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Original Research Article

FREQUENCY OF SURGICAL SITE INFECTION IN PATIENTS UNDERGOING APPENDECTOMY WITH IMIPENEM SOLUTION WOUND IRRIGATION

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ABSTRACT

Background: *Surgical site infection (SSI) remains a significant postoperative complication following appendectomy, leading to increased morbidity, hospital stay, and healthcare costs. The use of intraoperative antibiotic wound irrigation has been proposed to reduce infection rates, though its effectiveness varies across studies.* ***Objective:*** *To determine the frequency of surgical site infection in patients undergoing appendectomy with imipenem solution wound irrigation at Saidu Group of Teaching Hospital, Swat.* ***Study Design:*** *Descriptive study.* ***Setting:*** *Department of Surgery, Saidu Group of Teaching Hospital, Swat, Pakistan.* ***Duration of Study:*** *From 13-August-2024 to 13-February-2025.* ***Methods:*** *A total of 132 patients diagnosed with acute appendicitis based on clinical and ultrasonographic findings were enrolled. All underwent open appendectomy. Before skin closure, each surgical wound was irrigated with 1 L of normal saline containing 1 g of imipenem. Patients were followed for 30 days postoperatively for signs of SSI, which was diagnosed by the presence of purulent discharge, pain, redness, swelling, or warmth at the incision site. Data were analyzed using SPSS version 25, and associations between SSI and comorbid conditions were evaluated using the Chi-square test.* ***Results:*** *Of the 130 patients, 77 (58.3%) were males and 55 (41.7%) females, with a mean age of [insert mean ± SD if available] years. The overall SSI frequency was 9 (6.8%). Hypertension and diabetes mellitus were significantly associated with the development of SSI ($p < 0.05$).* ***Conclusion:*** *The incidence of surgical site infection following appendectomy with imipenem solution wound irrigation was 6.8%. The findings suggest that imipenem irrigation may effectively reduce SSI risk; however, comorbidities such as hypertension and diabetes remain significant contributing factors.*

Keywords: Appendectomy, Surgical Site Infection, Wound Irrigation, Imipenem

INTRODUCTION

Appendectomy is a surgical procedure commonly carried out globally, primarily executed as a last resort for the treatment of acute appendicitis (AP). The appendix, even though its precise function remains unclear, is vulnerable to inflammation, which may lead to serious medical issues if left untreated. Surgery frequently becomes indicated when symptoms, including abdominal pain and fever, escalate in severity. Early detection is critical to prevent the rupture of the appendix, which can lead to the release of an infectious substance into the abdominal cavity. This may lead to peritonitis, a severe infection of the abdominal lining. Appendectomy can be carried out via traditional open surgery as well as laparoscopic techniques, with the latter gaining popularity due to its less invasive nature and reduced recovery times (1-3).

A study comprised 245 patients suspected of AP with a mean age of 44±5.03 years. Among the participants, 59% were males, while 41% were females. The incidence of AP was determined to be 61%. [4] Surgical site infection (SSI) constitutes a notable complication that may arise after multiple types of surgery, which include both minor outpatient surgeries as well as intricate operations. SSIs are defined by the identification of infectious agents at the surgical incision site or in adjacent tissues. Infections can manifest as superficial lesions involving the skin and subcutaneous tissues. SSIs lengthen hospital stays as well as increase healthcare costs, and if left untreated, they could contribute to significant mortality and morbidity (5-9).

When used as an irrigation solution, imipenem penetrates the wound bed effectively, reaching areas that may be inaccessible to systemic antibiotics or alternative topical treatments. The intended administration allows the drug to achieve elevated concentrations in the designated area, successfully eliminating bacteria within the wound and inhibiting biofilm formation, which could lead to persistent infection and impede healing (10, 11).

SSIs are a notable factor that leads to extended hospitalisations, elevated healthcare expenses, and increased patient morbidity. The use of imipenem solution offers an innovative approach to wound irrigation, potentially reducing the risk of SSIs and enhancing wound healing. There is a notable scarcity of literature on this subject in the local context. This study aims to determine the frequency of SSIs in patients undergoing appendectomy with imipenem solution wound irrigation at our healthcare facility. The results of this study will assist medical professionals in addressing this knowledge gap, potentially contributing to infection prevention strategies and enhancing patient outcomes in this clinical environment.

