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Original Research Article

A study of pattern of pathogen and their sensitivity isolated from surgical site infections in abdominal surgeries

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ABSTRACT

Background: Surgical site infection (SSI) is defined as those infections presenting up to 30 days after a surgical procedure if no prosthetic is placed and up to 1 year if prosthesis is implanted in the patient. SSI contributes to increasing morbidity, mortality and cost related to surgeries and continues to be a major problem even in tertiary care modern hospitals following standard protocols of peri operative preparation and antibiotics prophylaxis. Objective of this study was to study and analyse the pattern of pathogen causing SSI in abdominal surgeries in a tertiary care hospital.
Methods: Descriptive study on patients undergoing abdominal surgery in the department of surgery. Patients satisfying inclusion criteria will be assessed on 2nd postoperative day and then daily for surgical site pain, redness, warmth, discharge and swelling of surgical site till the patient gets discharged and followed up after discharge every 7 days up to 1 month. If SSI is detected, swab will be taken and sent for culture and sensitivity.
Results: At the end of the study, after analysing the pattern of pathogens and antibiotic susceptibility, we intend to conclude the safe usage of empirical antibiotic prophylaxis to prevent the incidence of SSI's in our hospital.
Conclusions: Appropriate prophylactic therapy for any open abdomen surgeries reduces incidence of surgical site infection thereby reducing morbidity, mortality and cost burden in patients undergoing abdominal surgeries.

Keywords: Abdominal surgeries, Antibioctic sensitivity, Common organisms from abdominal surgeries, Surgical site infections

INTRODUCTION

Post- operative infections and sepsis in modern surgery continues to be a significant problem for health care practitioners across the globe. Patients who are undergoing surgery are at risk of acquiring infections at the site of incision as a result of the same surgical procedures.[1]

Surgical site infection (SSI) is defined as those infections presenting up to 30 days after a surgical procedure if no prosthetic is placed and up to 1 year if a prosthetic is implanted in the patient.[2] SSI remains one of the critically serious problems in post-operative complications, constituting approximately 20% of all of health care associated infections.[3] SSI have been responsible for increasing morbidity mortality and cost related to surgical operations and continue to be a major problem even in hospitals with most modern facilities and with standard protocols of preoperative preparation and antibiotics prophylaxis. Although surgical site infection is a relatively serious problem, there are scanty of published reports on bacterial pathogens that are involved in SSI in our hospitals.

In India, due to lack of adequate information and guidelines for antimicrobial prophylaxis in surgery, there is urgent need to generate baseline data on the pattern of use of prophylactic antibiotics.

Objectives of this study is to analyse the pattern of pathogen which causes SSI in abdominal surgeries in a tertiary hospital, to study the predominant pathogen associated with SSI's in abdominal surgeries, to analyse the antibiotic sensitivity of the pathogen isolated, to study the risk factors leading to SSI's.

Rationale:

Appropriate antimicrobial prophylaxis has been shown to be effective in reducing SSI's but inappropriate use of antimicrobial is associated with increase in the cost of therapy and most importantly the emergence of bacterial resistance (MRSA, MRCONS, VRE ETC).[4] Data from this study may be useful in infection control pertaining to surgical wound sepsis.

METHODS

This was a descriptive study done in patients undergoing abdominal surgeries in JSS hospital Mysuru for period of one and half year from January 2018 to June 2019.

Procedure

Procedures taken under considerations are open appendicectomy, meshplasty, laparotomy, open cholecystectomy. Selected as first 100 cases undergoing above mentioned surgery in our hospital in definitive period. Inclusion criteria are all patients (elective and emergency) posted for abdominal surgeries (laparotomies, hernioplasty open appendicectomy and open cholecystectomy), all patients between the age of 18 to 60 years, laparoscopy converted to open surgeries, all SSI's meeting the criteria mentioned above. Exclusion criteria including laparoscopic surgeries, patients already on antimicrobials for therapeutic purpose, diagnostic surgical procedure

Primary outcome measure

After analysing the pattern of pathogens and antibiotic susceptibility, we may attempt to use a safe empirical antibiotic prophylaxis to prevent the incidence of ssis in our hospital. This will indeed decrease the burden of cost, morbidity and mortality associated with SSI's.

