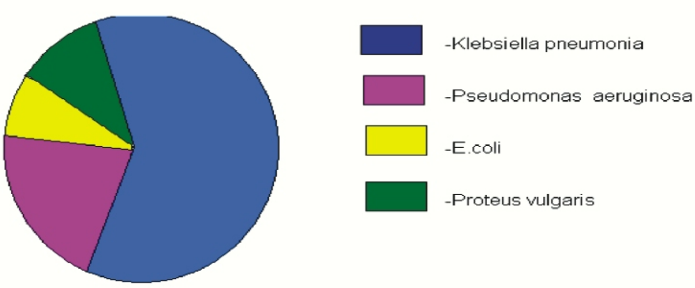
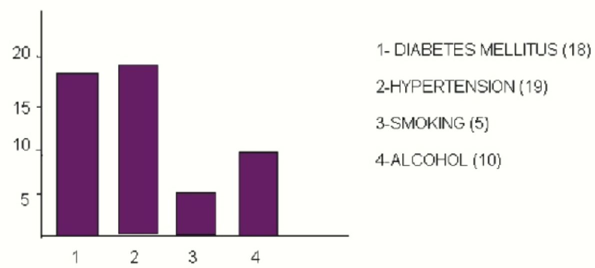
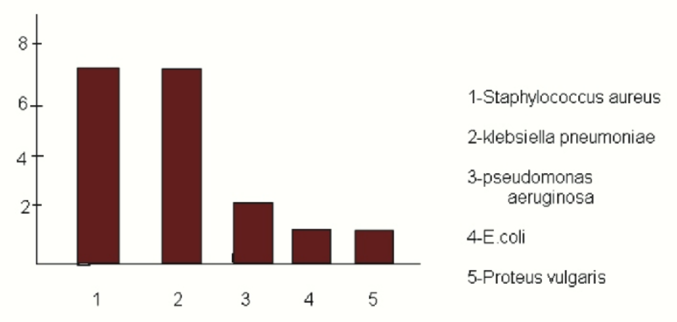


Diagram 2:Distribution of gram negative bacilli







4.Discussion:

The incidence of surgical site infection in India ranges from 4.04 to 30% [7-9].

In our study Staphylococcus aureus was the predominant isolate among the gram positive organisms. Among the gram negatives Klebsiella was the predominant isolate in our study.

The distribution of pathogens that causes surgical site infection is similar in many countries. In a study of these infection in European union,24- 40% were due to Staphylococcus aureus,6 to 11 % coagulase negative Staphylococci, 3 to 5% E.coli & 7to 10 % Pseudomonas.

A study in Turkey showed that staphylococcus aureus accounts for 50% isolates from surgical site infection . E.coli 8%, S.pyogenses & Pseudomonas aeruginosa each 7 % and coagulase negative Staphylococcus 6 %.

In bacterial profile of SSI and their antibiogram in a tertiary care hospital in Mumbai, Staphylococcus aureus, E.coli& Pseudomonas species were isolated from their hospitals which is comparable to other studies. Staphylococcus aureus was the predominant isolate in India and abroad. Among gram negative E.coli was the commonest as seen in their study. [10]

When seen in distribution of pathogen isolated from SSI , National Nosocomial infections Surveillance system , 1986 to 1996 : Staphylococcus aureus is the predominant isolate. [2]

In our present study, where E.coli or Pseudomonas was the least predominant isolate compared to other studies. This indicates the unique feature where we have a combination of Staphylococcus aureus and Klebsiella in our setup.

Surprisingly the common nosocomial pathogen namely Peudomonas was not a common isolates in our study.

The exact reason for this pattern could not be clearly defined which may be due to sample size and probably the study of environmental factors may reveal the hidden facts beyond this unique pattern of isolates.

There is a gradual increase in the emergence of antibiotic resistant micro-organisms in surgical patients [7,9,11,12].

