

A Hospital-Based Study on Single-Dose Antibiotic Prophylaxis in Laparoscopic Appendicectomy

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How to citation this article: Dr. Jhanavi R Parmar, Dr. A. O. Noyda, Dr. Kunj M Uperiya, “A Hospital-Based Study on Single-Dose Antibiotic Prophylaxis in Laparoscopic Appendicectomy”, IJMACR– September– 2026, Volume – 9, Issue – 5, P. No. 378 – 384.

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Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Purpose: Acute appendicitis is a common surgical emergency, and laparoscopic Appendicectomy is widely preferred due to reduced postoperative morbidity. Appropriate antibiotic prophylaxis is essential to prevent surgical site infection (SSI) while avoiding unnecessary antibiotic exposure and resistance. So this study was conducted to evaluate the safety and effectiveness of single-dose preoperative antibiotic prophylaxis in patients undergoing laparoscopic Appendicectomy for non-perforated appendicitis.

Methods: This retrospective hospital-based study included 50 patients who underwent laparoscopic Appendicectomy over a 12 - month period at a tertiary care centre. Patients with perforated or gangrenous appendicitis, open Appendicectomy, pregnancy, conservative management, or those receiving multiple-

dose antibiotics were excluded. All included patients received a single intravenous dose of ceftriaxone (1 g) at induction of anaesthesia. Demographic details, clinical presentation, operative findings, laboratory parameters, duration of surgery, postoperative hospital stay, and occurrence of SSI were analysed.

Results: The majority of patients were aged 21–30 years, with male predominance. Planned (interval) Appendicectomy accounted for 66% of cases. Surgical site infection occurred in 10% of patients, predominantly among those with longer hospital stays, higher preoperative leukocyte counts, and inflamed appendix on Intraoperative or Histopathological examination. No severe infections were observed, and most patients were discharged within 1–2 days.

Conclusion: Single-dose preoperative antibiotic prophylaxis in laparoscopic Appendicectomy for non-

perforated appendicitis is safe and effective, with low SSI rates, shorter hospital stay, and reduced antibiotic exposure.

Keywords: Antibiotic Prophylaxis, Laparoscopic Appendectomy, Single-Dose Antibiotic Prophylaxis, Surgical Site Infection

Introduction

Acute appendicitis remains one of the most common surgical emergencies encountered worldwide, with a lifetime risk of approximately 7–8% in the general population. Laparoscopic Appendectomy (LA) has progressively replaced open Appendectomy as the standard surgical approach due to its well-documented advantages, including reduced postoperative pain, shorter hospital stay, earlier return to daily activities, and lower rates of wound infection.^{1,2} Despite these benefits, surgical site infections (SSIs) and intra-abdominal complications continue to represent significant sources of postoperative morbidity, particularly in cases of gangrenous or perforated appendicitis.³

Antibiotic prophylaxis in surgery is defined as the administration of antibiotics prior to, during, or immediately after a procedure to prevent postoperative infectious complications rather than to treat an established infection.

The rationale for its use in Appendectomy is grounded in the fact that the gastrointestinal tract harbors a diverse poly microbial flora, and any breach during surgery carries the risk of contamination.⁴ International guidelines from bodies such as the World Health Organisation (WHO) and the Surgical Care Improvement Project (SCIP) have consistently emphasised the importance of appropriate timing, choice, and duration of prophylactic antibiotics in reducing SSI rates.⁵

A subject of ongoing debate in the surgical literature concerns whether a single preoperative dose of antibiotics is sufficient to confer adequate protection in patients undergoing laparoscopic Appendectomy for uncomplicated (non - perforated, non-gangrenous) appendicitis, or whether extended multiday post operative courses are necessary. Several randomised controlled trials and meta-analyses have demonstrated that single-dose prophylaxis is non-inferior to prolonged antibiotic regimens in terms of SSI incidence, organ/space infection, and length of hospital stay.^{6,7} This evidence has significant implications for antimicrobial stewardship, as unnecessary prolongation of antibiotic use contributes to rising rates of antimicrobial resistance, increased healthcare costs, adverse drug effects, and disruption of the host micro biome.

Despite the growing body of evidence favouring single-dose prophylaxis, wide variability in clinical practice persists across institutions and geographical regions. Many surgeons, particularly in resource-limited settings, continue to prescribe extended antibiotic courses empirically, often without robust institutional protocols or local evidence to support such decisions. There is thus a critical need for hospital-based prospective studies that evaluate the efficacy and safety of single-dose antibiotic prophylaxis in the specific context of laparoscopic Appendectomy, particularly in settings where patient demographics, pathogen profiles, and perioperative protocols may differ from those of Western populations.^{3,5}

The present hospital-based study was therefore designed to evaluate the outcomes of single-dose antibiotic prophylaxis in patients undergoing laparoscopic Appendectomy, with particular focus on postoperative SSI rates, length of hospital stay, and overall

complication profiles. By generating locally relevant clinical data, this study aims to contribute to evidence-based surgical protocols and support rational antibiotic stewardship in our institution.^{1,6}

Materials and Methodology

Study Design and Setting

This retrospective, hospital-based study was conducted in a tertiary care hospital in Jamnagar, Gujarat, over a period of 12 months, from March 2023 to April 2024. The study included patients who underwent laparoscopic Appendicectomy with single-dose pre - operative antibiotic prophylaxis.

