Original Article

"Surgical Site Infections" and it's Management 'Our Experience' at KMC/Civil Hospital Khairpur

Surgical Site Infections and its Management

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ABSTRACT

Objective: To find out the incidence, causative organism, severity and treatment of surgical site infections (SSIs) at of KMC/Civil Hospital Khairpur Mir's.

Study Design: Prospective Observational study.

Place and Duration of Study: This study was conducted at the in Surgical Unit and Gynae Obs, KMC/Civil Hospital Khairpur Mir's from January 2018 to December 2018.

Materials and Methods: The study included 100 patients in this study. Four of these patients were lost during follow up, therefore net 96 patients were statistically analyzed. 54 (56.25%) patient were male and 42 (43.75%) patients were female. All those post-operative cases were included in this study, who developed wound infection during their hospital stay or one month follow up. Protocol of pus culture and sensitivity report of each infected case was also followed in this study.

Results: Out of 802 procedures, 96 (11.97%) patients developed SSIs. Mean age of these patients was 32.0 +7 years. Forty one patients (42.70%) were having different comorbidities. SSI was found more common in laparotomy, Pyelolithotomy, prostectomy and appendicectomy, accounting (68%) of overall recorded infections.In this study overall Gram-positive organism were (54%) and Gram-negative organism (46%).

Conclusion: Surgical site infection (SSI) is common in developing countries, pre-operative assessment, aseptic measures and prophylactic antibiotic can reduce post-operative wound complications /sepsis. In this study, Piperacillin/Tazobactam found most effective and Oxytetracycline most resistant agents against these isolated organisms.

Key Words: Surgical site infection; incidence, severity; organism; treatment

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INTRODUCTION

Surgical site infection (SSIs) has remained as a burning issue and important public health concern all over the word. Surgical site infection (SSIs) are defined as infection that occurs within 30 days of the operation or within 1 year, if an implant is left in place. Superficial infections (47%) involve only skin or subcutaneous tissue of incision; deep infections (23%) involve the fascia and muscle layers; and organ space infections (30%) involve any part of the anatomy.

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Globally, SSI rates have been found to be from 2.5% to 41.9%.[1,2] SSIs are preventable complications following surgery and imposes significant burden on patient's morbidity, mortality and additional cost of treatment. World health organization (WHO) and other global studies indicated that, periodic surveillance and giving feedback for surgeons on SSIs rate and associated factors can decrease up to 50% of SSIs.[3,4]

Infections and rates are increasing globally even in hospitals with most modern facilities and standard protocols of pre-operative preparation and antibiotic prophylaxis.[5]

These infections not only increase significantly the rate of morbidity and mortality but serious SSIs almost doubled the patient's risk of death after surgery.

The following measures are identified as prevention to risk of SSI

1. Pre-operative patient bathing
2. Avoiding hair removal or performing this with clipper
3. Appropriate surgical hand preparation
4. Appropriate patient skin preparation
5. Optimal antibiotic prophylaxis and

Therefore, this study aimed to show the incidence rate, pattern and predictors of SSIs in surgical ward of KMC/Civil Hospital Khairpur. The result of our study will provide base line information for surgeons, governmental and non-governmental organizations working in health care system of KMC/Civil Hospital Khairpur particularly as well as in and outside country at large, to control the surgical infections (SSIs).

MATERIALS AND METHODS

All those cases were included in this study which developed any degree of wound infection, at the incision site of surgery during admission or after wards, but within 30 days of operation. At our institution, post-operative patients are followed by related surgeons on weekly basis for 4 consequent weeks. During follow up, wound infection cases were picked and brought on record and included in present study. In more severe cases, if patients required post-operative close wound care, then they were readmitted in surgical wards for wound management according to SSIs protocol. First of all, ongoing antibacterial treatment was completely hold for consecutive 3 days and then sample of pus send for culture and sensitivity report. In each case wound swabs were taken in pairs and immediately send to creditable microbiological laboratory for aerobic and anaerobic medium culture. They were processed and inoculated in 'automatic machine' and the prepared results were collected after 72 hours in routine cases. Antibiotics were latter on restarted according to their sensitivity report. Meantime, local management of wound was also carried out with aseptic dressings. Final outcome of each wound was recorded and statistics were prepared as per PASW.