METHODOLOGY

This descriptive study was conducted in the General Surgery Department, Saidu Group of Teaching Hospital, Swat. Ethical approval was obtained from the hospital. The study duration was 13-August-2024 to 13-February-2025. A sample size of 132 patients was calculated based on the previous SSI frequency of 7.5%12, a 95% confidence level, and a margin of error of 4.5%. Patient selection was carried out using a non-probability consecutive sampling technique.

We selected patients aged 18 to 60 years, both genders included. These patients were diagnosed with appendicitis and underwent appendectomy. Acute appendicitis was established through ultrasound evaluation, which revealed a hyperechoic appendicolith, a wall thickening of> 3 mm, and the presence of echogenic periappendiceal fat, along with symptoms such as periumbilical pain (VAS > 4), nausea, and vomiting. Patients presenting with peritonitis, bleeding disorders, women who were pregnant or lactating, and patients who were immunocompromised were dropped from the study.

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Upon receiving written consent from the patients, their demographic data, such as age, gender, BMI, socioeconomic status, employment status, education status, place of living, and comorbidities (Hypertension/Diabetes), were stored on a structured pro forma.

All patients underwent an open appendectomy procedure under general anesthesia. The surgical protocol involved the separation and removal of the appendix from the blood vessels and surrounding tissues. Before wound closure, the operative site was irrigated with a solution of Imipenem prepared by mixing 1 g of the antibiotic with 1 L of normal saline. Surgical site infections were observed in all patients within 30 days of surgery. A surgical site infection was defined in our study as the presence of infection at or near the incision site with clinical signs including pain (VAS > 3), redness, swelling, and warmth. Physical examination was conducted to reveal purulent drainage or discharge from the wound. The entire process was performed under the supervision of a consultant with at least 5 years of experience after fellowship.

Data was analyzed using SPSS 27. Categorical demographics/comorbidities and SSI were evaluated using frequency and percentages. BMI and age were calculated using the mean and SD. The chi-square test was applied to stratify SSI by demographics and comorbidities. Significance was achieved if $P \leq 0.05$.

RESULTS

This study included 132 patients, with a mean age of 37.44 ± 11.73 years. The gender distribution showed that 77 (58.3%) were male patients and 55 (41.7%) were female patients. Twenty-six patients (19.7%) had hypertension, and 15 (11.4%) had diabetes (Table 1).

The incidence of surgical site infection in our study was 9 (6.8%), while 123 (93.2%) patients did not have an infection (Table 2).

When we performed stratification of SSI with demographic and comorbidities, we found that hypertension and diabetes were significantly linked with SSI. Demographics did not show any potential association with SSI (Table 3).

Table 1: Demographic variables

Demographic variables		n	%
Gender	Male	77	58.3%
	Female	55	41.7%
Socioeconomic status	Lower class	31	23.5%
	Middle class	78	59.1%
	Upper class	23	17.4%
Education status	Literate	61	46.2%
	Illiterate	71	53.8%
Place of living	Rural	57	43.2%
	Urban	75	56.8%
Employment status	Employed	60	45.5%
	Unemployed	72	54.5%
Mean age: 37.44 ± 11.73 years *Mean BMI: 24.46 ± 1.51 kg/m²*			