Sample Size

As this was a retrospective study, no formal sample size calculation was performed. All eligible patients who met the inclusion criteria during the defined study period were included.

Inclusion and Exclusion Criteria

The study includes patients who underwent a planned laparoscopic Appendicectomy as well as those who underwent emergency laparoscopic Appendicectomy, excluding cases with Intraoperative findings of a perforated or gangrenous appendix, who underwent open (standard) Appendicectomy, received multiple doses of antibiotics, were managed conservatively, or were pregnant.

Preoperative Evaluation

All patients underwent routine preoperative assessment, including haematological and biochemical investigations and Ultrasound examination of the abdomen. Based on clinical and radiological findings, patients were scheduled for laparoscopic Appendicectomy.

Intervention Protocol

All included patients received a single dose of intravenous Ceftriaxone (1 g) administered immediately after induction of anaesthesia.

Postoperative Care and Follow-up

Patients were monitored postoperatively and typically discharged after 48 hours, and Follow-up was conducted on the 7th postoperative day for suture removal and assessment of recovery.

Ethical Considerations

All procedures performed in the current study were approved by the institute's ethics committee (reference number 287/03/2023) in accordance with the 1964 Helsinki Declaration and its later amendments.

Data Collection and Statistical Analysis

Data were entered into a Microsoft Excel spreadsheet. Descriptive statistics were used for analysis, and the data were summarised in terms of frequencies and percentages.

Results

In this study of 50 cases of laparoscopic Appendicectomy performed in GGH in various surgical units, a single dose of antibiotic was used. This study included cases of interval laparoscopic Appendicectomy as well as cases of emergency laparoscopic Appendicectomy, excluding those whose perioperative findings were a perforated appendix or a gangrenous appendix.

The Socio-demographic profile of the patients shows that the majority belong to the 21–30 years age group (36%), followed by 11–20 and 31–40 years (20% each). Males constituted a higher proportion (58%) compared to females (42%). Most participants belonged to the lower middle socio-economic class (34%), followed by upper lower (24%) and upper middle (18%) classes.

Only 8% of cases were from the upper socio-economic group. Out of the total 50 cases, 5 (10%) patients developed Surgical Site Infection (SSI), of which the majority (4) belonged to the 21-30 years of age group and 1 case was in the 31-40 years of age group.

Appendicitis commonly presents with associated systemic or gastrointestinal features rather than as a single localised symptom. Additionally, the predominance of planned (interval) Appendicectomy (66%) over emergency surgery (34%) reflects that a majority of cases were managed electively after initial stabilization. Table 1

The pre-operative profile demonstrates a clear association between clinical parameters and the occurrence of SSI. The incidence of SSI increased with longer hospital stay, higher WBC counts, and positive Ultrasonography findings suggestive of appendicitis, indicating that more severe or advanced disease is linked to higher infection risk. Table 2

The Intraoperative and Histopathological findings indicate that SSI is closely associated with the severity of Appendiceal inflammation, with no infections observed in normal appendix cases and higher rates in inflamed conditions, particularly tip-adherent and mildly inflamed appendices. Histopathology further supports this trend, showing the highest SSI incidence in acute appendicitis, lower rates in chronic cases, and no infections in normal or less severe forms. Table 3

Swab culture was done on cases that developed SSI (5), in which 1 case (20%) had a positive culture, and 4 cases (80%) had a negative culture.

There was no surgical site infection (SSI) observed among patients discharged after 1 day. SSI occurred in 11.42% of patients with a 2-day hospital stay and increased to 16.67% among those staying for more than

2 days, indicating a higher SSI rate with longer duration of hospitalisation.

Discussion

The study was done on 50 patients undergoing laparoscopic Appendicectomy with a single-dose antibiotic regimen; the overall incidence of surgical site infection (SSI) was 10%. Overall, the results show that laparoscopic Appendicectomy with a single-dose antibiotic is associated with a low rate of surgical site infections (SSIs), with perioperative variables and the degree of inflammation being the main factors influencing infection risk.

In a study done by Yogendra D. Shah et al.^[8] the majority of patients were in the age group from 21-30. Half of the patients were in the age groups from 11-20 and 31-40.

The same reflects in the surgical site infection rate. In a study done by Yogendra D. Shah et al.^[8], the surgical site infection rate is more common in the age group 21-30.

In a study done by Yogendra D. Shah et al.^[8] appendicitis is more common in male patients. In a study done by Yogendra D. Shah et al.^[8] 71.67% of patients underwent elective surgery, and 28.33% of patients underwent emergency surgery.

In the study by Yogendra D. Shah et al.^[8], surgical site infection is higher in emergency surgeries as compared to elective surgery.

In a study done by Soon Min Choi et al.^[9], the patient group whom single shot preoperative antibiotic was given, have shorter hospital stay, which was around 2.5 ± 0.7 days.

