SURGICAL SITE INFECTIONS IN PEDIATRIC POPULATION - AN EXPERIENCE AT A TERTIARY CARE HOSPITAL

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ABSTRACT

Objective: To determine the frequency of surgical site infections in children undergoing elective laparotomies.

Material and methods: This cross-sectional study was conducted in pediatric surgery unit of Khyber Teaching Hospital from 10th October 2019 to 20th March 2020. This study included a total of 112 patients. Data was collected regarding age, gender and operative time. Patients were observed clinically for development of infection and confirmed by culture from the laboratory. Collected data were analyzed using SPSS version 20. Statistical significance was accepted at a value $p<0.05$.

Results: Mean age of the patients was 3.5±2.4 years. Gender distribution showed female patients were 33.9% and male patients were 66.1%. Infection was recorded in a total of 25.9% (29 out of 112). Mean duration to develop infection was 4.8±0.9 days. Patients having age up to one year had wound infection rate of 9.6%, age 1 to 5 years had wound infection 72.3% and age above 5 years had 18.1% ($p=0.92$). Distribution of operative time showed that less than 30 min surgery had a zero percent infection, 30 to 60 min surgery had 13.8%, 60 to 120 min surgery had 44.8% and more 120 min surgery had 41.4% infection ($p=0.01$).

Conclusion: Percentage of surgical site infection for elective laparotomies is higher in our setup and longer duration of surgery is a risk factor for developing infection.

Key words: Surgical site infection, SSI, pediatric elective surgery, laparotomy

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INTRODUCTION

Surgical site infections (SSI) are defined as infection which develops within 30 days post operatively in that part of body where surgery has been perfromed[1]. SSI are most common health associated infection (HAI) and important cause of mortality and morbidity in post-operative patients including neonates and infants[2]. SSI has been reported as major factors of wound dehiscence[3], which has been shown to compose up to 11% of all of healthcare associated infections[1].

SSI presents with redness, edema and pain around the incision site and discharge of cloudy fluid or pus from the wound[4] resulting in delay in healing process. Other signs and symptoms related to specific types of SSIs depends on the organ involved. They can be superficial infections involving the skin only or more serious and can involve tissue under the skin, organs or implanted material. Center for disease control and prevention (CDC) guidelines classify the SSI into superficial incisional, deep incisional and organ/space abscess[5].

Superficial SSIs involve the skin or subcutaneous tissue only and may present with pus discharging from the wound site. Pus can be taken for culture to find out infective micro-organism involved. Deep SSIs involve deep soft tissues (fascia and muscles). Organ or space SSIs involve any part of organ other than incision site and may present with pus coming from draining site[2,6].

SSIs can be prevented by giving pre-operative antibiotic prophylaxis prior to surgery with plain or antimicrobial soap, shaving hair from the incision site and following strict intra operative aseptic protocol[7,8].

SSIs results in increasing hospitalization and attribute to the increase cost per patient compared to non-infected patient having similar surgical procedure[9,10]. Variability of reports on SSI, makes it difficult to calculate the rate of SSI and recognize the possible risk factors in the pediatric surgery. This study was conducted to find out the rate of SSIs in elective laparotomies and different factors

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which results SSIs in pediatric elective laparotomies.

MATERIAL AND METHODS

A cross sectional study was conducted in pediatric surgery unit of Khyber Teaching Hospital from 10th October 2019 to 20th March 2020. Sampling was done through non probability consecutive sampling technique. Sample size of 112 was calculated through WHO formula. Patients having age below 16 years and who underwent laparotomies on the elective list were included in the study. Patients who were operated in emergency and those having laparoscopic surgery were excluded from the study. Surgical site infection was observed clinically and then confirmed by culture & sensitivity. Operative time was recorded for each surgery and categorized for the development of wound infection. All patients received peri-operative antibiotics and were discharged from hospital after treating the infection with a culture sensitive antibiotic. Wound infection was classified as superficial incisional, deep incisional and organ abscess.

The data were collected by the researchers themselves. Statistical analysis was carried out using SPSS-20. Mean and standard deviation was calculated for numerical data like age, while frequency and percentages were calculated for categorical data like infection, age groups. Chi square test was used for categorical data by age and operative time.

RESULTS

A total of 112 patients data was analyzed and out of these, female patients were 33.9% (38 out of 112) and male patients were 66.1% (74 out of 112). Mean age of the patients was 3.5±2.4 years. Further age distribution showed 9.8% up to 1 year (11 out of 112), 71.4% from 1 to 5 years (80 out of 112) and 18.8% greater than 5 years (21 out of 112) see Fig 1. Infection was recorded in a total of 25.9% (29 out of 112). Mean duration to develop infection was 4.8±0.9 days. Further analysis showed that 6.9% patients developed infection on 3rd post-operative day, 34.5% patients developed infection on 5th post-operative day, 27.6% patients developed infection on 4th post-operative day, 17.2% patients on 6th post-operative day. Superficial incisional SSI were 41.4%, deep incisional 58.6% and organ space abscess 0%. Patients having age up to one year had wound infection rate of 9.6%, age 1 to 5 years had wound infection 72.3% and age above 5 years had 18.1% (p=0.92). Distribution of operative time showed that less than 30 minutes surgery had a zero percent infection, 30 to 60 minutes surgery had 13.8%, 60 to 120 minutes surgery had 44.8% and more 120 min surgery had 41.4% infection (p=0.01). Age and operative time was categorized as shown in table 1and 2.

