ORIGINAL RESEARCH ARTICLE

A Study on Abdominal Surgical Site Infections

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A B S T R A C T

Introduction: Surgical site infections remain a significant problem following an operation and the third most frequently reported nosocomial infections. The present study was undertaken to identify incidence of surgical site infections (SSI) and the risk factors associated with it, and the common organism isolated and its antibiotic sensitivity and resistance.
Material and Methods: This study was carried out on 100 surgeries. Infected samples from patients were collected by following all aseptic precautions and were processed without delay by the standard microbiological techniques
Results: The overall infection rate was 12%. The SSI rate was 0% in clean surgeries, 6.06% in clean contaminated ones, 25% in contaminated ones and 46.66% in dirty surgeries. Female patients were affected more (25%) than the male patients (12.5%). The Surgical site infections rate increased with increasing age and it also increased significantly with the increasing duration of pre- operative hospitalization. The Surgical site infections rate was less in patients who received pre- operative antibiotic prophylaxis. The Surgical site infections rate was significantly higher in emergency surgeries as compared to the elective surgeries. The infection rate was significantly higher as the duration of the surgery increased. The commonly isolated organism from surgical site infections was pseudomonas (50%), followed by staphylococci (25%) and other bacteria. Most of the organisms which were isolated were multidrug resistant.
Conclusion: The high rate of resistance to many antibiotics underscored the need for a policy that could promote a more rational use of antibiotics.

Keywords: Abdominal Surgical Site Infections; Surgical Site Infections; Pseudomonas; Risk Factors For SSI.

INTRODUCTION

Surgical infections, particularly surgical site infection have always been a major complication of surgery and trauma. The infection of wound can be defined as the invasion of organism into tissues following a breakdown of local and systemic host defense mechanisms (barriers) and are associated with greater morbidity, significant mortality, and increased cost of care.[1] The treatment of disease has been an integral part of the surgeon's practice since the dawn of time, the body of knowledge that led to the present field of surgical infectious disease was derived from the evolution of germ theory and antisepsis. The application of the latter to clinical practice, concurrent with the development of anesthesia, was pivotal in allowing surgeons to expand their repertoire to encompass complex procedures that previously were associated with extremely high rates of morbidity and mortality due to postoperative infections. However, until recently, the occurrence of disease related to the surgical wound was the rule rather than the exception. In fact, the development of modalities to effectively prevent and treat infection has occurred only within the last several decades.[2] Surgery's inherent invasiveness creates portals of entry for pathogens to invade the host through natural epithelial barriers. Surgical illness is immunosuppressive (e.g., trauma, burns, malignant tumors), as is therapeutic immune suppression following solid organ transplantation. Considering that the development of a postoperative infection has a negative impact on surgical outcomes, recognizing and minimizing risk and an aggressive approach to the diagnosis and treatment of these infections are crucial. Although morbid and costly, infection is preventable to some degree, and every physician who has patient contact must do his or her utmost to prevent infection. Advances in disease control practices include improved operating room ventilation, sterilization methods, barriers, surgical technique, and availability of antimicrobial prophylaxis. Despite these activities, surgical site infections remain a substantial cause of morbidity and mortality among hospitalized patients. This may be partially explained by the emergence of antimicrobial resistant pathogens and the increased numbers of surgical. The patients who are elderly and have a wide variety of chronic, debilitating, immune compromising underlying infections. The increased numbers of prosthetic implant and organ transplant operations performed. Thus, to reduce the risk of Surgical site infections,

a methodical but realistic approach must be applied with the awareness that this risk is influenced by characteristics of the patient, operation, personnel, and hospital.[3] The surgical site infections can double the length of time a patient stays in hospital and thereby increase the costs of health care. The additional costs are related to re-operation, extra nursing care and interventions, and drug treatment costs. The indirect costs, due to loss of productivity, patient dissatisfaction and litigation, and decreased quality of life, have been studied less extensively.[4] Abdominal surgical site infections are among the common complications of inpatient admissions and have serious consequences for outcomes and costs. The different risk factors may be involved, including age, sex, nutrition and immunity, prophylactic antibiotics, operation type and duration, type of shaving, and secondary infections.[5] The present study was undertaken to identify incidence of surgical site infections (SSI) and the risk factors associated with it, and the common organism isolated and its antibiotic sensitivity and resistance.

