Original Research Paper

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Surgery

SURGICAL SITE INFECTIONS IN PEDIATRIC POPULATION: A 1YEAR PROSPECTIVE STUDY IN A TERTIARY CARE HOSPITAL.

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ABSTRACT

Background: Postoperative wound or surgical 'site infections (SSI) place a significant burden on both patients and surgeons. SSIs are the second most common nosocomial infection, accounting for 24% of all hospital-acquired infections, and are a major source of morbidity, prolonged hospital stay, and increased health care costs.' Despite the numerous publications on the incidence of and risk factors for SSI in adults, There have been few studies highlighting the details of pediatric surgical patientsThis study was performed to determine incidence risk factors measures to prevent SSI in pediatric population.

Methods: The study was conducted in a B J wadia institute and included a total of 650 patients comprising neonates, infants and older pediatric patients undergoing surgery under anaesthesia during a 1year period.

Results: Our SSI rate came out to be 9.8%. The factors which significantly increase the incidence of SSI were found to emergency surgery, dirty wounds, duration of surgery, patient with prolonged hospital stay use of prosthesis low Hb level. The commonest organisms found to infect the wounds was E. Coli.

Conclusion: Surgical site infections are a major cause of morbidity and increased costs in health care.A multitude of risk factors influence the development of SSIs, and awareness of these will help to promote effective preventive strategies..

KEYWORDS : Surgical site infection, pediatric patients, post-operative wound infection

Introduction: SSIs are the second most common nosocomial infection, accounting for 24%of all hospital-acquired infections, and are a major source of morbidity, prolonged hospital stay, and increased health care costs.' [1]The rates of SSI differ between children and adults, because of unique susceptibilities of each population[2]

Wound infection and wound related complications are common causes of lengtheningof hospital stay. According to literature data, the incidence of postoperative wound infection in children varies significantly, from 1.6 to 18.7% (3–7),and even up to 27% for contaminated operations (8) and up to 30%–40% for dirty-infected operations (9,10). The incidence of SSI depends on wound class (5).

The risk for development of wound infection is higher in emergency operations and operations lasting longer than 1 hour (11), as well as in operations in newborns and in operations where open drains were used (10).

Aims and objectives:

1. To determine the incidence of SSI in pediatric population.
2. To determine the risk factors of SSI in pediatric population.
3. To detect the common causative organisms.
4. To detect measures to prevent SSI in pediatric population.

Exclusion criteria:

SSI detected after 1 month of surgery
Surgeries with only mucosal incisions
Transient erythema without exudate/induration
Simple stitch abscesses

Materials and methods:

All pediatric patients between age group 0 to 14 years undergoing surgery in the pediatric surgery department of this tertiary care institute were included in the study during the period from August 2014-to July 2015

Pre-operatively, for all elective cases, remote site infections were ruled out and the nutritional status was optimised. For major cases, patients were admitted 2 days prior to surgery; for minor cases, they were admitted 1 day prior. All patients were given a bath on the day prior to the procedure.

Preparation of the surgical site was done as per the standard protocol in all patients. Wounds were classified into clean, clean-contaminated, contaminated and dirty according to the Centre of Disease Control (CDC) definitions. Antibiotic was administered just prior to incision for all major clean, clean-contaminated, contaminated and dirty wounds.

Post-operatively, wound check was done routinely on the 2nd post-operative day and then as and when there was soakage of the dressing for all indoor patients. For day care surgeries, the wound was checked on follow-up from the 7th to 10th post-operative day usually. According to the revised CDC classification of types of SSIs, we included superficial and deep incisional infections in our study.

A pus swab was sent in case of all SSIs and daily dressing was carried out till discharge. Antibiotics were continued till wound healing.The wounds were assessed in terms of time of onset of infection, organism and antibiotic profile and the type of healing. Demographic and clinical variables were recorded at the time of operation. Data collected included age, weight, sex, primary diagnosis, presence of any coexisting diseases or anomalies, presence of a distant site infection, total number of days hospitalized before surgery, duration of operation, location of procedure ,class of operation determined by wound contamination, and administration of perioperative antibiotics. Each patient was followed for 30 days after surgery, either in the hospital or as an outpatient. For the purposes of this study, all surgical incisional infections were grouped together. Statistical analysis was performed with a statistical package program

