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ORIGINAL ARTICLE

Postoperative Surveillance for Surgical Site Infections (SSIs) and Altered Anatomy after Open Appendectomy.

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ABSTRACT… Objective: To discover the frequency of surgical site infections (SSIs) for acute appendicitis and altered anatomy following the open appendectomy. **Study Design:** Cross Sectional study. **Setting:** Department of Surgery, Khyber Teaching Hospital, Peshawar. **Period:** January 2021 to June 2021. **Material & Methods:** In this research, overall, 287 patients were examined and scrutinized. After obtaining the informed consent and detailed history, all the patients considered of having appendicitis were placed on the next OT list. Typical pre-operative measures were followed. In all cases, a single qualified general surgeon carried out all the surgeries. Once the surgeries were completed, standard post-operative protocols were maintained for all patients which included antibiotics like ciprofloxacin 500mg BD+ Flagyl 400mg/100ml TDS, analgesics (like diclofenac 50 mg TDS) and wound dressings for 24 hours. **Results:** In the current study, the average age was 33 years with a standard deviation (SD) ±9.81. Fifty six (56%) percent of the research participants were males, while 44% were females. The duration of surgery was 45 minutes on average with SD±5.94. Mean BMI was 25 Kg/m^2 with SD±4.77. Twenty percent (20%) of patients did not use proper medicine while 80% patients had used proper medicine. Seventy-nine (79%) percent of patients had wound care but 21% of patients did not have wound care. Moreover, 18% of patients had SSI and 82% of patients did not have SSI. **Conclusion:** We concluded from our study that the frequency of surgical site infections (SSIs) was around 18% after the open appendectomy for acute appendicitis.

Key words: Anatomy, Acute Appendicitis, Appendectomy, Surgical Site Infections, Surveillance.

INTRODUCTION

Infection is known as a clinical representation of the inflammatory reaction commenced by microorganisms' attack and spread.[1] A Surgical Site Infection (SSI) is an infection known to develop post-surgery duration in the region of the body that was operated on.[2] As a result, it is one of the most commonly presented surgical conditions and healthcare-associated infection (HCAI).[1,3] Superficial Surgical Site Infection (SSSI) can occasionally just affect the skin. Others are more significant, affecting tissues under the skin, organs, or implanted material, and can be more dangerous.[2] Haridas M et al. determined that 83.6 percent of the superficial, 7.3% of the deep and 9.3% of the organ SSIs were related.[4] SSIs are characterized by redness and discomfort in the surgical area, drainage of murky fluid from the surgical incision, and a high temperature.[2] On average, SSIs occur in 40 percent of surgical trials, prolonging the healing process by one week on average.[1] This often leads to the necessity for a second surgery. Every year, approximately 500,000 SSIs happen globally, with 2 to 5% of patients experiencing inpatient surgery being evaluated solely in the United States.[5]

SSI is a leading cause of prolonged hospitalization, morbidity, and higher healthcare expenditures.[1] When relating these patients with those who did not have an SSI, each SSI is linked with roughly a week to ten extra postoperative days in the hospital and a 2 to 1 ratio of increased chance of mortality.[3]

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Seventy-seven percent of SSI-associated fatalities are directly connected to the SSI itself. It is predicted that 55% of patients undergoing surgery would likely get an SSI, resulting in a prolonged stay and higher morbidity and death. Appendectomy is the surgical intervention for appendicitis, which is an inflammation of the appendix and most happening surgical emergency, with a mortality risk of 12% for men and 25% for women.[6,7] Amyan, an English army surgeon, conducted the first appendectomy in the year 1735. He performed the procedure without anesthetic to eliminate a ruptured appendix. Appendectomy is the most common emergency surgical practice performed internationally, with appendicitis accounting for over 1 million days per year in the hospital.[8] Complex appendectomy is used to treat appendicitis with a perforated or gangrenous appendix, with or without confined or disseminated peritonitis.[9] Perforation, empyema, abscess development, and fecal peritonitis are among the complications of surgical removal of appendicitis.[10] A perforated appendix can be removed by laparoscopic or open appendectomy.