MATERIAL AND METHODS

The study was obtained from patient's undergone abdominal surgery in Department of General Surgery, MNR MCH, Sangareddy, from 1stSep 2017 to 31stSep2019. Surgical site were considered to be diseased according to the definition by NNIS. The wounds were classified according to the wound contamination class system.

Inclusion criteria: Only those who have undergone abdominal surgeries in MNR Medical College and hospital, Sangareddy, will be included.

Exclusion criteria: patient with previous abdominal surgery, wound site previously infected, stitch abscess cases. 100 subjects who were patients will be included in the study that fulfills the inclusion criteria. The study of these cases with regard to date of admission, history, clinical features of wound disease, type of surgery, emergency or elective, preoperative preparation and postoperative management is done till patient is discharged from hospital, and then followed up the patient on OPD basis for any signs of wound infection. In history, presenting disorders, duration, associated diseases, coexistent infections at a remote body site, personal history including diet, smoking, and alcoholism were noted. Preoperative findings which include preoperative bath, skin preparation, type and time of preparation, preoperative abdominal skin culture, nasal swab for culture for commensals, preoperative antibiotics use. The operative findings which include, type of incision, wound contamination, drain used and its type, and duration of operation. The postoperative findings which included, day of wound infection, day of 1stdressing and frequency of change of dressing. Findings on the day of diagnosis of wound infection were noted which included fever, erythema, discharge, type and colour and the exudates was collected from the depth of the wound using sterile cotton swab and was sent to microbiology department for culture and sensitivity. In the the Department of Microbiology, the swabs were inoculated onto blood agar plate, Mc Conkey's agar plates and nutrient broth. The inoculated media were incubated aerobically at 37 C for 24-48 hrs. Nutrient broth was sub cultured if the original plates did not yield any organisms. The bacteria extracted were identified by their morphological and cultural characteristics. The samples collected were processed as follows: Direct microscopic examination of gram stained smear, Inoculation of the samples into different culture media for aerobic and anaerobi corganisms. Preliminary identification, Bio-chemical tests and Antibiotic sensitivity were assessed.

RESULTS

This study included 100 abdominal surgical patients, out of which 12 were infected. So the incidence is 12% (Table 1).
Incidence of infection among males is 11.25%; whereas incidence of infection among females is 15% (Fig-1).
Infection is more commonly seen among 61 to 70y old patients with an incidence of 42.8%and also among 51 to 60 and 31 to 40y old patients (fig-2).
Incidence of infection among Emergency surgery is 41.66% whereas among Elective is 2.63% (Table 2).
Most of The patients were having BMI of 20.1 to 25, followed by 25 to30. Incidence infection was more in extreme of the BMI that is 61.5% in >30 group and 23.5% in<20 group. Most of the patients were anemic (31%) with infection rate of 22.5%. hypoprotenimic (20%) patients had infection rate of 25%, diabetes mellitus (20%) had infection rate of 40%, UTI (4%) had 25% and RTI (9%) had infection rate of 55.5%.89 patients had a pre op hospitalization of 1 to 5 days. But infection was more among patients who had pre op stay of 6 to 10 days 50%. Organisms were isolate from throat, nasal and from skin before painting. After painting no growth noted. Among these before painting (75%) is associated with most incidence of infection. Most common organism isolated is pseudomonas. Inguinal hernia and acute/ recurrent appendicitis were the most common operations performed. Surgical site infection was more among ileal perforation, duodenal perforation, mesenteric ischemia, ca. stomach, hydatid disease of liver, sigmoid volvulus, strangulated inguinal hernia. 72 of 100 cases received pre op antibiotics, 9 cases were infected with incidence of 12.5% whereas patients who received only post op antibiotics had an infection rate of 20%.35 patients had preparation of their parts by shaving done between 21 to 24 hrs; incidence of infection was more among those had preparation done within 15 hrs. 28.5% and17.64%.Out of 100 cases 40% were clean cases, 33% were clean contaminated, 12% were contaminated and 15% were dirty cases. Out of which clean cases dint had any infection, clean contaminated had incidence of 6.06%, contaminated cases had 25% and dirty cases had 46.66%. Infection was more in dirty cases. 65% cases had operation in less than 1.5hrs with incidence of infection of 4.69%, 35% of cases had operation in 1.5 to 4 hrs with an incidence of infection of 25.7%. Incidence was more in longer duration of surgery. Drain was used in 53% of cases out of which 10 cases were infected with an incidence of 18.86%. Mesh was used in 21 cases, none had infection. Drain use is associated with increased rate of wound infection. In our study in 38 surgeries cautery was used out of which 4 were infected accounting for 10.52% of infection rate. Out of 12 infected cases 6 cases had pseudomonas infection, 3 had staphylococci, 2 had ecoli

