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Original Article

SUPERFICIAL SURGICAL SITE INFECTIONS: A COMPARATIVE STUDY BETWEEN ELECTIVE AND EMERGENCY GASTROINTESTINAL SURGERIES IN CHILDREN

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Abstract

Background: Surgical site infections (SSIs) are an important cause of healthcare-associated infections. They complicate the postoperative course of a signiûcant proportion of general abdominal surgical patients and are associated with considerable morbidity and mortality. Risks associated with SSIs are related to both host and perioperative factors. Although intrinsic factors in patients - such as age, underlying illness and site of the procedure - increase the risk, the quality of care delivered during the perioperative period is critical to preventing SSI. The aim and objective of this study was to compare the incidence (percentage) of superficial surgical site infections in elective and emergency gastrointestinal surgeries.

Method: In this comparative study, a total number of 60 cases were taken purposively from January, 2015 to December, 2016 in the Department of Pediatric Surgery, Dhaka Medical College Hospital, Dhaka. All the patients, fulfilling the inclusion criteria, were enrolled for emergency gastrointestinal surgery (Group A) and elective gastrointestinal surgery (Group B). For assessing development of SSIs in post operative patients and evaluating the outcome of emergency gastrointestinal surgery, comparison was made with the patients undergoing elective gastrointestinal surgery. ASEPSIS wound scoring method for assessment of wound infections was used during postoperative period.

Result: In this study, 20 (66.6%) patients were male in emergency operative group (group A) and 16 (53.3%) patients were male in elective operative group (group B). Age range was 19 days to 12 years in emergency operative group and 10 months to 11 years in elective operative group. In group A out of 30 patients, 6 developed wound infection (20 %) and in group B out of 30 patients, 2 developed wound infection (6.67%). Chi-square test revealed a p value of 0.74 which was > 0.05. So the difference was not significant. Total 5 cases had growth of microorganisms in wound swab in group A and 1 case had growth in group B. Among 5 cases of group A, *Staphylococcus aureus, Escherichia coli* and *Pseudomonus aeruginosa* observed in 1, 3, 1 cases respectively. Only 1 case of *Escherichia coli* was observed in group B.

Conclusion: There is no statistical difference in superficial surgical site infections between elective and emergency gastrointestinal surgeries in this study.

Introduction

Surgical site infection (SSI) in abdominal surgeries has been a major concern for the surgeons since the commencement of aseptic surgical practice. With regard to abdominal surgery, the rate of wound infection may be much higher, with several prospective studies reporting an incidence of 15%–25% depending on the level of contamination.[1-4] In 2010, an estimated 16 million operative procedures were performed in acute care hospitals in the United States. A recent prevalence study found that SSIs were the most common healthcare-associated infection (HAI), accounting for 31% of all HAIs among hospitalized patients. The Center for disease control and prevention (CDC) healthcare-associated

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infection prevalence survey found that there were an estimated 157,500 surgical site infections associated with inpatient surgeries in 2011.[5] During 1986–1996 the CDC reported "National nosocomial infections surveillance system" which had shown 16,147 SSIs following 8,49,659 operations (1.9%).[5]

CDC defined and classified surgical site infection (SSI) into superficial incisional surgical site infection, deep incisional surgical site infection, organ/space surgical site infections.[6]

In children SSI is on the higher side due to inadequate body defense mechanisms and the manifestations like fever, septicemia etc. develops more rapidly. Septicemia following SSI is one of the important cause of mortality and morbidity in neonate, infants and toddlers. Due to an increased rate of surgeries in the preterm newborns and low birth weight babies, the complications related to SSI following septicemia are common encounters now a days.[6]

SSI is the index of the health care system of any hospital. With the increase in incidence of nosocomial infections and multi drug resistance, a meticulous and periodic surveillance of various hospital acquired infections accumulated for periodic reporting.[7] This study was designed to observe the different aspects of SSI in a tertiary level hospital of Bangladesh and find out more efficient ways to prevent it.