Health-care-associated illnesses, such as SSI can have severe cost and morbidity implications for patients.[11] In research reported by Danwang C et al, SSI occurred in 4.9% of patients who underwent open appendectomy.[12] In one other study by Mueck KM et al, 12.14% of patients developed SSI after open appendectomy.[13] The rationale of this study is to assess the incidence of SSI following acute appendicitis appendectomy. There have been findings that suggest steps may be done at the pre-operative, intra-operative, and post-operative phases to decrease the chance of emerging an SSI[3] since if an SSI occurs following surgery, it places a significant cost on both the patient and the health system. Our results may differ from other studies and literature because of poor compliance of medicine, and no proper wound care in our population. By knowing the latest and updated statistics about the magnitude of SSI we will be able to suggest future research needs before we can devise a proper surgical protocol for the prevention of SSI after appendectomy. The results will be proposed to other health professionals locally to make them sensitive about the degree of the problem. This will assist in careful use of appendectomy of acute appendicitis and healthier services can be provided to the patients to decrease morbidity and mortality.

To discover the frequency of surgical site infections (SSIs) for acute appendicitis and altered anatomy following the open appendectomy.

Operational Definitions

Acute Appendicitis

Acute appendicitis was diagnosed on the source of occurrence of all of the following features: Abrupt onset of pain in the right iliac fossa, Vomiting (forceful expulsion of gastric contents even for one time) on history, Tenderness in a right iliac fossa on physical examination and raised leukocyte count of $\geq$10000 cm^3/dl on laboratory investigation.

Surgical Site Infection

Surgical site infection was identified based on all subsequent characteristics detected till the 15th postoperative day:

- Redness, detected by naked eyes.
- Swelling, detected by naked eyes.
- Discharge of pus (yellowish fluid from wound confirmed by culture in a laboratory)

MATERIAL & METHODS

The cross sectional study was conducted at Department of Surgery, Khyber Teaching Hospital, Peshawar for 06 months (01/01/2021 to 30/06/2021).

The sample size calculated through WHO sample size calculator was 287 patients, 4.9%[13] proportions of surgical site infections after appendectomy with a 2.5% margin of error and 95% confidence interval. Non-probability consecutive sampling was done.

Inclusion Criteria

All patients who are having an open appendectomy for acute appendicitis.
Either gender.
Age 18 years to 60 years.

Exclusion Criteria

Patients with previously diagnosed diabetes and a fasting blood glucose level of more than 126mg/dl at the time of admission.

All patients who had an appendectomy for appendicular mass was included in the study.

Patients with a history of last one month on steroid.

After obtaining the ethical approval from Institutional Ethical Review Board (IERB), NMC vide No: NMC/IERB/Sec. All indoor patients, as well as patients from outpatient departments fulfilling the inclusion standards, were included in the research study. The rationale and advantages of the study and the complete course of action of appendectomy were explained to the patients and written informed consent was signed. All patients were interviewed for a detailed complete history and examination like measuring pain on VAS, leucocytes level on CBC test and ultrasound was done for the diagnosis of acute appendicitis. Everyone suspected of having appendicitis was placed on the next OT list. Typical pre-operative trials were implemented. A single experienced general surgeon fellow of CPSP having about five years of surgical experience performed all the surgeries. Once the surgery was completed, standard post-operative protocols were maintained for all patients which included antibiotics like ciprofloxacin 500mg BD and Flagyl 400mg/100ml TDS, Analgesics (like diclofenac 50mg TDS) and wound dressings by a male nurse for 24 hours. All the patients were discharged if there were no complaints. All the patients were followed up after 7^{th} and 15^{th} post-op day for the evaluation of SSI. Diagnosis of SSI was done on the basis of redness, detected by naked eyes and discharge of pus (yellowish fluid from wound confirmed by culture in the laboratory). Any patient who lost to follow up had been excluded from the study. Strict exclusion criteria had been followed to control confounders and bias in study results. All the preceding stated information comprising name, age and gender was noted in the Performa.

