SHORT COMMENTARY

Surgical-site infections in emergency abdominal paediatric surgeries at a tertiary-care hospital in Pakistan

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Abstract

A retrospective chart review was carried out in children (neonates to 18 years) who underwent acute surgical abdominal exploration during 2012-2016 at the Aga Khan University Hospital, Karachi, to evaluate the post-operative surgical site infection rates in emergency paediatric abdominal surgery. Incidence of surgical site infection (SSI) was estimated. P-value was calculated, chi-square and non-parametric tests were performed by comparing pre-surgical and post-surgical procedure pathogen occurrence and pre-procedure wound status. Pathogen occurrence related to time-trend of 98 paediatric patients who underwent emergency abdominal surgery was plotted. Of the 94 who were discharged in stable condition, it was found that there was no significant difference between pre- and post-surgical pathogens. Escherichia coli (n=10) was found to be the most common pathogen. Contaminated wounds were associated with higher SSI (p=0.036, OR 1.95 95% CI 0.7-5.4). The study found that pre-surgery wound status could be an indicator for risk of SSI in a post-operative scenario.

Keywords: Paediatric emergency, Post-surgical, Risk factors, Surgical site infection, Wound classification.

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Introduction

A wound that gets infected after a surgical procedure is defined as surgical site infection (SSI). Surgical site infections are the leading cause of post-surgical complications which include extended hospitalisation, morbidity and mortality.[1] The incidence of post-surgical wound infection is estimated to be 30% overall and ≈ 7-12% in children undergoing any surgical procedures.[2,3] In Pakistan, very few hospitals document surgical wound infection rates, therefore the data is limited and even more so for paediatric population.[4]

Guidelines are available for SSI prevention in both elective and emergency surgeries and adherence to these is pivotal in infection prevention.[5] Risk factors for SSI differ in both elective and emergency surgical settings and are dependent on comorbidities of the patient and pre-surgical risk factors such as wound contamination, length of scar and appropriate antibiotic therapy.[6] While the risk of infection and procedure- related morbidity is minimal in elective procedures, this could be unpredictable in emergency procedures.[7] The risk is higher, if the procedure is performed in children with a relatively weak immune system. Pakistan has a high primary care antibiotic prescription rate as well as chronic malnutrition; and previously published studies[8,9] showed a high extended spectrum beta lactamases (ESBL) gut colonisation in children. These children may have higher chances of SSI, in the absence of appropriate antibiotic therapy. There is dearth of literature on SSI in post-paediatric population. Hence, we aimed to determine the post-operative surgical site infection rates in emergency surgical procedures in a developing country. We also correlated these to risk factors for surgical site infection, all when standard operating procedures were followed.

Methods, Results and Discussion

A retrospective chart review was carried out in children (neonates to 18 years) who underwent acute surgical abdominal exploration during 2012-2016 at Aga Khan University Hospital, Karachi. The incidence of SSI varies from one hospital to another and from developing to developed countries. It is an important tool for hospital quality improvement programme. The Aga Khan University is a joint commission for international accreditation (JCIA) accredited hospital where international policies for infection control are followed. The study was approved by the ethical review board of the Aga Khan University (4647-Sur-ERC-17).

Records were accessed by using hospital information management system (HIMS) and confirmed with online hospital surgical registry that keeps all inpatient and discharge records codes using international coding system (ICD-9), with codes 998.59, 54.11. Children who underwent emergency surgical exploration were included; however, children whose main surgical exploration was done elsewhere and any minor surgical procedure done at

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Table-1: Reasons for Admission in Study population (n=98).