Materials and Methods

This study was a prospective, comparative study carried out Department of Pediatric Surgery, Dhaka Medical College Hospital, Dhaka from January, 2015 – December, 2016. All the patients were enrolled for emergency gastrointestinal surgery (Group A) and elective gastrointestinal surgery (Group B). On presentation, detailed history of the patient was taken from the patient's attendants. In group A, Emergency operative group, Patients were kept nothing per oral, nasogastric suction & preoperative resuscitation was done with adequate intravenous fluid. Intravenous antibiotics (Ceftriaxone/Ceftazidime+Metronidazole) were started immediately after admission. In group B, Elective operative group, majority of patients were given standard gut preparation for elective enterostomy closure. Preparation was started 18-24 hours before surgery. Only clear fluids (plain water, juice, ORS) were allowed in this period. The patients were given a dose of ceftriaxone/ceftazidime injection just before induction of general anesthesia. Wound dressing was given with dry gauze with no local antiseptic/antibiotic ointment.

Post operative intravenous antiobiotics (previously mentioned) were continued upto 5th post operative day, after that patients were given 2 additional days of 1st generation oral cephalosporin (Syrup Cephradine-25-50mg/kg/day-6-8 hourly). Children attended the pediatric surgery ward for follow up visit on 30th POD: 1st follow up: on 3rd POD, 2nd follow up: on 5th POD, 3rd follow up : on 7th POD, 4th follow up: on 30th POD. The data was collected and edited manually. Then the data was entered into SPSS Statistical Package for Social Scientists, version 22.0 computer software program. For statistical analysis, Chi-square test, 't'-test, Mc-Nemar test were done to determine the significant differences between the groups. Differences were considered statistically significant at $p < 0.05$.

Results

Table-I

Demographic characteristics of the study populations (n=60):

Age in years	Types of treatment				Total
	Group A		Group B		
	n	%	N	%	
0-1	6	20	6	20	12
1-5	6	20	12	40	18
5-10	15	50	9	30	25
10-12	3	10	3	10	5
Total	30	100	30	100	60
Mean± SD	5.8 ± 3.5		4.5 ± 3.3		P= 0.32
Min-Max	(19 days-12yr)		(10 months-11yr)		
Sex					
Male	20	66.6	16	53.3	*P*=0.29
Female	10	33.4	14	46.7	

Table-III

Name of wound class with percentage among populations (n=60)

Wound-class	Group-A	Group-B	Total	%
Clean-Contaminated	17	30	47	78.33
Contaminated	10	0	10	16.66
Dirty	3	0	3	5.00
Total	30	30	60	100

Table-III

Superficial SSI by wound class and percentage among study populations:

Wound-class	Clean-Contaminated	%	Contaminated	%	Dirty	%
SSSI	5	10.64	2	20	1	33.33
No SSI	42	89.36	8	80	2	66.67
Total	47	100	10	100	3	100

Table-V

Comparison of Superficial Surgical Site Infection (wound infection) among study populations:

Wound infection	Group A (n=30)		Group B (n=30)		*P* value
	N	%	N	%	$p = 0.74^{ns}$ (Chi-square)
SSSI	6	20.0	2	6.7	
No SSI	24	80.0	28	93.3	
Total	30	100%	30	100%	

Table-V

Positive culture of wound swab among study populations:

Positive culture of wound swab (7^{th} POD)	Group A (n=5)	Group B (n=1)
Staphylococcus aureus	1	0
Escherichia coli	3	1
Pseudomonus aeruginosa	1	0
Total	5	1

Table-VI

ASEPSIS score among study subjects (n=60):

Day of assessment		ASEPSIS score					
		0-10	11-20	21-30	31-40	>40	*p* value
3^{rd} POD	Group A	0	6	0	0	0	$p = 0.26$
	Group B	0	2	0	0	0	
5^{th} POD	Group A	0	2	6	0	0	$p=0.28$
	Group B	0	1	1	0	0	
7^{th} POD	Group A	0	2	6	0	0	$p=0.24$
	Group B	0	1	2	0	0	
30^{th} POD	Group A	0	0	0	0	0	-
	Group B	0	0	0	0	0	

0-10= satisfactory healing; 11-20= disturbance of healing; 21-30=minor wound infection
31-40=moderate wound infection; >40=severe wound infection

Discussion

SSIs are the most common type of adverse events occurring in hospitalized patients following surgery and are one of the most common surgical complications. The incidence of SSI differs widely from hospital to hospital and from one geographic location to another.