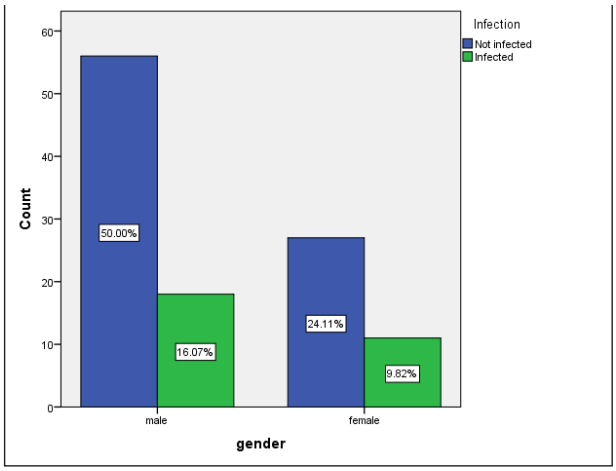

Fig 1: Gender distribution in relation to development of infection

Table 1: Age of the children and frequency of Infection

Age	Infection development		Total	P value
	No	Yes		
Upto 1 year	8 (72.7%)	3 (27.3%)	11(100.0%)	0.94
1-5 year	60 (75.0%)	20 (25.0%)	80 (100.0%)	
> 5 years	15 (71.4%)	6 (28.6%)	21 (100.0%)	
Total	83 (74.1%)	29 (25.9%)	112(100.0%)	

Table 2: Operative time and frequency of Infection

Operative time	Infection		Total	P value
	No	Yes		
< 30 min	12 (100.0%)	0 (0.0%)	12(100.0%)	0.01
30 to 60 min	27 (87.1%)	4 (12.9%)	31 (100.0%)	
60 to 120 min	27 (67.5%)	13 (32.5%)	40 (100.0%)	
> 120 min	17 (58.6%)	12 (41.4%)	29 (100.0%)	
Total	83 (74.1%)	29 (25.9%)	112(100.0%)	

DISCUSSION

One of the major cause of morbidity in surgical unit is surgical site infection. Infection rate varies from center to center and affected by variables such as type of surgery, operative time, wound status, and antibiotic coverage, etc. A study conducted in Japan reported infection rate of 1.2 % for elective surgeries and 4.5% for emergency surgeries. SSI reported in Netherland and UK are 6.6% and 5% respectively[11,12]. Wound infection rate of 14.8% has been reported by Tay M[13]. One of the study conducted locally in a teaching hospital, had reported infection rate in 33.8%[14] of surgeries. Emergency surgery has been reported to have high infection rates as compare to elective[15]. Our study included only the

laparotomies performed on elective list which were followed for development of SSI. Most of the elective laparotomies performed involved congenital anomalies like Hirschsprung disease and surgeries like which require long duration. one-fourth of patients developed infections in our study. Such a high rate of infections can be attributed to the overcrowded conditions leading to cross infection, longer duration of surgery and exclusion of laparoscopic surgeries from the study.

Analysis in the current study showed that most patients developed SSI on 5th post-operative day and the deep incisional infection was the most common, which usually required removal of stitches to drain the collection and obtain specimens for culture. Our findings are consistent with other researches that also reported that most infections develop in the 1st week after surgery.

Pediatric population was studied for the development of wound infections related to different ages. Neonates, infants and older children have been reported to have different percentages of infection rates. In a study conducted in Brazil, neonates, infant and older children have wound infection of 11.4%, 6.4% and 6.1% respectively[16]. High neonatal in these studies was infections due to large sample size and inclusion of all surgeries in the pediatric surgery unit. Another study, where patients with age less than one year, 1 – 4 years, 5 – 13 years and greater than 14 years, were reported to have infection rate of 1.8%, 1%, 1.1% and 1.2% respectively. In current study, age distribution was done in 3 groups and analyzed for the development of infections, age up to 1 year, 1 – 5 years and greater than 5 years.

Literature showed that infections are predominant is males[12]. Similar are the findings of the current study where the male percentage was 66.1% and although Infection rate was also high for male patients but the findings were not statistically significant ($p = > 0.05$).

In our study certain variables had been studied, to know the association of development of SSI. Duration of surgery was one the main factor strongly related to the development of SSI. Porras-Hernandez et al reported that duration of surgery longer than 2 hours has been significantly related to the development of SSI[17]. Another study conducted in India also reported operative duration longer than 1 hour strongly associated with the SSI[18]. Our analysis endorsed the finding in previous studies and clarify that operative duration of more than 2 hours is significant in development of wound infection. Small sample size and short duration of study were the main limitation in the current study.

CONCLUSION

Most of the elective surgeries were performed related to the congenital anomalies with longer duration of operation. Factors related to patients like age and gender had no statistical significance in development of SSI while longer duration of surgery is main determinant of SSI in electively performed laparotomies. On the basis of our study we recommend that SSI should be analyzed further in hospital including all peri-operative factors, which will help in implementing targeted approach to lessen the rate of SSI.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Imran M:	Study supervision and critical revision
Rehman FU:	Study idea, concept, design and drafting
Ali S:	Statistical Analysis
Saeed K:	Data collection

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.