The data collected was evaluated using SPSS version 25. Mean±SD were computed for continuous variables such as age, duration of surgery and BMI. For categorical variables such as gender, medication and wound care compliance, and SSI, frequencies and percentages were computed. SSI was stratified with age, gender, duration of surgery, BMI, Compliance of medicine and wound care to see how the outcome changes. The post-stratification chi-square test was used, with a p-value ≤ 0.05 deemed significant. All of the findings were provided in the form of tables and graphs.

RESULTS

In the present research, the age distribution was analyzed as follows: 98 (34%) patients were between the ages of 18 and 30 years, 103 (36%) patients were between the ages of 31 and 40 years, 52 (18%) patients were between the ages of 41 and 50 years, and 34 (12%) patients were between the ages of 51 and 60 years. The mean age was 33 years, with a standard deviation of 9.81 years (Table-I). The gender distribution was examined, and 161 (56%) of the patients were male, while 126 (44%) were female (Table-II). The duration of surgery was examined, with 187 (65%) patients having duration of surgery of 45 minutes or less, and 100 (35%) patients having duration of surgery of more than 45 minutes. The average surgical time was 45 minutes, with a standard deviation of 5.94 minutes (Table-III). Status of BMI was analyzed as 178 (62%) patients had BMI < 25 Kg/m^2 and 109 (38%) patients 178 (62%) patients had BMI >25 Kg/m^2. Mean BMI was 25Kg/m^2 with SD$\pm$4.77 (Table-IV). Compliance of medicine was analyzed as 57 (20%) patients did not use proper medicine while 220 (80%) patients had used proper medicine (Table-V). The status of wound care was analyzed as 227 (79%) patients had wound care but 60 (21%) patients did not have wound care (Table-VI). The frequency of SSI was analyzed as 52 (18%) patients had SSI while 235 (82%) patients did not have SSI (Table-VII). Stratification of SSI with respect to age, gender, duration of surgery, BMI, Compliance of medicine and wound care is given in Table-VIII, IX, X, XI, XII and XIII.

Age	Frequency (%)
18-30 Years	98 (34%)
31-40 Years	103 (36%)
41-50 Years	52 (18%)
51-60 Years	34 (12%)
Total	287 (100%)

Table-I. Age distribution.
Mean age was 33 years with SD±9.81.

Gender	Frequency (%)
Male	161 (56%)
Female	126 (44%)
Total	287 (100%)

Table-II. Gender distribution.

Duration	Frequency (%)
<45 Minutes	187 (65%)
>45 Minutes	100 (35%)
Total	287 (100%)

Table-III. Duration of surgery.
Mean of surgery duration was 45 minutes with SD±5.94

BMI	Frequency (%)
<25Kg/m^2	178 (62%)
>25Kg/m^2	109 (38%)
Total	287 (100%)

Table-IV. Status of BMI.
Mean BMI was 25 Kg/m^{2}with SD±4.77

Compliance of Medicines	Frequency (%)
Yes	57 (20%)
No	230 (80%)
Total	287 (100%)

Table-V. Compliance of medicines.

Wound Care	Frequency (%)
Yes	227 (79%)
No	60 (21%)
Total	287 (100%)

Table-VI. Wound care.

Surgical Site Infection	Frequency (%)
Yes	52 (18%)
No	235 (82%)
Total	287 (100%)

Table-VII. Surgical site infection.

SSI	18-30 Years	31-40 Years	41-50 Years	51-60 Years	To tal	P-Value
Yes	18	19	9	6	52	0.9979
No	80	84	43	28	235	
Total	98	103	52	34	287	

Table-VIII. Stratification of surgical site infection with respect to age.

