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SURGICAL SITE INFECTION;
EVALUATION OF CAUSATIVE ORGANISMS INVOLVED

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ABSTRACT… Wound infection can be defined as invasion of organisms through tissues following a breakdown of local and systemic host defenses. The basic principles of wound care and antisepsis introduced during the past century improved surgery dramatically. **Objective:** Evaluation of causative organisms which evolved in the surgical site infection (elective abdominal surgery) at surgical unit of Liaquat university hospital Jamshoro. **Subjects & Methods:** This prospective observational study was contains 103 patients undergoing elective, abdominal surgery were included in this study. Surgical wound categories i.e. clean, clean contaminated, were included. Prophylactic antibiotics were given in all cases. Primary closure of wounds was employed in all cases. Follow up period was 30 days postoperatively. All cases were evaluated for postoperative fever, redness and swelling of wound margins, collection and discharge of pus. Cultures were taken from all the cases with any of the above findings. **Results:** The mean age of the patient was 37 years with male to female ratio of 1:5:1. The overall rate of wound infection was 13.04%. Most frequently involved pathogen was E.col 33.33% followed by Staph Aureus 20%, Klebsiella 20%, proteus 13.33%, Pseudomonas 6.66% and no organism was isolated in 6.66% cases. Most effective antibiotics were cephalosporins, quinolones and aminoglycosides' whereas septran, erythromycin and tetracycline's were ineffective. **Conclusions:** Surgical wound infections are quite common. Time of postoperative hospital stay was twice longer in infected case. Male sex, old age, anemia, longer duration of operation and wound class were significant risk factors. Most common organims are found in this study E-Coli, Kllebcella and Staph Aureus, these are mostly sensitive to cephalosporins, quinolones and aminoglycosides.

Key words: Postoperative wound infection; elective surgery abdominal.

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INTRODUCTION

Wound infection can be defined as invasion of organisms through tissues following a breakdown of local and systemic host defenses[1]. The basic principles of wound care and antisepsis introduced during the past century improved surgery dramatically. The past decade has seen an explosive growth of wound healing research that promises to facilitate clinical wound repair[2]. Wound infection is quite common and most troublesome factor in wound healing and increases the patients discomfort, prolongs hospital stay, increases chances of incisional hernia and increases the economic burden. The introduction of antibiotic therapy in middle of the twentieth century fostered hope that serious surgical infections would be eliminated. Unfortunately, this did not occur. Not only have postoperative wound and hospital-acquired infections continued, but wide spread antibiotic therapy has often made prevention and control of surgical infections more difficult. The present generation of surgeons has seen increasing numbers of serious infections related to a complex combination of factors[3]. Not only development of wound infection doubles the cost of hospitalization but it is also responsible for significant mortality. Factors intrinsic to the patient, as well as those related to the type and circumstances of surgery, affect the incidence of infection[4,5]. A clinical syndrome including fever, leucocytosis, elevated cardiac output and reduced systemic vascular resistance has been associated with severe infection (i.e. sepsis). Term "Sepsis Syndrome" refers to population of patient who appeared to have a physiologic and metabolic response associated with, but who did not have, severe infection. More commonly called the systemic inflammatory response syndrome

(SIRS), the sepsis syndrome is now associated with the non specific systemic activation of the human inflammatory cascade by any of a number of clinical events[6]. The impacts of increasing drug resistance and cost of therapy thereof, are most obvious in developing countries, with their fragile, economies and inequitable health systems. The sad state of affairs in Pakistan is a classical case in point[7]. Realizing the above facts regarding wound infection, the modern surgeon cannot escape the responsibility to deal with infections and must realize the knowledge of many aspects of microbiology, immunology and pharmacology is an essential complement to surgical skills. In order to decrease the incidence of post operative wound infection, it is of paramount importance to document the incidence in our local set up and know the organism involved. In this original work of this presents study of Evaluation of Causative Organisms in surgical site Infection in Elective Surgery at Surgical Unit I, Liaquat University Hospital Jamshoro.

SUBJECTS & METHODS

This prospective observational study was contains 103 patients who were underwent elective abdominal surgery and was conducted at liaquat university hospital Jamshoro with the duration of time one year, from 07-01-2010 to 21-12-2010. All the Patients with both sex and above the age of 15 years requiring elective surgery were included in the surgery. Patients systemic disorders like Diabetes Mellitus, Jaundice, Renal failure, patients on steroid, immunosuppressant or anti chemotherapeutic drugs and the patients those were referred from primary care units, having already wounds sepsis were excluded from the study.

