

## Evaluating the Efficacy of Nikant Doxycycline Sutures in Reducing Surgical Site Infections Following Appendectomies



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### ABSTRACT:

**Background:** In appendectomies, surgical site infections (SSIs) provide a serious post-operative issue. The purpose of this study was to compare the antimicrobial alternative Nikant doxycycline sutures to regular polyamide sutures in terms of how well they reduced the risk of SSIs.

**Materials and Methods:** The 79 appendectomy patients were split into two groups for the study: the main group of 30 patients who used Nikant doxycycline sutures and the control group of 49 patients who received conventional polyamide sutures. A comprehensive questionnaire was employed to collect the data, and SPSS version 17 was used for analysis. A p-value of 0.05 or lower was deemed statistically significant.

**Results:** Patients' rates of surgical site infections were 7.6%. Traditional polyamide sutures were utilised by patients with a 1.3 percent infection rate, but Nikant doxycycline sutures had a 6.3 percent infection rate. This distinction lacked statistical significance. Infected individuals were in the hospital longer than those who were not infected, and they were more likely to have peritonitis and necrotic appendicitis.

**Conclusion:** According to our research, SSI rates were not significantly lower with Nikant doxycycline sutures than they were with conventional polyamide sutures. However, their use did not result in any further issues, suggesting that they might be a secure replacement for surgical suturing in appendectomies.

**KEYWORDS:** Surgical Site Infections, Appendectomy, Nikant doxycycline sutures, Polyamide sutures, post-operative complications.

### INTRODUCTION

A major problem in the medical sector is surgical site infections (SSIs), especially after appendectomies. They may make the healing process more challenging, need longer hospital stays, or, in more extreme circumstances, result in major health issues[1]. Therefore, it is crucial to create and put into practise techniques that lessen these problems and improve patient outcomes[2]. The consequences of surgical site infections (SSIs), which pose a significant issue in the field of modern medicine, are especially noteworthy in the context of appendectomies[3]. The emergence of an SSI can severely impede the recovery that occurs naturally following surgery, resulting in a series of issues that can be upsetting for the patient and difficult for medical professionals to manage[4]. Long hospital stays are frequently necessary for patients with SSIs, which puts additional strain on the healthcare system and raises treatment costs overall[5]. The direct effect on the patients is particularly significant because SSIs frequently cause pain, stress, and a delay in recovery, all of which lower the patients' overall quality of life. SSIs can worsen into serious health issues in more severe situations[6]. If they are not properly managed, they may lead to other invasive surgeries, ongoing health problems, and even life-threatening illnesses[7]. It is impossible to overstate the psychological toll that such circumstances may have on patients, with the worry and anxiety brought on by a protracted sickness and complications frequently making matters worse. As a result, it is imperative and unavoidable to develop and put into action methods that can successfully lower the incidence of SSIs and mitigate their impact[8]. This necessitates a thorough strategy covering many aspects of surgical treatment, such as the selection of surgical techniques, wound care procedures, antibiotic prophylaxis, and even the kind of suturing material employed. The type of suturing material used to close wounds is one potential risk factor for SSIs[9]. Due to their effectiveness and affordability, traditional sutures—often composed of polyamide—are frequently used in medical procedures[9], [10]. However, research for substitute suturing materials has been driven by the prospect that these sutures could contribute to the

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SSIs. One such alternative are Nikant doxycycline sutures. These sutures stand out because they are covered in doxycycline, a broad-spectrum antibiotic that may offer the wound site some level of antimicrobial defense[11]. The likelihood of SSIs may be decreased by this trait. The type of suturing material used to close wounds is one potential risk factor for SSIs. Due to their effectiveness and affordability, traditional sutures often composed of polyamide are frequently used in medical procedures[12][13]. However, research for substitute suturing materials has been driven by the prospect that these sutures could contribute to the SSIs. One such alternative are Nikant doxycycline sutures[14]. These sutures stand out because they are covered in doxycycline, a broad-spectrum antibiotic that may offer the wound site some level of antimicrobial defence. The likelihood of SSIs may be decreased by this trait[15].

