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ORIGINAL ARTICLE

Frequency of surgical site infections after emergency laparotomy.

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ABSTRACT… Objective: To find out the frequency of surgical site infections after emergency laparotomy. **Study Design:** Case Series study. **Setting:** General Surgery Unit, Hayatabad Medical Complex, Peshawar. **Period:** 1st March 2022 to 31st August 2022. **Methods:** Total of 173 patients were included. Patients undergoing emergency laparotomy were included in the study and were followed postoperatively for 30 days for signs and symptoms of SSIs. Sampling technique was non probability consecutive sampling. Data analysis was done on SPSS version 23 and p value of 0.005 was considered to be significant. **Results:** In this study of 173 patients, the mean age was 38.6 years, with a range of 19-65 years. The majority of patients were in the 18-40 years age group (64.7%), and male patients constituted 69.4% of the sample. Regarding BMI classification, 64.2% were in the normal range, while 12.7% were obese. The most common indications for emergency exploratory laparotomy were enteric perforation (24.9%), firearm injury (16.2%), and perforated appendicitis (8.1%). Surgical site infection (SSI) occurred in 33.5% of patients. Comparing SSI rates, there was no significant difference between the 18-40 years age group (35.3%) and the 41-65 years age group (41.9%). Similarly, no significant difference was found between male (36.7%) and female (26.4%) patients. The different BMI categories did not show a significant difference in SSI rates, with rates of 36.1% (Normal), 31.2% (Overweight), and 36.4% (Obese). **Conclusion:** The overall frequency of SSIs after emergency laparotomy was 33.5%.

Key words: Emergency, Laparotomy, Surgical Site Infection.

INTRODUCTION

Despite the fact that the worldwide burden of surgical diseases are significant, it is still insufficiently defined and documented. According to estimates, just four surgical diseases requiring emergency laparotomy cause 7.1 deaths per 100,000 people worldwide each year.[1] Emergency laparotomy is one of commonly performed procedure in emergency departments[2] By 2030, it is intended that 80% of the world's population would have access within two hours to facilities that will offer necessary surgical treatment, under the supervision of Global Surgery (GS) and the Lancet Commission. Another objective is to have a specialised surgical work force density of 20 per 100,000 people.[3] Even though estimates suggest that 84% of the Pakistani population is at a 2-hour driving distance to hospital staffed with a surgeon, there is just 1 surgeon for 139,299 individuals.[4] In Pakistan, healthcare facilities' surgical capability and safety have regularly been rated as deplorable.[5]

Surgical site infections (SSIs) continue growing at an alarming rate, costing billions of dollars in monetary damage due to morbidity and mortality.[6] The search for techniques that can minimize the risk is continually being refined and expanded. Basic understanding of how the body defends itself against infection is essential to a rational application of surgical and other therapeutic principles to the control of infections.[7] Being confronted with SSIs has always been a source of general concern for healthcare providers and remains the most common post-operative annoyance.[8] The idea of infection is more than five millennia old. Egyptians were the paramount civilization to have been proficient heath care providers. They were masters in inhibiting putrefaction by mummification.[9] Hippocrates,

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acknowledged as the father of medicine, used vinegar to hose open wounds and draped dressings around wounds to avoid supplementary harm.[10] The theory of wound healing stayed a mystery for a long time for prehistoric civilizations but they recognized that pus needs to be drained. Although, the perception of wound infection was modernized by the effort of Fleming, who invented Penicillin but, even in this modern era, SSI is still a crucial impediment of trauma and surgery.[9,10]

In one study conducted by Chowdhury S et.al. in Pakistan, reported that 12.9% patients developed SSIs after emergency laparotomy. Majority of SSIs were reported after 7 days during hospital stay.[11]

Aim of this study was to determine the frequency of surgical site infections in patients undergoing emergency laparotomies. The results of this study will be shared with other health professionals for their updated knowledge, better treatment and further recommendations regarding SSIs.

METHODS

A descriptive cross section study was conducted after approval from ethical review board of institution (IRB No: 1344) on patients who undergone emergency exploratory laparotomy for acute abdomen from 1st March 2022 to 31st August 2022. Total of 173 patients were included in the study after strict inclusion criteria. 32 patients were excluded based on exclusion criteria. Informed written consents were taken from patients. All included patients were subjected to detailed history and examination. All the surgeries were performed by experienced general surgeon or under his/her supervision. Once the surgery was completed, standard post-operative protocols was maintained for all patients which included triple antibiotic regime for all patients, analgesics and daily wound dressings. The surgical site infection was assessed after 7th post-operative day. Any patient with symptoms of surgical site infection (redness, detected by naked eyes, swelling detected by naked eyes and discharge of pus i.e. yellowish fluid coming out from the wound) were recorded.

Information including name, age, gender, height, weight, BMI, diabetes mellitus, hypertension, history of smoking and indication of surgery were recorded in the Proforma. Strict exclusion criteria were followed to control confounders and bias in study results. Statistical analysis was done through SPSS version 23. P value of 0.005 was considered significant with the confidence interval of 95%.

