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PREVALENCE OF SURGICAL SITE INFECTION AND PATTERN OF ANTIBIOTIC USE IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Objective: To determine the prevalence of surgical site infection and to find out the most frequent pathogen in cases operated in casualty of LRH Peshawar, Pakistan and to which antibiotics isolated pathogens are sensitive.

Study Design. A descriptive and cross sectional study

Place and Duration: This study was conducted at surgical C unit of LRH Peshawar. A descriptive hospital record based study was carried out starting from1st November 2018 to 30th November 2019.

Methods: Total 125 patients of both genders aged between 10-80 years were included in this study. Patients detailed demographics age, sex and body mass index were recorded after taking written consent. Patients who suffered from peritonitis secondary to traumatic bowel perforation or perforated viscus and later on developed surgical site infection after being operated in casuality were included.while those on elective list were excluded.

Complete data was analyzed by SPSS 24.0 version.

Results: Mean age of the patients were 38.96 ±8.14 years with mean BMI 28.96 ±4.14 kg/m^2 . 70 (56%) patients were males and 55 (44%) were females. Out of 125 presented cases infection rate was observed among 18 (14.4) patients those were affected with surgical site. Causative organism isolated was found escherichia coli. Commonly prescribed antibiotics were Cefoperazone Sulbactam which was followed by the ceftriaxone and metronidazole during the operative time.

Conclusion: We concluded in this study that surgical site infection was found 14.4 % and can be cured by early medication. Cefoperazone Sulbactam was the most commonly used drug. The most commonly pathogens isolated from patients with postoperative SSIs was found to be Escherichia coli (35.2%) followed by Klebsiella pneumonia (28%).

Keywords: Antibiotic, Surgical Site Infection, Resistance

INTRODUCTION

In developed countries, it is predicted that about 10% of hospitalized patients have acquired infections in hospitals. Infection in hospitals remains a major clinic issue that has caused substantial morbidity, death and increased health care costs. Most of them are SSIs that constitute 5.6% of admitted surgical

patients[1,2]. SSIs are an infection occurring during or close to surgical incision within 30 day(s) of surgery or a year after implant, and affecting either the incision or the deep tissue in areas of the body, where surgery occurred[3].

SSIs are still an important problem for surgical society, despite advances in surgical technology and the understanding of surgical wound infection pathogenesis.[4,5] Antimicrobial prophylaxis should therefore be started in advance of contamination which is considered necessary in control of bacterial growth and considerably lower the incidence of SSIs[6-8]

For the prevention of post-operative infections or for the treatment of existing infections, antibiotics are indicated in surgical wards. Nearly 30%–35% of the antimicrobials employed in hospitals are prescribed for surgical prophylaxis, 30-90% of which are inappropriate.[9,10] In addition, they are also used for long-term and over-spectrum purposes in the wrong timescale. Cephalosporin (for example cefazoline) antibiotics are main agents for most surgical procedures and target species most likely thus avoiding antimicrobial prophylaxis of broad spectrum, contributing to antimicrobial resistance. Over 24 hours should not be longer than the duration of surgical antimicrobial prophylaxis (SAP).

The efficacy of prophylaxis is determined by the required antibiotic range, initial administration schedules, the number of dosages administered during the operation and the use of postoperative therapies. Incorrect performance of any of these factors may impact the rate of surgical site infections.[11]

MATERIAL AND METHODS

This study was conducted at surgical C unit of LRH Peshawar, Pakistan . A descriptive hospital record based study was carried out starting from1st November 2018 to 30th February 2019.All those patients who developed SSI after they were operated for peritonitis secondary to bowel perforation. These patients presented to surgical casualty with Bowel perforation secondary to bomb blast injuries, firearm injuries, acute appendicitis and enteric fever, operated in surgical casualty operation theater and later on shifted to surgical ward. those who were less than 12 yrs age and patients operated on elective ot list were excluded. All patients preoperatively received antibiotics same doses in tds were given postoperatively for further 5 days. NNIS CRITERIA was used for the diagnosis of SSI and south ampton wound classification was used for surgical wound grading[2].A special performa was used in which date, name, age, gender. adress, admission number, name of surgeon(s) who performed surgery, grade of wound, c/s report, and the name of antibiotics which the organism is sensitive. u/s reports were seen in cases of organ/space infection. Data was analyzed using spss version 24 and results were expressed in percentages, mean and median.