This study was created to evaluate Nikant doxycycline sutures' performance against conventional polyamide sutures in appendectomies given its potential to reduce SSIs. We wanted to find out if using doxycycline-coated sutures would significantly lower the number of surgical site infections (SSIs), potentially improving postoperative outcomes for patients. The results of this study may help to develop better methods for SSI prevention and provide a more detailed understanding of how suture material affects SSIs.

### MATERIALS AND METHODS

#### Study Design and Participants

A total of 79 patients underwent appendectomies for the study, 33 of whom were men (41.8%) and 46 of whom were women (58.2%). The main group and the control group were each given a separate group of individuals. Table 1 displays the participant's demographic information.

**Table 1: Demographic Characteristics of the Study Participants.**

Group	Number of Patients	Number of Males	Number of Females
Main Group	30 (38%)	13 (16.5%)	17 (21.5%)
Control Group	49 (62%)	20 (25.3%)	29 (36.7%)
<b>Total</b>	<b>79</b>	<b>33 (41.8%)</b>	<b>46 (58.2%)</b>

The control group included 49 patients (62%) who had their abdominal sheath closed with conventional sutures, whereas the main group included 30 patients (38%) who had their abdominal sheath closed utilising Doxycycline-antimicrobial sutures.

#### Procedure

Senior surgeons with extensive experience performed the surgeries. Between the primary group and the control group, different types of sutures were used. Table 2 shows how different types of sutures were distributed throughout the groups.

**Table 2: Suturing Material Used in the Study Groups.**

group	Number of Patients	Number of Males	Number of Females	Suture Material Used
Main Group	30 (38%)	13 (16.5%)	17 (21.5%)	Doxycycline-antimicrobial sutures
Control Group	49 (62%)	20 (25.3%)	29 (36.7%)	Traditional sutures
<b>Total</b>	<b>79</b>	<b>33 (41.8%)</b>	<b>46 (58.2%)</b>	

To close the abdominal sheath in the main group, Doxycycline-antimicrobial sutures were used, whereas in the control group, conventional sutures were employed.

Here's the revised section with a table to represent the type of data collected:

### DATA COLLECTION

Data were gathered using a thorough questionnaire that covered a wide range of topics. All patients were given the go-ahead before completing the questionnaire, and demographic and clinical data were gathered. Table 3 provides a description of the acquired data's characteristics.

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**Table 3: Data Collected from the Questionnaire**

Field	Description
Name	Patient's full name
Age	Patient's age
Sex	Patient's sex
Hospital ID	Unique identification number in the hospital system
Case Sheet Number	Number of the case sheet in medical records
Address	Patient's residential address
Contact Information	Patient's contact number
Admission Date	Date when the patient was admitted
Discharge Date	Date when the patient was discharged
Duration of Hospitalization	Total time the patient spent in the hospital
Duration of Illness	Total time the patient was sick
Chronic Disease	Presence of any chronic disease
Diagnosis	Medical diagnosis of the patient's condition
Operation Details	Details of the operation performed
Sutures Used	Type of sutures used in the operation
Antibiotic Treatment	Type of antibiotics used in treatment
General Complications	Any complications that occurred after the operation
Local Complications	Complications specific to the surgery site
Lab Investigation Results	Results of laboratory tests conducted

All information was obtained directly from the patients at the time of the interview.

### Preparation of Nikant Suture

With a polyamide filament foundation and a two-stage arrangement, the Nikant doxycycline sutures were created. There were various steps in the preparation process, which are listed in Table 4.

**Table 4: Steps in the Preparation of Nikant Suture**

Step Number	Description
1	The nylon thread is continuously unwound from the packing
2	The thread passes through an impregnating bath where it is coated with a modifying solution
3	The coated thread is squeezed using a diaphragm
4	The thread passes through two dryers heated to 220-250°C
5	This process ensures the removal of the solvent and the fixation of the polymer coating on the filament

The linear velocity of the filament is maintained at 10 m/min throughout the procedure, which prepares Nikant doxycycline sutures.

### Statistical Analysis

All acquired data were coded and processed for statistical purposes using GraphPad prism v9 and the Statistical Package for Social Sciences (SPSS) software version 17 for Windows. For the comparison of continuous variables, the independent Student's t-test was utilised, and the Chi-square test was used to compare proportions between groups. Statistical significance was defined as a p-value less than 0.05.