Inclusion Criteria

1. Adult patients undergoing emergency abdominal laparotomy irrespective of indication.
2. Either gender.
3. Age group 18 to 65 years.

Exclusion Criteria

1. Patients with Diabetes on history and having fasting blood glucose of more than 126mg/dl on admission.
2. Patients scheduled for elective laparotomy.
3. Patients with hypertension as determined by medical records.
4. Patients with liver cirrhosis as determined by medical records.
5. Patients with chronic kidney disease with eGFR less than 60-90 ml/min/1.73m^2.
6. Patients receiving steroids for the last one month on history.
7. Patients with history of abdominal surgery in last one month.

RESULTS

A total of 173 patients were included in the study, with a mean age of 38.6 years (SD±14.08). The age range of the patients was 19-65 years. Of the 173 patients, 64.7% (n=112) were in the 18-40 years age group, while 35.3% (n=61) were in the 40-65 years age group. Male patients made up to the majority of the sample at 69.4% (n=121) while female were 30.6% (n=53). BMI classification showed that 64.2% (n=111) were in the normal range, while 12.7% (n=22) were obese. (Shown in Table-I)

The most common indication for emergency exploratory laparotomy was enteric perforation (24.9%, n=43), followed by firearm injury (16.2%,

n=28) and perforated appendicitis (8.1%, n=14). The least common indications were gallbladder perforation (1.2%, n=2), ischemic gut (1.2%, n=2), and liver abscess (1.2%, n=2). Full details of the indications for laparotomy are shown in Figure-1.

Characteristics:	N	%	P-Value
Age			<0.0001
18-40yrs	112	64.7	
41-65yrs	61	35.3	
Gender			<0.0001
Female	53	30.6	
Male	121	69.4	
BMI Category			<0.0001
NORMAL	111	64.2	
OBESE	22	12.7	
OVERWEIGHT	32	18.5	
UNDERWEIGHT	8	4.6	
Total	173	100.0	

Table-I. Demographic characteristic

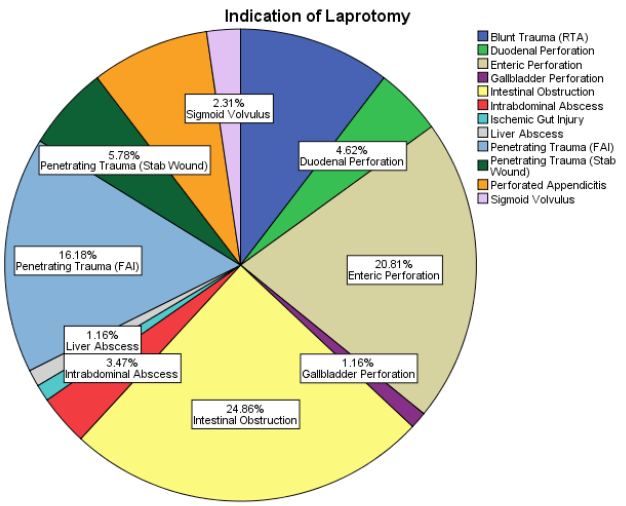

Figure-1. Indications of laparotomy

Of the 173 patients, 33.5% (n=58) developed postoperative surgical site infection (SSI), while 66.5% (n=115) did not develop SSI (Table-II).

Category	Frequency	Percent
SSI	58	33.5%
No SSI	115	66.5%
Total	173	100%

Table-II. Frequency of SSI

As shown in Table-III, In 18-40 years age group, the SSI rate was 35.3% (32 cases with SSI, 79 cases without SSI), compared to 41-65 years age group, which had SSI rate of 41.9% (26 cases with SSI, 36 cases without SSI). The p-value for this comparison was 0.080, indicating a non-significant difference in SSI rates between the two age groups. Similarly, when comparing SSI rates based on gender, it was found that there was no significant difference between male patients, with an SSI rate of 36.7% (44 cases with SSI, 76 cases without SSI), and female patients, with an SSI rate of 26.4% (14 cases with SSI, 39 cases without SSI). The p-value for this comparison was 0.223, suggesting no significant disparity in SSI rates between males and females. In terms of BMI categories, the analysis revealed that there was no significant difference in SSI rates between the different categories. Under the Underweight category, there were no cases with SSI and 8 cases without SSI. In the Normal category, the SSI rate was 36.1% (40 cases with SSI, 71 cases without SSI). The Overweight category had an SSI rate of 31.2% (10 cases with SSI, 22 cases without SSI), and the Obese category had an SSI rate of 36.4% (8 cases with SSI, 14 cases without SSI). The p-value for the comparison of SSI rates among the BMI categories was 0.212, indicating no statistically significant difference.