Results -Overall, 650 surgical procedures were performed and 64 cases developed SSI; thus the SSI rate was 9.8%.Various factors associated with SSI has been studied result shown as in table no 1

Table-1Comparison of variables between cases with & without SSI

Variables ^	SSI	Mean	SD	Median	IQR	Z- value	p-value
Age (months)	Yes	30.31	41.83	10.00	33.00	-1.9	0.057
	No	35.43	39.93	24.00	43.00	Difference is not significant	
Total hospital stay (days)	Yes	22.19	16.92	17.50	14.00	0.7530	5.06E-14
	No	9.48	9.19	4.00	11.00	Difference is significant	
Pre-operative duration of hospital stay (days)	Yes	4.84	5.38	3.00	7.00	-3.65	0.00026
	No	3.13	4.30	1.00	2.00	Difference is significant	
Duration of surgery (min)	Yes	167.03	83.56	162.50	94.00	-5.35	8.70E-08
	No	112.95	62.41	105.00	105.00	Difference is significant	
Hb (gm %)	Yes	10.28	0.98	10.00	0.90	-7.7	1.38E-14
	No	11.15	0.70	11.00	0.90	Difference is significant	

Table -2 Association of age with SSI

Age		SSI status		Total
		Present	Absent	
Neonate	No.	7	51	58
	%	12.1%	87.9%	100.0%
Infant	No.	28	204	232
	%	12.1%	87.9%	100.0%
1 yr to 5 yrs	No.	16	221	237
	%	6.8%	93.2%	100.0%
6 yr to 11 years	No.	12	88	100
	%	12.0%	88.0%	100.0%
12 & > years	No.	1	22	23
	%	4.3%	95.7%	100.0%
Total	No.	64	586	650
	%	9.8%	90.2%	100.0%
Chi-Square tests	Value	df	p-value	Association is-
Pearson Chi-Square	5.478	4	0.242	Not significant

No significant association was noted between age and occurance of SSI

Table -3 Association between socioeconomic class and SSI

Socioeconomic class		SSI status		Total
		Present	Absent	
Low	No.	38	114	152
	%	25.0%	75.0%	100.0%
Middle	No.	25	453	478
	%	5.2%	94.8%	100.0%
High	No.	1	19	20
	%	5.0%	95.0%	100.0%
Total	No.	64	586	650
	%	9.8%	90.2%	100.0%
Chi-Square tests	Value	Df	p-value	Association is-
Pearson Chi-Square	51.325	2	7.16E-12	Significant

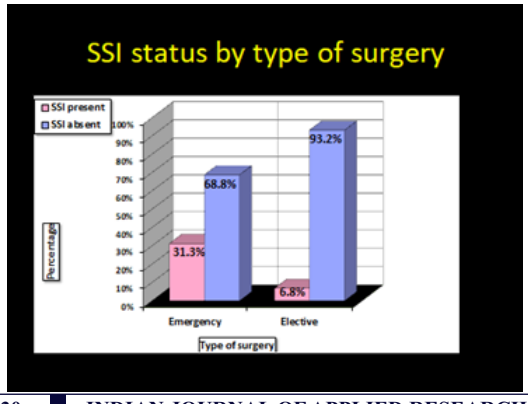
Significant association noted between socioeconomic class with SSI

Table4-Association between wound class class and SSI

Wound Class		SSI status		Total
		Present	Absent	
Clean ^	No.	6	370	376
	%	1.6%	98.4%	100.0%
Clean Contaminated ^	No.	40	164	204
	%	19.6%	80.4%	100.0%
Contaminated #	No.	18	50	68
	%	26.5%	73.5%	100.0%
Dirty #	No.	0	2	2
	%	0.0%	100.0%	100.0%
Total	No.	64	586	650
	%	9.8%	90.2%	100.0%
Chi-Square tests	Value	Df	p-value	Association is-
Pearson Chi-Square $	72.122	3	1.50E-15	Significant
Pearson Chi-Square ^, #	20.294	1	6.64E-06	Significant