Surgical wound categories i.e. clean and clean contaminated were included. Prophylactic antibiotics were given in all cases. Primary closure of wounds was employed in all cases. Follow up period was 30 days postoperatively. All cases were evaluated for postoperative fever, redness and swelling of wound margins, collection and discharge of pus. Whenever wound infection was encountered, pus and moisten swabs were taken and sent promptly to pathology department of Liaquat University of Medical & Health Sciences for culture and sensitivity report. When bacterial culture results were available and antibiotics considered inappropriate, suitable antimicrobial agents were substituted. Data was analyzed on SPSS program 11.0.

RESULTS

In this study from total of 103 cases 65 were male and 38 were female, mostly patients were found in the age group of 31 to 44 years of the age, according to residential status patients were more found in urban areas as compare to the rural areas table-I.

All the patients were underwent different surgical procedures, which included two classes of surgical wounds, i.e., clean and clean-contaminated. Various surgical procedures of these two classes are shown in table-II.

The responsible organisms were identified by culture of the pus from either discharging wounds or opened wounds in case of collected pus. If there was no discharge the moist swabs were sent for culture. Most frequently involved pathogen was E.coli 33.33% followed by Staph Aureus 20%, Klebsiella 20%, proteus 13.33%, Pseudomonas 6.66% and no organism was isolated in 6.66% cases. (figure No. 1)

In this study it was observed that gram positive organisms outnumbered the gram negative organisms as most frequent pathogens as they were isolated in 03 (60%) cases, while gram negative in 2 (40%) cases. The ratio of gram positive to gram negative organisms in wound infection was 1.6:1.

Reports of sensitivity to antimicrobial agents of causative pathogens were analyzed in order to select the best antibiotic and to identify the resistant pathogens in local set up. The commonly found pathogens and the tested antibiotics are given in detail in table-III.

E.coli was found to be sensitive against imipenem,

cephalosporins, quinolones and amino glycosides (amikacin), but resistant against Co-trimoxazole, tertracyclines and erythromycin. Klebsiella were found to be sensitive against imipenem, piperacillin, cefpirome, fosfomycin and aztreonam, while they were resistant against Co-trimoxazole and cephalosporins. Proteus was found to be sensitive against imipenem, piperacillin, cephalosproins and Amoxicillin+Clavulanic acid but they were resistant to doxycycline, Erythromycin, Co-trimoxazole and quinolones (ofloxacin, ciprofloxacin). Pseudomans were found to sensitive against 3rd generation cephalosporins (cefotaxime, ceftazidine) and amikacin but resistant against Co-trimoxazole and 1st generation cephalosporins (cephradine, cefadroxil). Staphylococcus aureus were found to be sensitive against 1st and 3rd generation cephalosporins but were resistant against Co-trimoxazole and amikacin. Klebsiella were generally found to be resistant to 2nd and 3rd generation cephalosporins while proteus were resistant to quinolones.

Third generation cephalosporins (cefotaxime, ceftazidine, cefoperazine) imipenem and piperacillin (beta-lactamase inhibitory) were the most effective antibiotics in most of the organisms, while septran, erythromycin and tetracycline (doxycycline) proved to be ineffective against most of pathogens.

Characteristics	Frequency	%
Gender		
Male	65	63.11%
Females	38	36.89%
Age groups		
15 – 30	25	24.27%
31 – 44	40	38.38%
46 – 60	30	29.13%
<60	08	7.78%
Residential status		
Rural	70	67.96%
Urban	33	32.04%

Table-I. Basic characteristics of the cases (n-103)

Clean	No. of Patients
Herniorraphy	20
Jebuly's operation	02
Excision of epidydimal cyst	01
Mayo's repair	08
Excision of haematoma (abdominal wall)	01
Subtotal thyroidectomy	10
Near total thyroidectomy	02
Thyroid lobectomy	05
Breast surgery (lumpectomy/Mestectomy)	09
Parotid surgery (excision of cyst)	02
Excision of sub mendibular swelling	03
Excision of cervical cyst	01
Excision of branchial cyst	01
Excision of lipoma	03
Total	**68**
Clean Contaminated	
Open Colecystectomy	04
Lap Colecystectomy	04
Laparotomy (hemicolectomy)	01
Pyelo-nephrolithtomy	18
Cystolithotomy	02
Prostatectomy (transvesical)	04
Nephrectomy	02
Total	**35**