SSI	Male	Female	Total	P-Value
Yes	29	23	52	0.9579
No	132	103	235	
Total	161	126	287	

Table-IX. Stratification of surgical site infection with respect to gender.

SSI	<45 Minutes	>45 Minutes	Total	P-Value
Yes	30	22	52	0.2118
No	157	78	235	
Total	187	100	287	

Table-X. Stratification of surgical site infection with respect to duration of surgery.

SSI	<25Kg/m^2	>25Kg/m^2	Total	P-Value
Yes	20	32	52	0.0001
No	158	77	235	
Total	178	109	287	

Table-XI. Stratification of surgical site infection with respect to BMI.

SSI	Yes	No	Total	P-Value
Yes	47	5	52	0.0001
No	10	225	235	
Total	57	230	287	

Table-XII. Stratification of surgical site infection with respect to compliance of medicines.

SSI	Yes	No	Total	P-Value
Yes	2	50	52	0.0001
No	225	10	235	
Total	227	60	287	

Table-XIII. Stratification of surgical site infection with respect to wound care.

DISCUSSION

According to our findings, the average age was 33 years, with SD± 9.81. Fifty-six percent of patients were men, while 44 percent were women. The average time for operation was 45 minutes, with an SD±5.94. Mean BMI was 25Kg/m^2 with SD±4.77. Twenty percent of patients did not use proper medicine while 80% of patients had used proper medicine. Seventy-nine percent patients had wound care but 21% patients did not have wound care. Moreover, 18% of patients had SSI and 82% of patients did not have SSI. Similar findings were found in another study done by Ibrahim T et al.[14], where the mean age and gender

in both groups were negligible with (p=0.077) and (p=0.3321) respectively. The overall rate of SSI in LA minimum (3% versus 11.68% in the laparoscopic and open groups respectively), was statistically significant (p=0.03). There was some degree of pain perceived by patients in both the groups, in group LA 37 (48.05%) perceived pain of variable degree and in OA group 77 (100%) perceived pain (p=0.001).

Comparable discoveries were seen in another study directed by Hattori T et al.[15] in which an aggregate of 154 were incorporated into this study requiring treatment for intense a ruptured appendix, out of which 13/77 in open appendectomy (16.8%) created SSI. Every one of the instances of shallow SSI was treated with wound toilets, povidone-iodine packs, oral anti-microbial and day by day dressings with uneventful recuperation. There was no organ space disease in either gather. The individuals who created SSI were incision in both the gatherings. There were no profound or organ contaminations found in either assembly. Persistent in both the gathering create SSI right lower quadrant (RLQ). In another study conducted by Chen C et al.[16] had reported that surgical site disease has been generally used to analyze the two modalities of medicines for intense an infected appendix. It may not be a genuine entanglement all alone but rather may hamper patients' improvement time and personal satisfaction with the profound SSI ended up being life undermining in numerous patients. The mean age was 30 years with SD±12.37. Sixty percent of the patients were men, and forty percent were women. In individuals with acute appendicitis, the rate of surgical site infection was 20%. Our findings are consistent with those of Song DW et al.[17], found that the average age for the open appendectomy was 10 years with SD±1.26. Sixty percent of the patients were men, and 40% were women. More than 20% of patients experienced surgical site infection, for which open appendectomy was recommended in 80% of cases.

CONCLUSION

We concluded from our study that the frequency of surgical site infections (SSIs) was around 18% after the open appendectomy for acute appendicitis.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Aqsa Saleema	Overall conduction of reserach and analysis of results.	
2	Muhammad Haris	Introduction, Writing and data analysis.	
3	Abdullah	Discussion writing.	
4	Usman Afridi	Critical review of the manuscript.	
5	Abeer Jehanzeb Khan	Results analysis.	
6	Khalid Rehman	Abstract writing.	
7	M. Jehangir Khan	Referencing and compilation of the whole draft.	
8	Sobia Haris	Results analysis.	
9	Farah Deeba	Results Writing.