RESULTS

Mean age of the patients were 38.96 ±8.14 years with mean BMI 28.96 ±4.14 kg/m^2 . 70 (56%) patients were males and 55 (44%) were females. (table 1)

Table 1: Baseline detailed demographics of enrolled cases

Variables	Frequency(n=125)	% age
Sex		
Males	70	56
Females	55	44
Mean Age (yrs)	38.96 ±8.14	
Mean BMI	28.96 ±4.14	

Out of 125 presented cases infection rate was observed among 18 (14.4) patients those were affected with surgical site. In these infected patients, 7 (5.6%) were males and 11 (8.8%) were females. (table 2)

Table 2: Prevalence of infection among patients after surgery

Variables	Yes	No
Rate of infection	18 (14.4%)	107 (85.6%)
Gender		
Males	7 (5.6%)	63 (50.4)
Females	11 (8.8%)	44 (35.2%)

The pathogens isolated from patients with postoperative SSIs were found to be Escherichia coli (35.2%), Klebsiella pneumonia (28%), Enterococcus faecium (17.6%), Acinetobacter species (4.8%), Citrobacter freundii (4.8%), Staphylococcus aureus (4.8%), Enterococcus faecalis (4.8%). (table 3)

Table 3: Association of bacterial profile among SSI patients

Variables	Category	%age
Escherichia coli	Gram negative	35.2
Klebsiella pneumonia	Gram negative	28
Enterococcus faecium	Gram negative	17.6
Acinetobacter species	Gram negative	4.8
Citrobacter freundii	Gram negative	4.8
Staphylococcus aureus	Gram Positive	4.8
Enterococcus faecalis	Gram Positive	4.8

The most commonly prescribed pre-operative antibiotics were found to be Cefoperazone Sulbactam 2.25g followed by Ceftriaxone 1g and Metronidazole 500mg. And the widely used post-operative antibiotics were Cefoperazone Sulbactam 2.25g followed by Metronidazole 500mg and Ceftriaxone 1g. Escherichia coli were found to be highly resistant to Ampicillin, Amoxicillin+Clavulanic Acid, Cefazolin, Cefuroxime, Cefotaxime, Cefoperazone Sulbactam and Azithromycin. Klebsiella pneumonia was found to be highly resistant to Ampicillin, Amoxicillin+Clavulanic Acid, Cefazolin, Cefuroxime while Enterococcus faecium was found to be highly resistant to Ampicillin, Imipenem, Meropenem, Piperacillin+Tazobactam, Azithromycin, Ciprofloxacin and Levofloxacin. (table 4)

Table 4: Effectiveness of antibiotics among organisms

Variables	Escherichia coli	Klebsiella pneumonia	Enterococcus Faecium
Antibiotics	Resistance/ Sensitivity	Resistance/ Sensitivity	Resistance/ Sensitivity
Ampicillin	4(100%)	6(100%)/0	5(100%)/0
Cefoperazone+Sulbactam and Azithromycin	3(100%)	4(100%)/0	5(100%)
Cefazolin	5(100%)	5(100%)/0	0/0
Cefuroxime	4(100%)	3(80%)/0	0/0
Cefotaxime	3(100%)	4(100%)/0	0/0
Amoxicillin+Clavulanic Acid	4(100%)	2(50%)/0	0/0
Amoxicillin+Clavulanic Acid	4(100%)	2(25%)/0	0/0
Cefazolin	3(100%)	5(100%)/0	0/0
Cefuroxime	4(100%)	4(100%)/0	0/0
Imipenem	0/4(100%)	1(80%)/0	0/0
Meropenem	0/5(100%)	2(70%)/0	3(100%)

Piperacillin+Tazobactam	4(78%)/2(50%)	3(50%)/3(50%)	2(100%)
Azithromycin	2(100%)	0/0	2(100%)
Ciprofloxacin	3(85%)/1(17%)	1(50%)/1(50%)/	2(100%)
Levofloxacin	6(84%)/1(17%)	3(70%)/1(17%)	2(100%)

DISCUSSION

Surgical infection is an infection that has been established at or near the incision site within 30 days of the procedure. The occurrence of infection in the surgical site varies from hospital to hospital on the basis of infection prevention protocols and systems used by the hospital.