Acute abdomen	(n=50, 51%)
Intussusception	13(26)
Acute appendix	6(12)
Bowel obstruction	12(24)
Intestinal perforation	9(18)
Ovarian cause	4(8)
Meckel's diverticulitis	3(6)
Bowel ischaemia	3(6)
Trauma	(n=14, 14%)
Blast	4(29)
Gunshot	4(29)
Other trauma	6(42)
Congenital	(n=14, 14%)
Duodenal atresia	4(29)
Jejunoileal atresia	3(21)
Pyloric stenosis	1(7)
Imperforate anus	2(14)
Malrotation	2(14)
Other congenital	2(14)
Other	(n=20, 20%)

our institute were excluded. Data was retrieved on age (in months); gender; pre and post-operative diagnosis; surgical site infection and the basis of diagnosis; type of wound class (clean, clean contaminated, contaminated, dirty); pre-surgical microbiological data including bacterial culture: blood and urine; post-surgical microbiological data; use of empiric antibiotic, postoperative surgical drainage needed; duration of hospital stay; discharge

Table-2: Wound status pre-surgery and the association with post-operative pathogens.

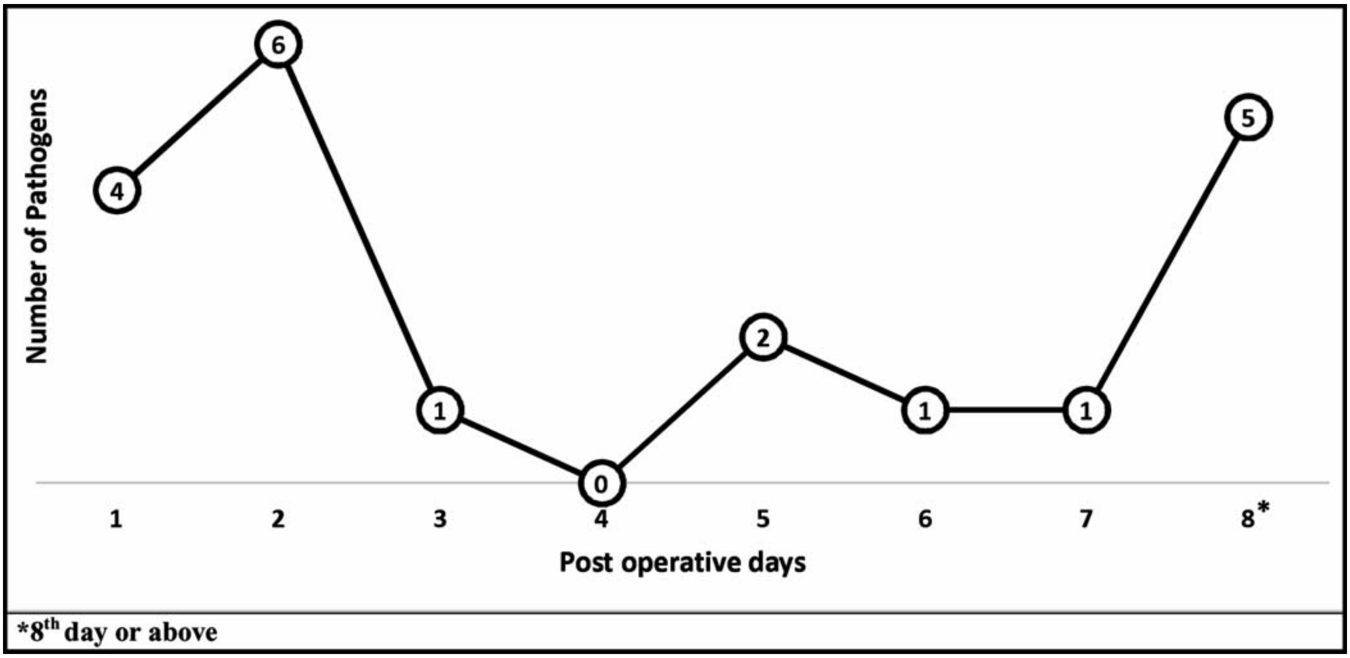
	n=98	SSI	Positive isolates post-operative	OR, 95%CI
Clean Contaminated	47 (48%)	1	7	
Contaminated	25 (26%)	0	5	1.95 (0.7-5.4)
Dirty	26 (26%)	2	8	

SSI (Surgical Site Infection).

disposition, etc.