The potential risk factors for SSSI in surgical patients in present study were assessed, and details were recorded preoperatively and postoperatively. In this study 60 patients were observed divided into 2 groups. Age range was 19 days to 12 years in emergency operative group (A) and 10 months to 11 years in elective operative group (B). The mean age difference was not statistically significant (p>0.05) in the two groups. Among the 60 patients in the study it was observed that majority, 20 (66.6%) patients were male in group A and 16 (53.3%) patients were male in group B. A male predominance was observed in both groups. The sex difference was not statistically significant (p>0.05), between the two groups. In one study details on 1,138 patients who underwent breast, hernia, esophagus, stomach, appendix, colon, or rectal surgery at a university-affiliated tertiary care center were retrieved from an SSI database. The mean patient age was 54.62 (range 2–92) years; 542 were male and 596 were female. 38 patients suffered from SSI, giving an incidence of 3.34%.[8] In the People's Republic of China, SSIs are still one of the leading causes of morbidity and mortality among patients undergoing major surgery. The incidence of SSI in various hospitals varies from 13.0% to 18.0%, and accounts for 25.0% of all nosocomial infection.[9]

In this present study, there was no association among the age groups. In a study, it was observed that age was significantly associated with the risk of infection. When age differences were compared with regard to the risk of postoperative wound infection a higher proportion of old people (>60 years) became infected compared with younger patients. The difference was statistically significant (P<0.0001).[10]

One epidemiologic study was undertaken to determine retrospectively the incidence of postoperative wound infection (WI) in children in a university hospital and included critical comparisons of pediatric surgery wound infection rates between different international reports. As few data exist on postoperative wound infections in pediatric patients, in contrast to numerous reports in adults, all infants and children undergoing operations in the pediatric surgical service during a 7-year period were reviewed for development of a WI, a total of 537 patients who underwent 575 operations. WIs occurred in 39 cases (6.7%). Clean wounds (56.8% of patients) had an infection rate of 2.7%, clean-contaminated (23.1%) 10.5%, contaminated (12.9%) 13.5%, and dirty/ infected (7.2%) 14.6%.[11]

In this study I found SSSI occurred in 8 cases out of 60 patients. Clean-contaminated wounds were 47 (78.33%) and had an infection of 10.64%, contaminated cases were 10 (16.66%) had an infection of 20% and dirty cases were 3 (5%) had an infection of 33.33%.

In other study of the 676 patients followed for 14 months revealed infection rates according to wound classification were: clean 1.0%, clean-contaminated 2.9%, contaminated 7.9%, and dirty 6.3%.[9]

In current study positive culture of wound swab among study subjects revealed total 5 cases had growth in group A and 1 case had growth in group B. Among 5 cases of group A *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonus aeruginosa* observed in 1, 3, 1 cases respectively. Only 1 case of Escherichia coli was observed in group B. Over a 14-month period, 676 patients who received an operative incision on the Pediatric Surgical service were entered. Demographic, nutritional, clinical, and laboratory data were collected. The patients were followed for development of postoperative wound infection. Cultures were taken from wounds to identify the offending organisms.[12] In another study in adult, twenty bacterial strains were isolated from the 38 infected surgical incision sites, including *Escherichia coli*, *Staphylococcus aureus,* and *Pseudomonas aeruginosa*.[8]

Conclusion

There is no statistical difference in superficial surgical site infections between elective and emergency gastrointestinal surgeries in this study. Further study including large number of study population involving several investigators at multiple centers should be done for precise result.

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