Clinically significant association noted between socioeconomic class with SSI

Table-5 SSI status by type of surgery



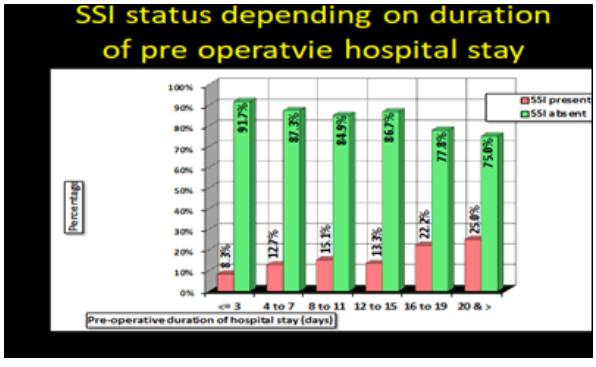
Risk of SSI is more in emergency cases as compare to planned elective cases

Table -6 Association between duration of surgery and SSI

Duration of surgery (min)		SSI status		Total
		Present	Absent	
30 min to 1 hr ^	No.	3	117	120
	%	2.5%	97.5%	100.0%
1 to 1.5 hr ^	No.	5	136	141
	%	3.5%	96.5%	100.0%
1.5 to 2 hrs ^	No.	8	68	76
	%	10.5%	89.5%	100.0%
2 to 2.5 hrs	No.	22	137	159
	%	13.8%	86.2%	100.0%
2.5 to 3 hrs	No.	8	82	90
	%	8.9%	91.1%	100.0%
3 to 3.5 hrs	No.	8	21	29
	%	27.6%	72.4%	100.0%
>= 3.5 hrs	No.	10	25	35
	%	28.6%	71.4%	100.0%
Total	No.	64	586	650
	%	9.8%	90.2%	100.0%
Chi-Square tests	Value	df	p-value	Association is-
Pearson Chi-Square $	40.691	6	3.33E-07	Significant
Pearson Chi-Square ^	36.92	4	1.87E-07	Significant
$ 2 cells (14.3%) have expected count less than 5. ^ Row data pooled & Chi-Square Test reapplied.				

As duration of surgery increases rate of SSI increases

Table -7 association between SSI and duration of preop hopital stay



If preop hospital stay duraation is more risk of developing SSI increases

Table 8-Association between hospital stay with SSI

Total hospital stay (days)		SSI status		Total
		Present	Absent	
1 to 10	No.	10	368	378
	%	15.6%	62.8%	58.2%
11 to 20	No.	25	142	167
	%	39.1%	24.2%	25.7%
21 to 30	No.	17	62	79
	%	26.6%	10.6%	12.2%
31 to 40 ^	No.	5	8	13
	%	7.8%	1.4%	2.0%
> 40 ^	No.	7	6	13
	%	10.9%	1.0%	2.0%
Total	No.	64	586	650
	%	100.0%	100.0%	100.0%
Chi-Square tests	Value	df	p-value	Association is-
Pearson Chi-Square $	79.490	4	2.23E-16	Significant
Pearson Chi-Square ^	77.757	3	9.29E-17	Significant

Significant association noted between duration of hospital stay with SSI occurance

Table 9 association between anemia and SSI

SSI status		Anaemia	Normal Hb	Total
Present	No.	49	15	64
	%	15.1%	4.6%	9.8%
Absent	No.	276	310	586
	%	84.9%	95.4%	90.2%
Total	No.	325	325	650
	%	100.0%	100.0%	100.0%
Chi-Square tests	Value	df	p-value	Association is-
Pearson Chi-Square	20.035	1	7.60E-06	Significant
Continuity Correction	18.874	1	1.40E-05	Significant

Table 10-association between height by weight percentile and SSI Out of 64 cases 48 cases were below 3rd percentile n had shown significant association with SSI

SSI status		Height-by-Weight < 3 Percentile		Total
		Yes	No	
Present	No.	48	16	64
	%	64.9%	2.8%	9.8%
Absent	No.	26	560	586
	%	35.1%	97.2%	90.2%
Total	No.	74	576	650
	%	100.0%	100.0%	100.0%
Chi-Square tests	Value	df	p-value	Association is-
Pearson Chi-Square	284.769	1	6.86E-64	Significant
Continuity Correction	277.817	1	2.25E-62	Significant

