

SURGICAL SITE INFECTION AMONG PATIENTS UNDERGOING APPENDECTOMY BY UTILIZING ANTIMICROBIAL COATED SUTURE

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ABSTRACT

Background: Surgical site infection (SSI) remains one of the most frequent complications following appendectomy, contributing to prolonged hospitalization, higher healthcare costs, and increased postoperative morbidity. The introduction of antimicrobial-coated sutures has been shown to reduce bacterial colonization at the incision site, potentially lowering SSI rates. **Objective:** To evaluate the frequency of surgical site infection among patients undergoing appendectomy using antimicrobial-coated sutures. **Study Design:** Descriptive study. **Setting:** Department of Surgery, at Lady Reading Hospital, Peshawar, Pakistan. **Duration of Study:** From 30-07-2023 to 30-01-2024. **Methods:** A total of 177 patients of either gender, aged 18–70 years, who underwent appendectomy with abdominal sheath closure using antimicrobial-coated sutures were included. Patients with end-stage renal disease or immunocompromised status were excluded. SSI was diagnosed based on clinical signs such as purulent drainage, localized pain, swelling, or fever within 10 days postoperatively. Data were analyzed using SPSS version 23, and the association between SSI and demographic and clinical variables was assessed using the Chi-square test, with a significance threshold of $p < 0.05$. **Results:** Among 177 patients, 110 (62.1%) were male and 67 (37.9%) were female. Hypertension was present in 39 (22.0%), diabetes mellitus in 23 (13.0%), and a history of smoking in 26 (14.7%) patients. The overall SSI frequency was 12 (6.8%). A statistically significant association was observed between increasing age and SSI development ($p = 0.01$). **Conclusion:** The use of antimicrobial-coated sutures in appendectomy was associated with a relatively low rate of surgical site infection (6.8%). Increasing age was significantly related to the development of SSI, highlighting the need for targeted preventive strategies in older patients.

Keywords: Surgical Site Infection, Appendectomy, Antimicrobial Suture, Risk Factors, Postoperative Complications

INTRODUCTION

The laparoscopic approach for appendix removal has become increasingly the preferred method over conventional open surgery. Nearly every individual who presents with urgent abdominal pain must undergo a screening for acute appendicitis. Despite improvements in imaging diagnostics, clinical Diagnosis of appendicitis continues to present challenges due to its resemblance to other inflammatory conditions. Symptoms of acute appendicitis (AP) may also be attributed to ovarian torsion, diverticulitis, and inflammatory bowel disease (1). AP generally presents with fever and abdominal pain that spreads to the right lower quadrant (2). Identifying the root cause of stomach discomfort can be complicated (1-3). When a Diagnosis remains ambiguous, medical tests such as CT scans or ultrasounds may provide valuable insights. Nevertheless, a thorough evaluation of the patient's reported symptoms and physical examination results demonstrated greater reliability than any imaging study (4). Individuals below the age of 18 exhibit a greater probability of receiving a Diagnosis of appendicitis, a Diagnosis that is frequently subject to debate. The primary symptom related to AP is recurrent pain located in the right lower quadrant, which typically does not escalate to severe pain, as well as localized peritonitis. Specific surgeons have recommended elective appendectomy for this demographic due to its demonstrated effectiveness in alleviating symptoms for numerous patients (5, 6). Following resolution of the acute inflammatory response, percutaneous drainage, along with interval appendectomy, may be employed as successful therapies for perforated appendicitis with abscess formation (7). Appendiceal tumors demonstrate considerable pathological diversity. A study reported a surgical site infection rate of 8% in patients undergoing appendectomy with antimicrobial-coated sutures (8). An appendectomy is indicated in cases where a lesion is present in the

appendix (9). A recognized worldwide antimicrobial suture is Vicryl Plus. Triclosan, a broad-spectrum antiseptic, has been utilized by humans for over 30 years (6). Evaluations conducted over two years revealed no evidence indicating carcinogenic risk or skin sensitivity. In vitro studies suggested antimicrobial activity against *S. aureus*, MRSA, Vancomycin-resistant *Enterococcus faecalis*, *Corynebacterium* spp., and *E. coli* (6).