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and 1 had Klebsiella infection. Pseudomonas was the most common isolated organism. Staphylococcus is commonly isolated in contaminated (50%) cases. Pseudomonas is commonly isolated among dirty (66.6%) cases. Ecoli is most commonly isolated with dirty (100%) cases. Klebsiella was associated commonly with clean contaminated (100%) cases. Staphylococci is most sensitive for cefotaxime(75%) followed by amikacin, cephoperazone, piperacillin, ceftazidime and ciprofloxacin. Pseudomonas is most sensitive for amikacin (83.3%), followed by other antibiotics. Ecoli is most sensitive for ceftriaxone (66%) and cefotaxime (66%). Klebsiella is most sensitive for piperacillin (100%) and amikacin (100%) followed by other antibiotics. Overal lamikacin (66.6%) and cefotaxime (66.6%) are the most sensitive antibiotics. Staphylococci is most resistant to doxycyclin (100%) followed by other antibiotics, pseudomonas is most resistant for piperacillin (50%) followed by other antibiotics, ecoliis most resistant for tazobactum (100%) followed by other antibiotics and Klebsiellais most resistant for cefotaxime. Over all doxycyclin (53.3%) is the most resistant antibiotic noted followed by piperacillin, ceftazidime, gentamicin and others.

Total no cases	No of casesinfected	Percentage
100	12	12%

Table-1: incidence of abdominal surgical site infection

Type	No. of cases	Infected	Percentage
Elective	76	2	2.63%
Emergency	24	10	41.66%
Total	100	12	