Inclusion Criteria: All those cases were included in this study who were pre-operatively categorized as, clean wounds, clean contaminated wounds and contaminated wounds as per their procedure classification.

Exclusion Criteria: Highly infected and dirty wounds, patients having serious illness like Cancer and septicemia, were not included in this study due to their high rate of morbidity and mortality.

RESULTS

Patient related Factors:- (Table-I) overall 100 patients were included in this study during the period of 12 months with the followup of 30 days from January 2018 to December 2018. Four of these patients were lost during followup, therefore net 96 patients were statistically analyzed. 54 (56.25%) patient were male and 42 (43.75%) patients were female.

Male to female ratio remained 1.28 :1. Mean age was 32.0 +7 years. More than half patients were from rural 71 (73.96%) area and other 25(26%) were from urban areas. Five patient (5.20%) were obese BMI > 30 and 32 (33.33%) patient were underweight with BMI <18.5 but the remaining patients were either normal weight or slightly overweight.

Forty one patients had different kinds of co-morbidities and nine patients had one or more co-morbidities like diabetic 15 (15.62%), respiratory 07 (7.29%), cardio-vascular disease 10 (10.41%) and miscellaneous diseases 09 (9.37%).

More than half of the patients 64 were under ASA score of II (66.66%) 76% patients had less than 07 days hospital stay and 24% had more than week stay in the hospital. (Table-I).

Table No.1: Patient Related Factors

Variables	Frequency	Percent
1. Age in Years		
12-20	25	26%
21-40	39	40.62%
>40	32	33.33%
2. Gender		
Male	54	56.25%
Female	42	43.75%
3. Residence		
Rural	71	73.96%
Urban	25	26%
4. Nutritional Status		
I. Undernutrition BMI<18.5 Kg/ $m^2$32 33.33%		
II. Normal weight BMI 18.5 to 25 kg / m^2	34	35.41%
III. Over weight BMI 25 to 30 kg / m^2	25	26%
IV. Obesity BMI>=30 kg /m^2	5	5.20%
5. Co-Morbidity		
I. Diabetic Mellitus	15	15.62%
II. Respiratory	07	07.29%
III. Cardiovascular Diseases	10	10.41%
IV. Miscellaneous	9	9.37%
6. ASA Score		
I	26	27%
II	64	66.66%
III	6	6.25%
7. Re-Admission & Hospital Stay		
<= 7 Days	73	76%
>7 Days	23	24%

SSI rate in different surgical procedures (Table-2)in this study 802 cases of general surgeries were included and total 20 common types of procedures were performed. Herniorapy and hernioplasty for inguinal and para-umbilical was the leading procedure 263 out of 802 (32.79%) followed by appendicectomies accounting 190 cases out of 802 (23.69%). Overall infection rate in our operated patients remained almost

12%. Among all these surgical procedures, SSI was found more common in emergency exploratory laparotomy, open Cholecystectomy,Pyelolithotomy, open prostectomy and appendicectomy accounting 68% of overall recorded infections.

SSIs rate is found minimum in clean wounds like procedures for thyroid, breast and hernia diseases 0% to 7.5% in our present series of patients. SSI rate in clean wound is 5.26% where as in contaminated wounds it raised up to 42.85% (Table-2).