Data was analysed using SPSS version 19. Categorical variables (gender, wound class, positivity of microbiological culture) were expressed as frequencies and proportions. The incidence of SSI (number of SSI/all emergency laparotomies*1000) was calculated. Numerical variables were reported as mean ± standard deviation or medians ± interquartile range depending upon the distribution of data. P-value, chi-square and non-parametric tests were performed by comparing pre-surgical and post-surgical procedure pathogen occurrence and pre-procedure wound status. Pathogens were plotted occurrence related to time-trend.

Ninety-eight children underwent emergency exploratory laparotomy due to various causes (Table-1) between 2012 and 2016. The majority (n=50, 51%) were due to acute abdomen of various causes. Males were predominant (n=69, 71%). Only three children developed surgical site



Graph-1: Post-operative culture positivity and time trends in the study population.

infections (incidence 30 per 1,000 emergency paediatric laparotomies). The reasons for surgery in these cases were bomb blast trauma, perforated gangrenous appendix and intestinal perforation. The median time from operation to diagnosis of SSI was five days (range 2 - 5). The emergency cases occurred more in summer as compared to winter months (52 vs 46). The median age of the admitted patients was 48 months (range 0 - 192), with the median length of stay being nine days (range 1 - 72). More than half (n=51, 52%) of the wounds were found to be contaminated and dirty at the time of the surgical procedure.

Overall, there were 37 pathogen isolates from cultures, pre-surgical samples (n=17) and post-surgical samples (n=20). *Escherichia coli* (n=10), *Candida albican* and other *Candida species* (n=6), *Enterococcus species* (n=5) and *Klebsiella pneumoniae* (n=4) were the most common pathogens. Both *Escherichia coli* and *Klebsiella pneumoniae* are extended spectrum beta lactamases. A further analysis of the surgical isolates revealed that there is no significant variation in the number of positive cultures, both pre-and post-surgery and there is no difference when comparing the pre and post emergent procedure.

The study population had high rate of gram negative rods (GNR) multidrug resistant (MDR) pathogen. The most common organisms isolated from culture was found to be five cases of *Escherichia coli* followed by three cases of *Klebsiella pneumoniae* and *Bacteroides* each. The bacteriological results are consistent with the results of SSIs found in a systemic review conducted by Nejad et al[10] where the most common cause of health-associated infection were found to be *Escherichia coli*, *staphylococcus aureus* and *Enterobacteriaceae*.

Ampicillin, Metronidazole and Amoxicillin-Clavulanic acid were the most frequently used empiric choices in this study. A combination of Ampicillin and Metronidazole was prescribed in two third of children (n=59, 60%). Approximately half of all cases were categorised as clean/contaminated and 52% fell in the contaminated/dirty category. There is a significant increase in the number of positive isolations going from clean/contaminated to contaminated/dirty (p=0.036, OR 1.95 95% CI 0.7-5.4) (Table-2).

Overall, 94 patients were discharged in stable condition, whereas four children expired (4%). Reasons for mortality were: *Klebsiella* pneumonia septic shock (2 children), Haemophagocytosislymphohistiocytosis with sepsis (1 child) and necrotizing enterocolitis with gangrenous perforated bowel and peritoneal spillage of bowel contents with bacteraemia (1 child).

Conclusion and Limitations

SSI rates were very low in contaminated and dirty wounds. The study found that wound status pre-surgery could be an indicator for risk of SSI in a post-operative scenario. Our study adds on to the management of emergency abdominal paediatric laparotomies and highlights the importance of using basic empiric antibiotics, adherence to standard clinical procedure guidelines and infection control practices. However, our study is limited due to a small sample size and variation in post-surgical use of antibiotics prescribed at the surgeon's discretion.

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Conflict of Interest: None

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