Table-2: incidence in relation to type of operation

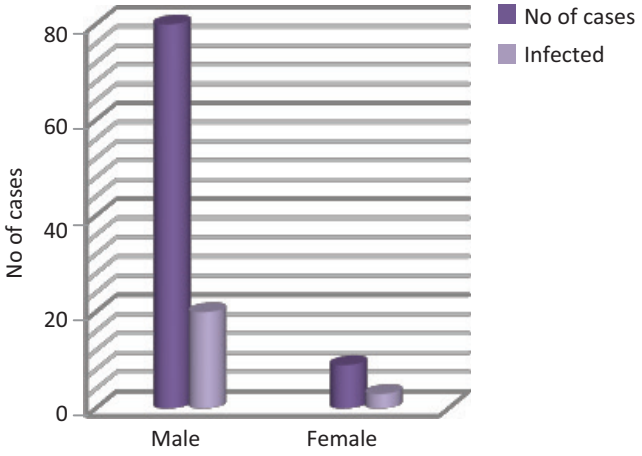

Figure-1: Incidence in relation to sex

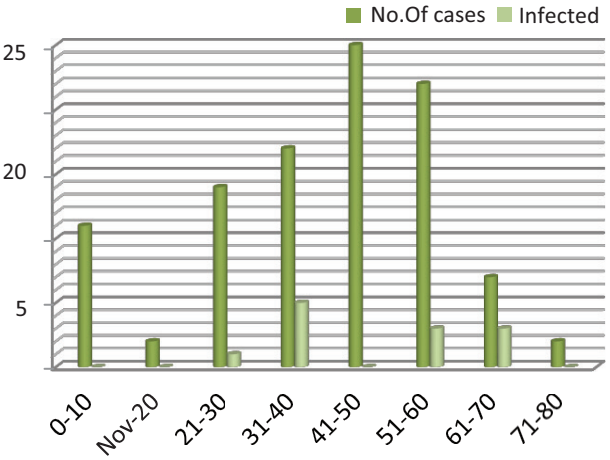

Figure-2: Incidence in relation to age group

DISCUSSION

The present study was conducted at General Surgery Department MNR Medical College and Hospital, Sangareddy. This is a prospective study of 100 cases that have undergone abdominal surgery in MNR hospital and were followed up from the day of operation to 30 days after discharge and in those cases where mesh was used they were followed up to 1year.The overall infection rate for a total of the 100 cases was 12%.The incidence rate in this present study is well within the infection rates of 2.8% to 17% seen in other studies. Different studies from India at different places have shown the Surgical site infections rate to vary from 6.09% to 38.7%. The infection rate in Indian senario is much higher than that in other countries; for instance in the USA, it is 2.8% and it is 2-5% in European countries. Seyd Mansour Razavi et al 2005, reported the higher infection prevalence rate in Indian hospitals may be due to the poor set up of our hospitals and also due to the lack of attention towards the basic infection control measures.[5] The rates of abdominal surgical site infections in male patients were 12.5% and in female patients, they were 25%. The significance of this observation is not well understood.

The present study almost confirms the understanding that there is a gradual rise in Incidence of wound infection as age advances. The incidence literally showed a gradual rise from 7.1% in the 21-30 age groups to 42.8% in patients more than 60 years. Mahesh c b et al ., 2010 observed in their study that older patients are more likely to develop infection in clean wounds than younger patient.[6] Similar studies were demonstrated by Mead, et al, who observed an increased wound infection in patients less than 1 year old (2.7%) or greater than 50 years old (2.8%) versus those 1 to 50 years old(0.7%). The high incidence of 42.8% in patients above 60 years, in our study is perhaps due to reduced immune competence and increased chances of co-morbid factors like Diabetes Mellitus, Hypertension, Cruse PJ, et al 1980 according to them chronic ailments like Asthma, Arthritis, conditions requiring Steroid therapy and personal habits like Smoking and Alcoholism. Age obviously is an immutable patient characteristic and even, if it is a risk factor for wound infection, it appears to be at most a modest one.[7] Hoer J et al said that surgical site infections rate in elective surgeries was found to be 2.63%, which was found to increase to 41.66% in emergency cases. Our results are comparable well with the results obtained by other workers all over the world.[8] One reason being a decrease in blood circulation in fat tissues is associated with the increase in infectionrate. Incidence among the risk factors like anemia 22.6%, hypoprotenimia 25%, UTI 25%, and RTI 55.5%. Similar results were also obtained in other studies cause being the reduced immunocompetence, wound healing factors, and preexisting diseases. Preoperative

hospitalization of more than 6 days had an incidence of 50percent.The rates of surgical site infections increased with the increasing duration of preoperative hospitalization. The higher incidence of infections due to a longer stay in the hospital could be attributed to the increased colonization of patients with nosocomial strains in the hospital as seen in our present with pseudomonas (75%) being isolated before painting and also, a longer pre- operative stay in the hospital reflected the severity of the illness and the co- morbid conditions which required patient work- up and or therapy before the operation. In 2010 Philipp Kirchhoff showed that antibiotic prophylaxis in preventing postoperative complications in colorectal surgery is very well established through many studies. However, there is still a debate about the duration of the antibiotic treatment, management, and the kind of antibiotic which should be used. In summary, most of the previous studies favour one to three intravenous doses of a second generation cephalosporin with or without metronidazole with the first dose being administered before skin incision. In 2001 Reiping tang, MD et al,. in contrast to other reports, there was three times more predominant in surgical procedures preceded by antibiotic prophylaxis in colonic surgeries.[9] This might be explained by the fact that these were contaminated wounds with increased risk of infection. Pre operative preparation was done with shaving in all the cases as expected. Cases that have undergone shaving between 21 to 24 hours were about 35 cases had an infection rate of 14.28percent, but those had shaving in less than 5 hrs hand 28.5% incidence of infection. But most of the studies compared the shaving and non shaving or other types of hair removal. Our study correlates with the Bucknall TE et al series, incidence among dirty cases are more due to most of the cases were bowel perforation cases were observed. This finding further supports the well known high prevalence of multiple antibiotic resistant nosocomial pathogens in our environmental conditions and may reflect the widespread abuse of antibiotics in the general population.[10] Our study reveals that though surgical site infections have been widely studied since a long time, they still remain as one of the most important causes of morbidity and mortality in surgically treated patients. The steps taken to reduce surgical site infections are still not adequate. Proper infection control measures and a sound antibiotic policy should reduce SSIs in the future.

CONCLUSION

Most of the organisms which were isolated were multidrug resistants. The high rate of resistance to many antibiotics as mentioned above underscored the need for a policy that could promote a more rational use of antibiotics.

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