Antibiotics for SAP and/or treatment were prescribed in 125 patients. In 18 (14.4%) patients, SSIs have been observed. The incidence rate of SSI is more important than that of studies in Qatar (5%), India (3.38%) and Brazil (3.4%)[12-14]. But the prevalence of SSI was 11.1%, in study of Alamrews K et al in 2019 was comparable to the study. This hospital's total SSI prevalence rate of 14.3% in hospital in Vietnam is comparable to findings from our research[23.] In New Delhi, India, Patir et al. reported a 15% post-neurosurgery infection rate, while Tran et al. reported a 14.2% postoperative infection rate among obstetric and gynaecological patients in Ho Chi Minh City [24,25]. The involvement of most types of the operation and the total difference in sample size in our study could be attributable to this. Two Ethiopian studies (20.6% and 19.1%) and Uganda (16.4%) have reported a higher rate of incidence[16-18]. From the study we concluded that the predominantly isolated organism from the surgical site were Escherichia coli (35.2%), followed by Klebsiella pneumonia (28%) and Enterococcus faecium (17.6%). In a study reports of vietnamese hospital, gram-negative bacteria were shown to be the most common cause of SSIs. Only two of the 30 SSI isolates were gram-positive, with the rest being gram-negative[23]. This data from the NNIS System showed that gram-positive organisms are the most common cause of SSIs, and data from Tran et al., who showed that S. aureus was the most commonly isolated pathogen in postoperative obstetric–gynecologic infections[25,29]. However, research from Brazil and Ethiopia shows that gram-negative organisms are becoming a more common cause of SSIs in some areas[30,31.]

According to the recommendations of American Family Physicists , antibiotics should be started 1 hour prior to surgical incision and this supports our finding that most studied participants were receiving the SAP (224; 90.2%) 1 hour prior to operative incision. In this study, we found that Cefoperazone+Sulbactam 2.25g (35%) was the most used pre-operative antibiotics, followed by ceftriaxone1g (28%) and 500mg (17.6%), while Cefoperazone+Sulbactam 2.25g (2,4%), followed by 500mg metronidazole (24%) and ceftriaxone 1 g was the most commonly used post-operative antibiotics (17.6%). Shrestha S et al show that ceftriaxone (35.9 %), followed by cefuroxime (22.2%) and cefotaxime are the most commonly prescribed prophylactic antibiotics (15.3%).[22] Osakwe et al found that more than 40% of patients have been treated with third generation cephalosporins and metronidazole[15].Nguyen D et al states that cephalosporins (33.4 %) and aminoglycosides, followed by penicillins (14.4 %) and cephalosporins of second generation, were the most commonly used antibiotics (5.3 %)[19].

According to our study, 70 (56%) of male patients had surgical procedures were higher as compared to women. Isik O et al. found also that males were mostly operated on (51.94 %) [23] Setty NK et al. states that SSI has developed as a significant proportion of males(29.1%) in comparison wth females. The Ntsama EC et al study[23] showed that most women (60.78 %), and the SSI rate in women was also higher compared to men, were the patients that underwent surgery. In our study prevalence of the SSI was higher 11 (8.8 %) in women than in men.

CONCLUSION

Gram negative rods were the most common organism involved in surgical C unit of LRH hospital. We concluded in this study that surgical site infection was found 14.4 % and can be cured by early medication. Cefoperazone+Sulbactam was the most commonly used drug. The most commonly pathogens isolated from patients with postoperative SSIs was found to be Escherichia coli (35.2%) followed by Klebsiella pneumonia (28%).

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