When analyzing the antibiotic profile, all isolates of Staphylococcus aureus were sensitive to vancomycin ,linezolid and fluroquinolones. And among the gram negatives all isolates sensitive to imipenem and amikacin.

Now we compare our study with other studies done in India and in abroad.

In bacterial profile of SSI and their antibiogram in tertiary care hospital Mumbai , vancomycin & linezolid are the drugs of choice for Staphylococcus aureus & Imipenam and piperacillin-tazobactum are common drugs of choice for gram negative organisms.(Klebsiella and Pseudomonas species [10]

In epidemiology and microbiology of SSI Italy : Staphylococcus aureus is sensitive to vancomycin & teicoplanin. Then the gram negative organisms like Klebsiella, Pseudomonas sp and E.coli are sensitive to imipenam. [13]

Thus comparing all other studies with our study, we can say that the antibiotic profile is similar to all other studies.

Noting this antibiotic profile, we conclude that the organisms are susceptible to higher end antibiotics, even though they are located in a semi urban or rural setting. So this indicates that in advertent use of antibiotics can lead to increased rate of drug resistance irrespective of rural or urban settings.

Risk factor analysis reveals that 18 cases had underlying diabetes which had composed of more than 1/3 rd (36%) of study population. Diabetes meillitus itself is a risk factor for acquiring infection and increase level of HBA1C will promote infection by attenuation of host defense mechanisms. Thus an increase in the infection rate .

Moreover, 19 isolates were obtained from diabetic host who had representation of all isolates obtained from the study. This was not the case when other risk factors like hypertension, smoking, alcoholism were considered. When hyper tension was a risk factor, except Proteus all other organisms were isolated. When smoking was considered as individual risk factor only Klebsiella was isolated. As the duration of the surgeries increased, more gram negative organisms were isolated (Klebsiella). Smoking or Nicotine use delays primary wound healing and may increase risk of surgical site infection. [2]

One of the complication of diabetes as well as hypertension is nephropathy. As all our gram negative isolates were sensitive to amikacin which is a nephrotoxic agent . Thus the use of this easily available cheap drug is restricted in the clinical setting compelling the treating physician to go for higher antibiotic. This will lead to selection pressure among the organisms and in due course, an ESBL (extended spectrum beta lactamase) becoming sensitive only to imipenam . This in turn will increase the economic loss to the patient unnecessarily.

To avoid the above said problem anti microbial prophylaxis has to be adopted, which should be safe, inexpensive, bactericidal and with the good spectrum of activity. The drug should be infused pre-operatively so that optimum serum concentrations are achieved intra operatively.

Thus the incidence of infection varies from surgeon to surgeon, from hospital to hospital , from one surgical procedure to another and most importantly from one patient to another [14].

5.Conclusion

SSI & multidrug resistant organisms had a high prevalence.

Organism isolated were Staphylococcus aureus, Klebsiella pneumonia, E. coli, Pseudomonas and Proteus. All these organisms were associated with diabetic population, which was not the case in hypertensives. In smokers common association with Klebseilla pneumoniae is seen.

The study indicates, underlying risk factor needs to be carefully evaluated in treating infection including SSI. Since, these isolates are MDR and are susceptible only to a select group of drugs would those drugs be suitable for these patients who already suffer with co- morbid condition.

It is evident from various studies that, uncontrolled or long standing diabetes mellitus is associated with delayed wound healing. Hence, strict control of glycemic status, may aid in rapid or atleast normal healing of wounds, which inturn may reduce the rate of SSI atleast in this subset of hospital population, who obviously is a vulnerable one.

In our study amikacin was a commonly susceptible drug to all isolates. Being a nephrotoxic agent, can it be administered safely in diabetes or hypertensives? More over both these conditions are associated with nephropathy.

In this aspect, we observe that what will be the behaviour pattern of organism in case of a good glycemic control Vs uncontrolled diabetes mellitus. These patients may be isolated from other non – diabetic people since, diabetes have a wide profile of organisms when compared to other, atleast to reduce cross-infection.

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