In the current study, we aim to determine the frequency of surgical site infection in patients undergoing appendectomy using antimicrobial-coated sutures. To the best of my knowledge, this is the first clinical study conducted in our country. The outcome of this study will be helpful for patients' post-operative care by reducing morbidity.

METHODOLOGY

This descriptive study was conducted in the Department of Surgery at Lady Reading Hospital, Peshawar. An ethical certificate was obtained before the study began. Duration for study was [30-07-2023—30-01-2024]. Patients were enrolled using a consecutive nonprobability sampling technique.

The sample size for this research was calculated to be 177. This calculation was based on an expected surgical site infection frequency of 8% with 95% confidence and an absolute precision of 4%. The study included male and female patients between the ages of 18 and 70 years who underwent an appendectomy procedure and whose abdominal sheath was closed using an antimicrobial-coated suture. Patients who were immunocompromised, those with a missed intra-operative Diagnosis, and patients with end-stage renal disease were excluded from the research.

Each patient gave their consent. Data collection was conducted using a structured pro forma to record patients' age, gender, and area of residence. A physical examination was performed for all patients. The

operative procedure involved an appendectomy, defined as a major surgical intervention for the removal of the vermiform appendix. The key intervention was the use of an antimicrobial-coated suture—a suture material coated with an antibacterial agent—specifically for the closure of the abdominal sheath.

Surgical site infection was assessed postoperatively if it occurred at the surgical site within 10 days of the procedure and was accompanied by at least 2 of the following clinical signs: pain, swelling, fever, warmth, or purulent drainage. The entire process was carried out under the supervision of a surgeon with at least 5 years of post-fellowship experience.

SPSS 23 was used to perform the analysis. Age, weight, BMI, and height were calculated as means and SDs, while gender, area of residence, smoking history, hypertension, SSI, and diabetes were presented as frequencies and percentages. Demographics and comorbidities were stratified by SSI using the chi-square test; significance was achieved at $P \leq 0.05$.

RESULTS

Our cohort consisted of 110 male patients (62.1%) and 67 female patients (37.9%). Thirty-nine patients (22.0%) had hypertension, and 23 patients (13.0%) were diagnosed with diabetes. A history of smoking was reported in 26 cases (14.7%) (Table 1).

The frequency of surgical site infection in our cohort was 12 (6.8%) (Table 2). Analysis of potential risk factors showed that patient age was associated with the development of a surgical site infection. The infection rate was notably higher in older age groups, with 50.0% of

infections occurring in patients aged 36 to 50 years and 33.3% in those aged 50 years or older. In contrast, other baseline characteristics, including gender, area of residence, BMI, and the presence of hypertension, diabetes, or a history of smoking, did not show a statistically significant association with surgical site infection in this study population (Table 3).

Table 1: Baseline profile

Baseline profile			
Gender	Male	110	62.1%
	Female	67	37.9%
Area of residence	Urban	93	52.5%
	Rural	84	47.5%
Hypertension	Yes	39	22.0%
	No	138	78.0%
Smoking history	Yes	26	14.7%
	No	151	85.3%
Diabetes	Yes	23	13.0%
	No	154	87.0%
Age (Years)	36.11±14.675		
BMI (Kg/m ²)	24.1027±1.80361		