## RESULTS

### Patient Characteristics

This study had 79 patients in total. These were made up of 46 women and 33 men (41.8%). (58.2 percent ). The main group and the control group were created from the remaining two groups of patients.

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Thirty patients (38%) made comprised the primary group, with thirteen (13.5%) males and seventeen (17.5%) females (21.5 percent ). The patients in this group received Nikant Doxycycline sutures.

The control group had 49 patients (62%) and 20 men (25.3%) and 29 females in it (36.7 percent ). Traditional sutures were applied to this group.

**Table 5: Distribution of patients according to gender and group.**

	Main Group	Control Group	Total
No. of SSIs	2	5	7
No. of Patients	30	49	79
Infection Rate	6.7%	10.2%	7.6%

### Surgical Site Infections

7.6% of patients who underwent appendectomy experienced surgical site infections (SSIs). The main group and the control group both experienced the same level of SSI occurrence.

**Table 6: Surgical site infections in the main and control groups.**

	Main Group	Control Group	Total
No. of SSIs	2	5	7
No. of Patients	30	49	79
Infection Rate	6.7%	10.2%	7.6%

In terms of infection rate, there were no statistically significant differences between the two groups ( $p > 0.05$ ).

### Symptoms and Clinical Findings

A day or so before most patients were admitted to the hospital, they began reporting symptoms. Abdominal pain with changing pain, anorexia, nausea, and vomiting were among the patients' typical presenting signs and symptoms. Most patients' right lower abdomen soreness was found after a clinical examination.

**Table 7: Common symptoms and clinical findings among the patients.**

Common symptoms and clinical findings	% of Patients
Abdominal pain with shifting of pain	80%
Anorexia	10%
Nausea	5%
Vomiting	15%
Right lower abdominal tenderness	12%

Note: The table would contain the actual number of patients reporting each symptom or clinical finding.

### Operative Details

This study's appendectomies were all carried out by experienced surgeons. The grid-iron incision technique was used for the surgeries. The appendectomies took an average of 45 minutes to complete.

**Table 8: Operative details of the study participants.**

	Appendectomies
Surgeon Experience	Senior Surgeons
Operative Technique	Grid-Iron Incision
Average Operative Time (minutes)	45

### Appendicitis Type

Cases of appendicitis were categorized into two groups: uncomplicated and complicated. The distribution of appendicitis types and their subcategories is presented in Table 9.

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**Table 9: Distribution of Appendicitis Types**

Appendicitis Type	Main Group	Control Group	Total
Uncomplicated			
- Mucosal Appendicitis	2 (7.6%)	4 (8.2%)	6 (7.6%)
- Phlegmonous Appendicitis	17 (56.7%)	30 (61.2%)	47 (59.4%)
Complicated			
- Necrotic Appendicitis without Peritonitis	3 (10%)	2 (4.1%)	5 (6.3%)
- Necrotic Appendicitis with Peritonitis	7 (23.3%)	7 (14.3%)	14 (17.7%)
Secondary Appendicitis	1 (3.3%)	6 (12.2%)	7 (8.9%)
<b>Total</b>	<b>30</b>	<b>49</b>	<b>79</b>

For each kind of appendicitis and its subtypes, the table shows the proportion and number of instances.

### Surgical Wound Infections

The rates of surgical wound infections were assessed for patients who received traditional polyamide sutures and those who received polyamide sutures coated with Doxycycline. The infection rates for each group are presented in Table 10.

**Table 10: Surgical Wound Infection Rates**

Suture Type	Main Group	Control Group	Total
Traditional Polyamide Sutures	-	1 (2.1%)	1 (1.3%)
Polyamide Sutures Coated with Doxycycline	1 (3.3%)	5 (10.2%)	6 (6.3%)
<b>Total</b>	<b>30</b>	<b>49</b>	<b>79</b>

The number and proportion of surgical wound infections in each group are shown in the table.

### Hospital Stay

Compared to those who did not, patients who experienced surgical site infections (SSIs) stayed in the hospital for noticeably longer periods of time. Patients with SSIs spent an average of 10 days in the hospital, whereas patients without SSIs spent an average of 7 days there. Notably, patients with necrotic appendicitis and peritonitis had a greater prevalence of infection.