Table No.2: Surgical site infection rate in different surgical procedure

Surgical Procedure	No. of Patients (n=)	No. Of SSIs (n=)	%age (n%)
Elective and emergency Laparotomy for abdominal trauma/ fire arm injury	62	15	24.19%
Open/ Laparoscopic Cholecystectomy	86	13	15.11%
CBD Exploration	07	01	14.28
Inguinal Hernioraphy/ Hernioplasty	213	15	7%
Mesh repair for P.U.H	50	6	12%
Pyelolithotomy	48	9	18.75%
Thyroid	15	0	0
Breast	25	01	4%
Appendectomy	190	25	13.15%
Ileostomy/ colostomy Closure	07	03	42.85%
V.C, B.P.H	36	06	16.66%
Hydrocele	38	01	2.63%
Miscellaneous (07 Procedures)	25	01	4%
Total	802	96	11.97%

SSI class & degree of wound infection: (Table-3). Three Hundred Forty One (42.51%) procedures were clean, Three Hundred Sixty Seven (45.76%) procedures were clean-contaminated and Ninety Four (11.72%) were contaminated surgical procedures. SSI rate in clean surgical wounds remained (4.39%), in clean-contaminated it was found (10.89%) but it was significantly high in contaminated wounds (43.61%). Degree of SSI was also found reciprocal to the nature of wound like it is 15.62% in clean, 41.66% clean-contaminated and 42.70% in contaminated incisions. Overall 58 cases (60.41%), were first degree, 26% second degree SSI, 7.29% third degree and 6.25 fourth degree surgical site infections.Table-4.

Microbiological Investigation SSI: (Table-04). In this study out of 96 SSI cases 76 swabs were microbiologically isolated for various aerobic and anaerobic organism. The following results depicts various bacterial isolates obtained from patients with SSI. Twelve (15.78%) Staphylococcus aureus in which 3 (25%) were methicillin resistant staphylococcus aureus (MRSA). 10 (13.15%) were P. Aeruginosa in which 2(20%) were multi drug resistant strain (MDR). 6(7.89%) were Klebsiella spp., 7(9.21%) E. coli, 5(6.57%) Streptococcus (4 group A and 3 S. mitis group). 6(7.89%) were Coagulase negative Staphylococcus (CONS) in which 1(16.66%) were MRCONS. 5(6.57%) were Enterobacter spp. 4(5.26%) were Enterococcus faecalis. 2(2.63%) were Nocardia spp. 2(3.13%) were Acinetobacter spp. Anaerobic infection was seen in 11 patient with 8(10.52%) Peptostreptococcus and 3(37.5%) Bacteriodes spp. (Table-04)

In this study overall Gram-positive organism were 54% and Gram-negative organism 46% and their antibiotic susceptibility revealed high degree of resistance for commonly used antimicrobial agents. Amoxicillin-clavulanate, ciprofloxacin and linezolid were found to be the most effective antimicrobial agents, were as Tetracycline, cefotaxime and Ceftriaxone were among the most resistant drugs against gram-positive organisms.

Piperacillin/tazobactam, meropenem, ceftriaxone and chloramphenicol were most common sensitive agents and tetracycline, ampicillin, cefuroxime and gentamycin were found resistant agents against gram-negative organisms.

Table No.3: Classes and degrees of wounds in study group of patients

wound class	No. of Procedures	Number of **SSI** the patient n=96	Degree of SSIs				Percentage of SSIs
			First Degree	Second Degree	Third Degree	Fourth Degree	
Class I / Clean	341	15 (4.39%)	11	04	00	00	15.62%
Class II/ Clean Contaminated	367	40 (10.89%)	24	11	03	02	41.66%
Class III/ Contaminated	94	41 (43.61%)	23	10	04	04	42.70%
Total	802	96	58 (60.41%)	25 (26%)	07 (7.29%)	06 (6.25%)	99.98%

Table No.4: Microbiological Profile of Pus Specimen with SSIs. (N=76)