Table-II. Various operative procedures in this study (N=103)

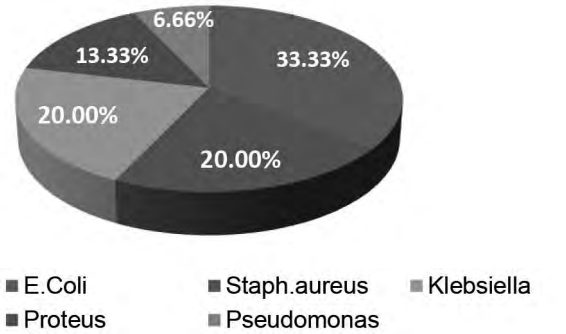

Fig-1. Pathogens isolated from infected cases (n=5)

DISCOUSION

This study showed little higher infection rate in male as compared to females. These findings are in consistence with studies, which have shown male sex as a risk factor in wound infection[8].
Overall infection in this study was 13.04%. Out of 103 cases, 05 surgical sites were infected while 98 surgical sites remained uninfected and smooth wound healing recorded, as compare other studies infection rate as in the table below.
The most common organism cultured from postoperative wounds was E.coli (33.33%)

Pathogens	Mostly sensitive	Variable sensitivity	Mostly resistant
E.coli	Imipenem Penicillin+tazobactam Ampicillin+cloxacillin Ciprofloxacin	Amoxicillin+ Clavulanic acid Ciprofloxacin Cefixim Amikacin Cefoperazone Sodium	Co-trimoxazole Erythromycin Ofloxacin Doxycycline
Klebsiella	Imipenem Penicillin+tazobactam cefpirom	Fosfomycin Azactam	Co-trimoxazole Cefotaxime Cefuroxime
Proteus	imipenem Cefoperazine Imipenem Penicillin+tazobactam	Unasyn Cefizox Pefloxacin Ampicillin+cloxacillin Amoxicillin+ Clavulanate	Doxycycline Erythromycin Ciprofloxacin Ofloxacin Co-trimoxazole
Pseudomans aeruginosa	Cefotaxime Ceftazidine	Amikacin	Co-trimoxazole Cephradine Cefadroxil
Staphylococcus aureus	Cephradine Cefadroxil Cefotaxime	Ceftazidine	Amikacin Co-trimoxazole Ceftizoxime Ceforanide

Table-III. Susceptibility pattern of the isolates

Author	Year	City/Country	No. of cases	Wound Infection				Over all %
Huma Muhammad Iqbal	1996	Nisther Medical College Multan	400	5.37%	12.62%	23.4%	48%	17
Dr.Amatullah Sheikh	1997	JPMC Karachi	92	3.26%	-	-	-	-
Dr.Lubna Riaz Dr.Farzana Fayaz	1999	Shalamar Hospital Lahore	88	2.26%	-	-	-	-
Bhatti-HA,et al.	2000	Services Hospital Lahore	107	1.8%	-	-	-	-
This study	2010	LUMHS Jamshoro	103	5.40%	12.5%			13.04

followed by Staph. Aureus and Klebsiella (20%), Proteus (13.33%) and Pseudomonas (6.66%). In 6.66% of cases no growth could be obtained. As anaerobic culture facilities were not available so anaerobic infection could not be excluded. Gram negative organisms causing wound infection outnumbered gram positive by ration of 3:1, a finding similar to other studies[9].

Susceptibility pattern of isolates in our set up is not much discouraging. There was mixed pattern of resistance to various antimicrobials. However most of isolates were sensitive to cephalosporins, quinolones and aminoglycosides but were resistant against septran, erythromycin and tetracyclines. Klebsiella were generally found to be resistant to second and third generation cephalosporins, while proteus were resistant to quinolones. Similar results were found another study of Ibtesam K. et al[10]. This is partially in agreement with the study of Khorvash et al.[11] who reported that Klebsiella were 100 % and E. coli was 77.8% while 83.3 % of Pseudomonas were sensitive to imipenem. And was also found that 78.9% of Staphylococcus aureus isolates were MRSA and vancomycin was the most effective antibiotic without any resistance[11].

CONCLUSIONS

In the conclusion of this study we concluded that, surgical procedures should be classified according to surgical wound class, operating room teaching should be encouraged to develop surgical skills and clinical judgment in surgical

residents, Antibiotic should be given according to culture and sensitivity reports; when given as antimicrobial prophylaxis measures should be taken to ensure the correct timing.

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