In a study by Himabindu Bangaru et al.^[10], laparoscopic Appendicectomy is preferred due to shorter hospital stay and lower wound infection rates compared to open surgery.

While prophylactic antibiotics are recommended in non-perforated appendicitis, they do not replace proper surgical technique, and postoperative antibiotics do not reduce infection risk but may increase antibiotic resistance. Therefore, a single preoperative antibiotic dose is considered sufficient to prevent postoperative wound infections.

In a study by Seyed - Mohammadreza Sadraei Moosavi et al.^[11], no significant difference in SSI rates was observed between single-dose and multiple - dose antibiotic regimens in non-perforated appendicitis, indicating no added benefit of postoperative antibiotics. The incidence of SSIs ranged from 0% to 11%, with disease stage at operation and appropriate prophylactic antibiotic use being key factors influencing infection risk.

In 1995, Liberman et al.¹² reported higher wound infection rates with preoperative cefoxitin alone (11.1%) compared to combined pre- and postoperative use (1.9%), while no infections were observed with a single dose of preoperative cefotetan. They concluded that selecting an appropriate preoperative antibiotic is more important than adding postoperative antibiotics for non-perforated appendicitis.

Mui et al.⁶ conducted a randomised trial on 269 patients to define the optimum duration of prophylactic antibiotics in non-perforated appendicitis. They found no significant difference in the wound infection rate between the three study groups. They concluded that a single dose of preoperative antibiotics could adequately prevent the postoperative infectious complications.

Recently, Coakley et al.¹³ compared patients receiving both pre- and postoperative antibiotics with those given only preoperative antibiotics and found no reduction in infectious complications with postoperative use. Instead,

it increased morbidity, including antibiotic-associated diarrhoea and *Clostridium difficile* infection, along with longer hospital stay and higher treatment costs without added clinical benefit.

In surgical practice, supplementary postoperative antibiotics have been used increasingly because of the fear of developing postoperative SSIs. Postoperative antibiotics cannot be a substitute for good surgical and aseptic techniques. The overuse of antibiotics is associated with an increased risk of antibiotic-related complications, antibiotic-resistant bacteria and the cost of care. For these reasons, the benefits and side effects of antibiotic therapy have to be evaluated.

Strengths

This hospital-based study provides real-world clinical evidence from a tertiary care centre with clearly defined inclusion and exclusion criteria, ensuring a focused evaluation of single-dose antibiotic prophylaxis in non-complicated appendicitis. Standardised antibiotic administration and analysis of multiple perioperative variables strengthen the reliability of findings. The study also highlights rational antibiotic use and cost-effectiveness, which are clinically relevant in current surgical practice.

Limitations

The retrospective design and small sample size (50 cases) limit statistical power and generalizability. Absence of a comparison group restricts definitive conclusions regarding superiority over multiple-dose regimens. Being a single-centre study with short postoperative follow-up, the findings may not reflect broader populations or long-term outcomes.

Conclusion

This study evaluated 50 cases of laparoscopic Appendicectomy performed over 12 months using a

single pre-operative antibiotic dose, excluding complicated appendicitis. Appendicitis was most common in the second and third decades of life and showed a male predominance. Right iliac fossa pain was the most frequent presenting symptom, followed by vomiting. The average operative time was approximately 40 minutes. Post-operative pain was minimal, with most patients experiencing pain for only one day. The incidence of wound infection was low (10%), with no Grade 3 or 4 infections reported. Post-operative hospital stay was short (1–2 days), reducing hospital-acquired infections. Laparoscopic Appendicectomy was found to be a safe and effective alternative to open surgery. Use of a single-dose antibiotic reduced unnecessary antibiotic exposure, morbidity, and overall treatment costs.

Table 1: Clinical features and Type of operation of patients

Sn.	Variable	Cases	Percentage
		n	
1	Clinical features		
	Normal	28	56
	RIF Pain and Fever	11	22
	RIF Pain and Nausea/Vomiting	8	16
	Pain in RIF	3	6
2	Type of Operation		
	Planned (Interval Appendicectomy)	33	66
	Emergency Appendicectomy	17	34
	Total	50	100

Table 2: Pre - Operative Profile of Patients

Sn.	Variable	Cases	SSI	Percentage
1	Stay			

	1 day	13	0	0
	2 days	32	3	9.37
	>2 days	5	2	40
2	USG finding			
	Normal	25	1	4
	Appendicitis	25	4	16
3	WBC count			
	< 4000	3	0	0
	4001-7000	24	1	4.16
	7001-10000	16	2	12.5
	>10000	7	2	28.5
	Total	50	5	

Table 3: Variables at the time of Surgery

Sn.	Variable	Cases	SSI	Percentage
1	Condition of the Appendix			
	Normal	27	0	0
	Tip Adherent	3	1	33.33
	Tip Inflamed	8	1	12.5
	Mildly Inflamed	12	3	25
2	Duration of Surgery (min)			
	20-40	30	3	10
	40-60	20	2	10
3	Histopathologic examination of the wound			
	Normal	2	0	0
	Acute	18	4	22
	Sub-acute	4	0	0
	Chronic	22	1	4.54
	Recurrent	4	0	0
	Total	50	5	

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