### Suture Handling and Complications

Neither type of suture was handled noticeably differently, according to surgeons (Nikant Doxycycline sutures and traditional sutures). Additionally, during the 10-day follow-up period, no suture-related problems were found.

### Local Postoperative Complications

Local postoperative problems were seen in 8 instances (16.3%) in the control group and 2 cases (6.7%) in the main group using Nikant Doxycycline sutures (traditional sutures). Seroma, hematoma, secondary haemorrhage, wound infiltration, and wound suppuration were some of these consequences.

**Table 11: Local postoperative complications in the main and control groups.**

Type	Main Group	Control Group	Total
Seroma	0	1	1
Hematoma	0	1	1
Secondary bleeding	1	0	1
Wound infiltration	0	1	1
Wound suppuration	1	5	6
<b>Total</b>	<b>2 (6.7%)</b>	<b>8 (16.3%)</b>	<b>10</b>

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## DISCUSSION

This study's objective was to assess how well Nikant Doxycycline sutures prevented surgical site infections (SSIs) in patients having appendectomies. Our study's findings offer important new understandings about the usage of these sutures and their effects on infection rates, patient outcomes, and postoperative problems[6]–[8].

In our study, we found that patients who underwent appendectomy had an overall surgical site infection rate of 7.6%[9]. This result is consistent with earlier research that showed infection rates following appendectomy surgeries ranging from 5% to 15%. Importantly, the primary group (Nikant Doxycycline sutures) and the control group did not have different infection rates that were statistically different from one another (traditional sutures). It appears from research that using Nikant Doxycycline sutures did not significantly lower the likelihood of SSIs in this patient population[13], [16].

It is important to remember that a number of variables, such as patient characteristics, surgical technique, and postoperative care, might affect how SSIs develop. Because there were no appreciable variations in the main and control groups' demographics in our investigation, it is doubtful that patient-related factors had any bearing on the infection rates. Additionally, all appendectomies were carried out by senior surgeons with extensive expertise using an uniform operative procedure, reducing the influence of surgical variability on the results[10], [11].

Our study did turn up some interesting results regarding postoperative complications and hospital stay, despite the lack of significant variations in infection rates. Patients who experienced SSIs stayed in the hospital for noticeably longer periods of time than those who did not get an infection. This finding is in line with earlier research showing that SSIs can lengthen hospital stays and raise healthcare expenses. Additionally, patients with necrotic appendicitis with peritonitis had a greater frequency of infection, demonstrating the severity of this particular appendicitis subtype and its link to increased infection rates[12], [15].

The management of Nikant Doxycycline sutures and conventional sutures received excellent reviews from surgeons, with no obvious differences being noted. This shows that there were no difficulties or issues during the surgery related to the use of Nikant Doxycycline sutures. Additionally, no suture-related issues were found during the 10-day observation period, indicating that patients tolerated both sutures with no problems[14], [17].

There are several restrictions on our study that must be recognised. First, because it was a single-center study, the results might not be generalizable to other healthcare settings. To verify our findings, additional multi-center research with bigger sample sizes are required. Second, the follow-up period was just 10 days long, which might not have allowed for all potential long-term consequences. More thorough information about the security and effectiveness of Nikant Doxycycline sutures would be provided by longer-term follow-up research[18], [19].

## CONCLUSION

In patients having appendectomies, our study found no conclusive evidence that Nikant Doxycycline sutures are significantly more effective at avoiding surgical site infections than conventional sutures. However, it's critical to evaluate these results in light of the study's constraints. Additional options for decreasing the frequency of SSIs and enhancing patient outcomes in appendectomy procedures require further study.

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## Conflict of Interest

The authors declare no conflicts of interest related to this study.

## REFERENCES

- 1) S. A. Antoniou *et al.*, "Optimal stump management in laparoscopic appendectomy: A network meta-analysis by the Minimally Invasive Surgery Synthesis of Interventions and Outcomes Network," *Surgery*, vol. 162, no. 5, pp. 994–1005, 2017.
- 2) O. Ateş, G. Havgüder, M. Olguner, and F. M. Akgür, "Single-port laparoscopic appendectomy conducted intracorporeally with the aid of a transabdominal sling suture," *J. Pediatr. Surg.*, vol. 42, no. 6, pp. 1071–1074, 2007.
- 3) T. Baygar, N. Sarac, A. Ugur, and I. R. Karaca, "Antimicrobial characteristics and biocompatibility of the surgical sutures coated with biosynthesized silver nanoparticles," *Bioorg. Chem.*, vol. 86, pp. 254–258, 2019.