The results were statistically analyzed using SPSS 21.0 Software

RESULTS

In our study nearly 60% of the case were operated on emergency basis and 40% on elective basis.

In our study, 69% of the study subjects underwent laparotomy, 11% underwent Meshplasty, 16% underwent open appendicectomy, 4% underwent open cholecystectomy.

Table 1: Distribution of study subjects based on the type of the surgery.

Type of surgery	Frequency	%
Elective	40	40.0
Emergency	60	60.0

Table 2: Distribution of study subjects based on the surgery done.

Surgery done	Frequency	%
Laprotomy	69	69.0
Meshplasty	11	11.0
Open appendicectomy	16	16.0
Open cholecystectomy	4	4.0

Common isolate

Common isolates in our study is *E. coli* (41), *Klebseilla* (20)

Table 3: Distribution of most common organism from the surgical site infection among study subjects.

Most common organism from the isolate	Frequency (n=100)	%
E. coli	41	41
Klebsiella	20	20

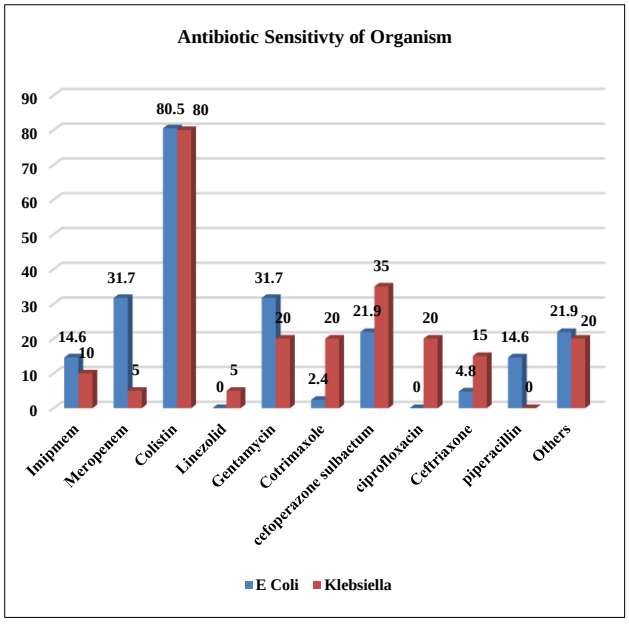

Figure 1: Distribution of antibiotic sensitivity of *E.coli* and *Klebsiella*.

Antibiotic sensitivity

Most common antibiotics which are sensitive to common organisms are colistin, cefaperazone, sulbactum, ciprofloxacin, imipenem, meropenem.

In our study the *E. Coli* and *Klebsiella* were found to be major organism to be isolated from the specimen. The *E. Coli* was found to most sensitive for colistin (80.5%), followed by cefoperazone, sulbactum (35%), meropenem (31.7%). For *Klebsiella colistin* (80%) and cefoperazone sulbactum (35%) and gentamycin (20%), ciprofloxacin (20%), cotrimoxazole (20%).

DISCUSSION

SSIs are any infections occurring in a surgical wound within 30 days. SSI is the most common healthcare-associated infection. Studies have shown an incidence between 5 and 10% of patients undergoing surgery are estimated to develop an SSI with an associated increased length of stay and increase in morbidity and mortality.[5,6]

The findings of our study where *E. Coli* was the most common organism isolated was also seen in the study done by Kamath where 79.33% of the organism isolated was *E. Coli*. Agrwal et al also isolated *E. Coli* to be the most common organism causing SSI in abdominal operations.[4] Even the studies done by Raka et al and Fiorio et al also found the *E. Coli* to be most common organism isolated from the surgical site.[10,12] Akhil et al in his study isolated *E. Coli* to be most common organism isolated from the surgical site followed by *Klebsiella* which is similar to our study findings.[9]

Anvikar et al isolated *Klebsiella* (26.8%) among the surgical site wound culture to be most common organism seen infecting the suture site.[11] Mama et al, also found that the predominant organism to be isolated was Staphylococcus followed by *E. Coli*.[8] In another study done by Bo et al it was *pseudomonas* the most common organism isolated from the specimen.[12] Lilani et al and Wassef et al, reported staphylococcus aureus has the most common organism isolated from the surgical post-operative wound.[6,18]

The antibiotic sensitivity of the organism was also tested and it was found that the organism isolated from the surgical site were sensitive to wide variety of the antibiotics But the majority of the organisms were found to be sensitive for colistin, linezolid, meropenem, ceftriaxone sulbactum, gentamycin and others.