Table 2: Frequency of surgical site infection

SSI	n	%
Yes	9	6.8%
No	123	93.2%

Table 3: Association of SSI with demographics and comorbidities

Demographics & comorbidities		SSI				P value
		Yes		No		
		n	%	n	%	
Age groups (Years)	18 to 30	2	22.2%	45	36.6%	NS
	31 to 45	3	33.3%	44	35.8%	
	> 45	4	44.4%	34	27.6%	
BMI (Kg/m^2)	18.5 to 24.9	5	55.6%	75	61.0%	NS
	> 24.9	4	44.4%	48	39.0%	
Gender	Male	3	33.3%	74	60.2%	NS
	Female	6	66.7%	49	39.8%	
Socioeconomic status	Lower class	4	44.4%	27	22.0%	NS
	Middle class	4	44.4%	74	60.2%	
	Upper class	1	11.1%	22	17.9%	
Education status	Literate	3	33.3%	58	47.2%	NS
	Illiterate	6	66.7%	65	52.8%	
Place of living	Rural	2	22.2%	55	44.7%	NS
	Urban	7	77.8%	68	55.3%	
Employment status	Employed	3	33.3%	57	46.3%	NS
	Unemployed	6	66.7%	66	53.7%	
Hypertension	Yes	7	77.8%	19	15.4%	P < 0.001
	No	2	22.2%	104	84.6%	
Diabetes	Yes	5	55.6%	10	8.1%	P < 0.001
	No	4	44.4%	113	91.9%	
NS = Not significant (P > 0.05)						

DISCUSSION

Our results showed an SSI rate of 6.8%, which aligns closely with several other studies that used imipenem as an irrigant. Aslam et al. reported a similar SSI rate of 6.0% in their imipenem group (11). Another study by Shah et al. reported an SSI rate of 7.5%. Similarly, the prospective study by Zeb et al. found a rate of 7.5% (13). This consistency across different study designs and settings strengthens the argument for the efficacy of imipenem irrigation. The quasi-experimental study by Khan et al. reported an even lower rate of 2.4% a finding they attributed to the prophylactic protocol and the specific concentration of their imipenem-cilastatin solution (14). Shah et al. reported the incidence of SSI in the normal saline group at 15%; Zeb et al. reported SSI in the control group at 15.1%; and Khan et al. reported SSI in the normal saline group at 8%. These findings strongly suggest that imipenem irrigation offers a superior protective effect

against wound contamination and subsequent infection compared to saline irrigation alone (12, 14).

Our patient cohort had a mean age of 37.44 years and a mean BMI of 24.46 kg/m², representing a slightly older, yet comparable, weight population relative to other studies, which typically reported mean ages in the mid-twenties (12, 13). Despite this, in our sample, age and BMI were not found to be statistically significant risk factors for infection. The gender distribution in our study (58.3% males) was consistent with the well-documented male predominance in acute appendicitis, a trend observed in prior studies (11-13).

The most notable findings from our analysis were the role of comorbidities. We identified a potential association between both hypertension and diabetes with the development of SSI. A substantial 77.8% of the patients who developed an SSI were hypertensive compared to only 15.4% in the non-SSI group. Similarly, 55.6% of the SSI patients had diabetes versus a mere 8.1% in the non-infected group. This observation aligns with a study that reported that diabetes is a critical risk factor for SSI in different types of surgeries (15). Amirah et al. documented that comorbidities can increase the chances for SSI, including diabetes, hypertension, renal disease, and heart disease (16). It is important to note that several studies have explicitly excluded patients with such comorbidities to control for confounding variables (13, 10). Our study, by including these patients, provides a more realistic scenario of the general surgical population and highlights a high-risk subgroup. This emphasizes the need for strict monitoring of patients with diabetes and hypertension preoperatively and postoperatively.

Our findings regarding the non-significance of socioeconomic status, education, and place of residence in relation to SSI are encouraging as they suggest that the surgical intervention and postoperative care were applied justifiably. However, these factors can indirectly influence outcomes through access to nutrition and follow-up care, and overall health literacy, which need further investigation in larger and more diverse cohorts.

CONCLUSION

From our study, we conclude that the surgical site infection rate in patients who underwent appendectomy with imipenem solution wound irrigation was 6.8%. Comorbidities such as hypertension and diabetes had a significant relationship with SSI.

DECLARATIONS

Data Availability Statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned. (IRB-024)

Consent for publication

Approved

Funding

Not applicable

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTION

SHER AFGAN (Postgraduate Resident)

Data Collection, Manuscript writing, Review of manuscript, and final approval of manuscript.

FAZLI AKBAR (Professor)

Supervision of research work, Study Design, Conception of Study, and Final approval of manuscript.

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