S No.	Organism	Percentage of isolation (n=76)	Drug Sensitively	Drug Resistant
01	S. aureus MRSA (Gram-Positive)	12 (15.78%) 3(25%)	Ciprofloxacin, Vancomycin, Linezolid	Amoxicillin-Clavulanate, Cefotaxime
02	P. Aeruginosa MDR (Gram-Negative)	10 (13.15%) 2 (20%)	Piperacillin/Tazobactam Amikacin, Meropenem	Amoxcillin-Clavulanate, Tetracycline, Ampicillin,
03	Klebsiellaspp(Gram-Negative)	6 (7.89%)	Ceftriaxone, Piperacillin/ Tazobactam	Gentamycin, Ampicillin, Cephradine
04	E.coli (Gram-Negative)	7 (9.21%)	MeropenemCefuroxime, Amoxicillin, Clavulanic Acid, Chloramphenicol	Tetracycline, Ampicillin, Cefotaxime, Cephazoline
05	Streptococcus spp (Gram-Positive) (4 group A and 3 S. mitis group	5 (6.57%)	Amoxillin/ Clavulanate Ceftriaxone , Ceftazidime	Gentamycin, Ciprofloxacin, Erythromycin
06	Coagulase negative Staphylococcus.MRCONS (Gram-Positive)	6 (7.89%) 1 (16.66%)	Gentamycin. Clindamycin Piperacillin/Tazobactam	Ciprofloxacin, Ofloxacin, Tetracycline, Ceftriaxone
07	Enterobacterspp (Gram-Negative)	5 (6.57%)	Nalidixic Acid, Piperacillin/ Tazobactam, Moxifloxacin	Vancomycin, Tetracycline, Gentamycin
08	Enterococcus faecalis (Gram-Positive)	4 (5.26%)	Amikacin, Linezolid, Amoxillin/ Clavulanate	Vancomycin, Penicillin, Tetracycline
09	Nocardiaspp (Gram-Positive)	2 (2.63%)	Amoxillin/ Clavulanate Nalidixic Acid	Cefotaxime, Cefamandole, Tobramycin
10	Acinetobacterspp (Gram-Negative)	2 (3.13%)	Ceftriaxone Meropenem, Chloramphenicol	Ampicillin, Cephazoline, Cefuroxime Sodium
11	Anaerobic Infection (Gram-Positive) Peptostreptococcus Bacteriodesspp (Gram-Negative)	08 (10.52%) 3 (37.5%)	Ciprofloxacin Gentamycin, Metronidazole	Ceftriaxone Ceftazidime, Tetracycline

DISCUSSION

In this study, we studied professionally different factors related to post-operative surgical site infection (SSIs) and found certain interesting facts and figures. Overall results were compared with similar domestic and international research work, with slight variations, due to difference in demographic, environmental and health facility setup.

In our study out of 802 patients who underwent different surgical procedures, out of them 96 patients developed SSI which give overall incidence rate of (11.97%). Infection rate varies from hospital to hospital, surgeon to surgeon and from patient to anotherpatient.[6] In our present study it varies from 0% (thyroid procedures) to 42.85% (gut procedures). Many studies from different places have shown the SSI rate to vary from 6.09% to 38.7%,[7] like in few domestic studies it was found 6.5% to 9.294%.[8,9] SSI rate was found higher in developing countries like in Africa 16.4%[10] and it was significantly found lower in developed countries, like in china 4.5%,[11] south Korea 3.3%[12] and in US 2-3%.[13] . In this study isolation and identification of causative agent remained our prime concern, followed by the specific antibiotic used in controlling and treating SSI. Predominant Causative organism were staphylococcus, S aureus, P. Aeruginosa, E. coli, Klebsiella spp. .[5,14,15] CDC also defined most common pathogen associated with SSI is S. Aureus likewise another study carried out in Bangalore demonstrated that, Staphylococcus aureus (S. aureus) was the most common pathogen, followed by Escherichia coli and Coagulase Negative Staphylococcus.[16]

Prolonged duration of surgery increases risk of SSI.[17,18] Successful management of patients with SSI depends on, early identification of bacterial pathogens and selection of an effective antibiotic against the organism. Current finding showed 54% and 46% of gram-positive and gram-negative organism respectively, which is comparable with other studies associated with SSI in different countries.[19,20]

CONCLUSION

A pre-exiting medical illness, prolonged operating time, the wound class and wound contamination strongly predispose to wound infection. The practice of aseptic technique during and after surgery should be the primary support rather than over-reliance on antibiotics to reduce emergence and spread of resistant pathogens.

Author's Contribution:

Concept & Design of Study:	Abdul Malik Sangri
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