Among all the antibiotics the most common organism which were found i.e., *E. Coli* was found to be more sensitive for colistin (80.5%), meropenem (31.7%), gentamycin (31.7%) and ceferaperazone sulbactum (21.9%). Whereas the *Klebsiella* was found to be more sensitive for colistin (80%), ceferaperazone sulbactum (35%), gentamycin (20%) and cotrimaxole (20%).

In the study done by Akil et al *E. Coli* was found to be sensitive for gentamycin, ciprofloxacin, imipenem and cefotaxime. Even *Klebsiella* were found to be sensitive for ciproflaxin, tetracycline, gentamycin, cefotaxime, imipenem. The colistin, meropenem were not tested in this study. In the study done by Victor et al the *E. Coli* and *Klebsiella* was found to be sensitive for imipenem, ceftriaxone, piperacillin and cetazidime. Here also the sensitivity of colistin, meropenem which were tested in our study were not tested.

In the study done by Mama et al the *E. Coli* and *Klebsiella* were found to be sensitive for gentamycin, ceftriaxone, chloramphenicol, ciproflaxin. The Antibiotic sensitivity of the organism in our study could not be compared to any similar studies because of use of different antiobiotics at different set up. Still we could be concluded that both the organism was found to be resistant to most of the commonly used antibiotics in the day to day life.

The frequency of the growth of the organism and its antibiotic sensitivity to various antibiotic varied from each place of study and even at different time frame the study was conducted. Even if the study is conducted at the same place at different period of time the growth of the organism and its sensitivity to the organism varies depending upon lot of factors like local endemic infection in the hospital, presence of new or old organism, improper sterilization technique and importantly the after how many day of sterilization the study was conducted and frequency of re sterilization in particular hospital set up . Though there are lot of research done in the study of surgical site infection since many years, it still remains a topic of importance due to emerging and reemerging of organism and infection. The infection of the surgical site is considered to be one of the major factors for increased morbidity and even mortality among patients and also leads to increased hospital stay along with financial losses to the subjects. The data suggests that the SSI was more common in emergency procedures where the pre-operative skin preparation was not good.[8]

In elective cases inspite of antibiotic prophylaxis the nutritional status, co-morbidities such as hypertension, anemia, diabetes and presence of intra-peritoneal sepsis affected the rate of SSI. The microflora isolated from the infected surgical wounds were mostly *E. Coli, Klebsiella, Staphylococcus* and some MRSA with few other organisms. And even p*seudomonas* was isolated. The antibiotics used in our hospital (ceftriaxone) were found to be sensitive to the micro-organisms isolated from infected wounds.

The organisms were susceptible to colistin, meropenem, cefaperazone-sulbactum, which were easily available in the hospital.

In our study, we found out that adhering to simple pre-operative steps to clean the skin, hand washing, hand rub

both in OT and wards before and after touching the patient can bring down the incidence of SSI.

In a busy medical college hospital such as ours visited by patients from low socio-economic conditions with poor skin hygiene, poor nutritional status and poorly controlled co-morbid conditions like diabetes and hypertension, small precautions like the criteria we followed for elective procedures brings down the rate of SSI and thus the hospital stay, cost of dressing material, cost of re-surgery can be very economical for the hospital and adds value to the potential benefit of surgical interventions.[6,7] In our hospital antibiotic prophylaxis is based on various studies and study in our hospital and specific prophylaxis should be cephalosporins (cefoperazone sulbactum).

Administer 30-60 minutes prior to skin incision. Maintain therapeutic levels of antibiotic in both serum and tissue throughout the operation.

CONCLUSION

After analyzing the pattern of pathogens and antibiotic susceptibility, we may attempt to use a safe empirical antibiotic prophylaxis to prevent the incidence of SSI in our hospital. This will indeed decrease the burden of cost, morbidity and mortality associated with SSI.

There should be a formulation of antibiotic policy in all the hospital, based on the commonly isolated organisms and its antibiogram. It has to be strictly enforced and followed in order to prevent SSI. Periodic assessment of the resistance patterns to the commonly used antibiotics is highly recommended.

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