Categories	SSI		P-Value
	Yes	No	
Age group			
18-40 years	32(35.3%)	79(64.7%)	
41-65 years	26(41.9%)	36(58.1%)	
Total	58	115	0.080
Gender			
Female	14(26.4%)	39(73.6%)	
Male	44(36.7%)	76(63.3%)	
Total	58	115	0.223
BMI			
Underweight	0	8(100%)	
Normal	40(36.1%)	71(63.9%)	
Overweight	10(31.2%)	22(68.8%)	
Obese	8(36.4%)	14(63.6%)	
Total	58	115	0.212

Table-III. Comparison of Postoperative SSI Rates by Age Group, Gender, and BMI

Table-IV shows the correlation between the indication of laparotomy and the development

of surgical site infection (SSI) in 173 patients. The results indicate that SSI rates varied across different indications for laparotomy. Patients with duodenal perforation had the highest SSI rate 75% (6 out of 8). The overall P value for the correlation between indication of laparotomy and SSI was significant at 0.001

Indications of Laparatomy	Surgical Site Infection		Total
	Yes	No	
Blunt Trauma (RTA)	2	16	18
Duodenal Perforation	6	2	8
Enteric Perforation	18	18	36
Gallbladder Perforation	2	0	2
Intestinal Obstruction	14	29	43
Intrabdominal Abscess	4	2	6
Ischemic Gut Injury	0	2	2
Liver Abscess	0	2	2
Penetrating Trauma (FAI)	8	20	28
Penetrating Trauma (Stab Wound)	0	10	10
Perforated Appendicitis	4	10	14
Sigmoid Volvulus	0	4	4
Total	58	115	173
P value			0.001

Table-IV. Cross tabulation between indication of laparotomy and SSI:

DISCUSSION

Surgical infections contributed considerably to the global illness burden. LMICs (lower-middle-income nations) face numerous management challenges. One of the major challenges continues to be the rising rate of antimicrobial resistance (AMR), which is most likely connected to antibiotic abuse. Expansion of surveillance, infection prevention, and antimicrobial stewardship programmes are first steps towards decreasing surgical infection.[12]

In our study the frequency of SSI after emergency exploratory laparotomy was 33.5%. These results are similar to study conducted in Nigeria which showed SSI rate of 44.7% in emergency surgeries.[13] In study conducted in Abbottabad showed prevalence of 27.7% SSI in emergency procedures.[14] Other study conducted by Shafi et al. showed 17.7% SSI in emergency cases.[15]

In our study, age group 41-65yrs had SSI rate of 41.9% compared to 35.3 % in age group 18-40yrs. These findings are comparable to study conducted to Sattar F et.al.[14]

Our study showed no statistically significant difference in developing rate of SSI between men and female with the p value of 0.080. These results are comparable to other studies.[14,15] These findings are opposite to other studies which showed statistically significant difference between male and female.[16,17]

Our study showed that patients in obese category showed 36.4% of SSI compare to 36.1% of SSIs in normal BMI patients with insignificant p value of 0.221.These results are comparable to results of other studies.[13-17]

In our study gut perforation such as duodenal and intestinal perforation accounted for overall increase frequency SSI compared to other pathologies. Same findings were noted in other studies where accounted for large proportion of SSI in emergency surgeries.[18-20]

SSIs are the one of the leading cause of morbidity in emergency abdominal surgeries and that lead to burden on not only healthcare setups but also adverse effects on the outcome i.e. morbidity and overall quality of life of patients. Our study highlights that the frequency of SSIs after emergency abdominal surgeries is quite high in our setups and they don't meet the international criteria set by World health organization and CDC.[12] Measures needs to be taken to cope the emerging increase incidences of surgical site infections and that eventually leads to increase burden on health care setups in term of costs and morbidity of patients.

Our Study is subjected to few limitation worth nothing. 1) Sample size might be low 2) We didn't measure the association between length of surgery and rate of SSI that might have impact on results 3) Socioeconomic and education status may influence the outcomes following surgeries and we didn't included those variables in our study 4) Sampling technique was non probability

consecutive 5) Time taken from diagnosis of patient till referral to our unit was not calculated and it might impact the occurrence of SSIs.

Despite limitation the study highlights the importance of infection control measures in surgical settings and the need for continued efforts to improve patient outcomes.

CONCLUSION

The overall frequency of SSIs after emergency laparotomy was 33.5%. Injudicious use of antibiotics for preventing SSIs leads to antimicrobial resistance and proper strategy should be devised to prevent SSIs after surgeries.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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1	**Haris Khan:** Manuscript writing, data analysis, final drafting.
2	**Moiz Azhar:** Manuscript writing, data analysis, data collection, final drafting.
3	**Talha Baig:** Proof reading, final drafting, conceptualization.
4	**Hassan Niaz:** Final drafting, data analysis.
5	**Muhammad Mustafeez Waheed Jami:** Final drafting, proof reading, conceptualization.
6	**Muhammad Zeb:** Proof reading, computer work, conceptualization.
7	**Muhammad Abbas:** Proof reading, final drafting.