Table 11-association between use of prosthesis and SSI

SSI status		Prosthesis Used		Total
		Yes	No	
Present	No.	18	46	64
	%	19.1%	8.3%	9.8%
Absent	No.	76	510	586
	%	80.9%	91.7%	90.2%
Total	No.	94	556	650
	%	100.0%	100.0%	100.0%
Chi-Square tests	Value	df	p-value	Association is-
Pearson Chi-Square	10.714	1	0.00106	Significant
Continuity Correction	9.524	1	0.00203	Significant

SSI rate was higher in surgery involving use of prosthesis

The organism profile in our set-up is shown in the following Table12 . The most common organism overall was E. coli (14.06%). The most common antibiotic to which the organisms were sensitive was meropenam followed by colistin & piperacillin tazobactum(20.31%) as shown in Table13. SSIs occurring in the ICU were found to grow organisms with greater resistance

TABLE 12: Organism profile in wound swabs

ANTIBIOTIC	% SENSITIVITY
Gentamicin	17.1
Amikacin	10.9
Imipenem	15.6
Piperacillin-tazobactam	20.31
Amoxycillin-clavulanate	15.62
Clarithromycin	1.5
Netilmycin	1.5
Vancomycin	4.6
Meropenem	31.25
Colistin	20.31
Polymixin	7.8

TABLE 13-ANTIBIOTIC SENSITIVITY PATTERN

ORGANISM	NO. OF PATIENTS (%)
E. coli	9 (14.06)
Klebsiella sp.	4 (6.25)
Staphylococci	3(4.68)
Pseudomonas	4 (6.25)
Acinetobacter	1 (1.5)
MRSA	0 (00)
Cornynebacteria	0 (00)
Enterococcus	1(1.5)
Proteus	1 (0.58)
No growth	41(26.06)
TOTAL	64(100)

TABLE 14: Comparison of SSI rates of various studies.

STUDY	YEAR	SSI RATE (%)
Doig and Wilkinson	1976	13.6
Davenport et al	1993	16.6
Davis et al	1984	4.2
Sharma et al	1986	5.4
Bhattacharya et al	1990	2.5
Uludag et al	2000	6.6
Estrada et al	2003	6.6
Emmanuel et al	2009	23.6
Harefuziah(journal)	2012	6.8
Our study	2014-17	9.8

Discussion

A lots of literature available on adult SSI.Very few study reported SSI in paediatric Population The present study revealed incidences of SSI & factors associated with SSI in children in all wound classes.

Our study showed that the overall rate of SSI was 9,8%; for the clean and clean- contaminated operations it was 1.6 and 19.6 which is lower than in previously reported
paediatric patients.

In our study SSI were most frequent for contaminated and dirty-infected operations (26.5.%), which is consistent with literature data according to which the rate of SSI for dirty-infected operations is 10–40.7% (12-15).

Although most studies report longer hospital stay in the case of SSI, the cause of such lengthening is not specified (15,16).

According to many studies,the duration of operation increases the rate of SSI (17,18,13, 14).

Direct association between the duration of operation and higher rate of SSI was pointed out by Cruse et al., who showed that infection rate increases almost two times by every hour of operation (19).

Data about wound drains and SSI in the literature are scarce. Only Porras-Hernandez et al.

showed in their study, using multiple regression analysis, that the use of open drains was associated with SSI (12). According to Bucher et al. (14), postoperative location, urinary catheter insertion, and use of an implantable device are potentially modifiable risk factors for an SSI in children None of the physiologic indices that we examined age gender appeared to be associated with the development of a postoperative SSI.

We agree with conclusion, according to our data the risk factors for wound infection were wound class socio economic status duration of hospital stay s duration of surgery use of prosthesis low hb type of surgery whether elective or done on emergency basis have shown significant association with occurance of SSI

Conclusion-Surgical site infections are a major cause of morbidity and increased costs in health care.A multitude of risk factors influence the development of SSIs, and awareness of these will help to promote effective preventive strategies.The degree of wound contamination and duration of surgery are proven risk factors.SSIs in children are related more to perioperative factors than to the patients' overall physiologic status.

Rigorous adherence to the principles of asepsis by all scrubbed personnel remains foundation of surgical site infection prevention

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