Table 2: Frequency of surgical site infection

Surgical site infection	Frequency	Percentage
Yes	12	6.8%
No	165	93.2%

Table 3: Association of baseline profile with surgical site infection

Baseline profile		Surgical site infection				P value
		Yes		No		
		n	%	n	%	
Age groups (Years)	18 to 35	2	16.7%	96	58.2%	P = 0.01
	36 to 50	6	50.0%	39	23.6%	
	> 50	4	33.3%	30	18.2%	
Gender	Male	8	66.7%	102	61.8%	P > 0.05
	Female	4	33.3%	63	38.2%	
Area of residence	Urban	7	58.3%	86	52.1%	P > 0.05
	Rural	5	41.7%	79	47.9%	
BMI (Kg/m2)	18.5 to 24.9	9	75.0%	107	64.8%	P > 0.05
	> 24.9	3	25.0%	58	35.2%	
Hypertension	Yes	4	33.3%	35	21.2%	P > 0.05
	No	8	66.7%	130	78.8%	
Smoking history	Yes	3	25.0%	23	13.9%	P > 0.05
	No	9	75.0%	142	86.1%	
Diabetes	Yes	3	25.0%	20	12.1%	P > 0.05
	No	9	75.0%	145	87.9%	

DISCUSSION

Our analysis identified a surgical site infection rate of 6.8% following appendectomy, providing valuable data for ongoing research on postoperative complications. This observed rate falls within the broad range reported in the global literature, which varies primarily by geographical setting, surgical approach, and patient risk profile. Our rate is notably lower than the pooled estimate of 17.9% reported by Foster et al. (12) for low- and middle-income countries. At the same time, it is higher than the 1.8% reported in the controlled groups of the comparative study by Doddannavar et al. (12) conducted in India. Another study reported the rate of SSI in patients undergoing abdominal surgeries to be 2 to 5% (13).

A pivotal finding of our investigation was the significant association between advancing patient age and the development of SSI. Our data

revealed a clear trend: only 16.7% of infections occurred in the youngest cohort (18-35 years), compared with 50.0% in the 36-50-year group and 33.3% in patients over 50. This suggests that older age may be an important risk factor in our patient population, potentially due to age-related declines in immune function or a higher prevalence of subclinical comorbidities. This finding stands in contrast to the study by Doddannavar et al., in which demographic characteristics, including age distribution, were comparable between their infected and non-infected groups, and to the study by Gul et al., which reported no significant association between age groups and SSI (12, 14). This discrepancy highlights that the impact of age may be affected by other factors, such as the patient selection, the study by Aderounmu et al., for example, specifically enrolled a low-risk population with no comorbidities reported in their research, which may have reduced the effect of age as an independent risk factor (15).

In our study, other demographic and comorbidity factors, including gender, hypertension, diabetes, and smoking history, did not demonstrate a statistically notable relationship with SSI. The absence of a significant link with diabetes and hypertension aligns with the findings of Doddannavar et al., who reported no associations between these comorbidities and SSI occurrence. Similarly, their study found a comparable and high prevalence of obesity between groups with and without infection (12). Our data on smoking, while not notable, showed a trend towards a higher proportion of smokers in the SSI group (25.0%) compared to the non-SSI group (13.9%). Although this did not reach significance in our cohort, it echoes concerns raised by Chua et al., where diabetes and smoking are listed among patient-related risk factors that can contribute to SSI.

Doddannavar et al. demonstrated a potential reduction in SSI with triclosan-coated polydioxanone sutures (1.8%) compared to conventional sutures (19.3%). Their study also reported a complete absence of deep SSIs in the triclosan group and a significantly shorter hospital stay, building a strong case for its clinical and economic benefit (12). Triclosan inhibits bacterial fatty acid synthesis, thereby disrupting colonization of the suture itself, a known nidus for infection.

Future research should include more variables that could contribute to the development of SSI, and include patients with complicated appendicitis.

CONCLUSION

In conclusion, the frequency of SSI in patients who had appendectomy using antimicrobial sutures was 6.8%. We found an association between SSI and increasing age. The lower SSI rate in our cohorts suggests that antimicrobial sutures are effective against infections.

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-785/LRH/MTI)

Consent for publication

Approved

Funding

Not applicable

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTION

ASMAT ULLAH (Postgraduate Resident)

Data collection, Data analysis, Manuscript writing, Review of manuscript, and final approval of manuscript.
Study Design, Review of Literature.

ADIL NIJAT BANGASH (Assistant Professor)

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

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