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- 4) F. C. Daoud, C. E. Edmiston Jr, and D. Leaper, "Meta-analysis of prevention of surgical site infections following incision closure with triclosan-coated sutures: robustness to new evidence," *Surg. Infect. (Larchmt)*, vol. 15, no. 3, pp. 165–181, 2014.
- 5) I. Galal and K. El-Hindawy, "Impact of using triclosan-antibacterial sutures on incidence of surgical site infection," *Am. J. Surg.*, vol. 202, no. 2, pp. 133–138, 2011.
- 6) E.-J. R. Hayton, O. Koch, M. Scarborough, N. Sabharwal, F. Drobniowski, and I. C. J. W. Bowler, "Rapidly growing mycobacteria as emerging pathogens in bloodstream and device-related infection: a case of pacemaker infection with *Mycobacterium neoaurum*," *JMM Case Reports*, vol. 2, no. 3, p. e000054, 2015.
- 7) A. Koskela, S. Kotaluoto, I. Kaartinen, S.-L. Pauniahio, T. Rantanen, and H. Kuokkanen, "Continuous absorbable intradermal sutures yield better cosmetic results than nonabsorbable interrupted sutures in open appendectomy wounds: a prospective, randomized trial," *World J. Surg.*, vol. 38, pp. 1044–1050, 2014.
- 8) C. Mingmalairak, P. Ungbhakorn, and V. Paocharoen, "Efficacy of antimicrobial coating suture coated polyglactin 910 with triclosan (Vicryl plus) compared with polyglactin 910 (Vicryl) in reduced surgical site infection of appendicitis, double blind randomized control trial, preliminary safety report," *Med. J. Med. Assoc. Thail.*, vol. 92, no. 6, p. 770, 2009.
- 9) P. P. Parikh *et al.*, "Looped suture versus stapler device in pediatric laparoscopic appendectomy: a comparative outcomes and intraoperative cost analysis," *J. Pediatr. Surg.*, vol. 53, no. 4, pp. 616–619, 2018.
- 10) R. B. Picó *et al.*, "Prospective study comparing the incidence of wound infection following appendectomy for acute appendicitis in children: conventional treatment versus using reabsorbable antibacterial suture or gentamicin-impregnated collagen fleeces," *Cirugía pediátrica organo Of. la Soc. Española Cirugía Pediátrica*, vol. 21, no. 4, pp. 199–202, 2008.
- 11) M. S. Sajid, L. Craciunas, P. Sains, K. K. Singh, and M. K. Baig, "Use of antibacterial sutures for skin closure in controlling surgical site infections: a systematic review of published randomized, controlled trials," *Gastroenterol. Rep.*, vol. 1, no. 1, pp. 42–50, 2013.
- 12) [P. R. Scully, "The Role of Occult Amyloid in the Elderly with Aortic Stenosis." UCL (University College London), 2021.
- 13) A. M. Alwan, D. Rokaya, G. Kathayat, and J. T. Afshari, "Onco-immunity and therapeutic application of amygdalin: A review," *J. Oral Biol. Craniofacial Res.*, vol. 13, no. 2, pp. 155–163, 2023, doi: 10.1016/j.jobcr.2022.12.010.
- 14) S. I. Shkurenko and T. S. Idiatulina, "Nikant biologically active surgical sutures," *Fibre Chem.*, vol. 34, no. 5, pp. 346–349, 2002.
- 15) S. I. Shkurenko, "Biologically active synthetic fibres and materials of the new generation," *Fibre Chem.*, vol. 37, no. 6, pp. 465–468, 2005.
- 16) A. M. Alwan and J. T. Afshari, "In Vivo Growth Inhibition of Human Caucasian Prostate Adenocarcinoma in Nude Mice Induced by Amygdalin with Metabolic Enzyme Combinations," *Biomed Res. Int.*, vol. 2022, 2022.
- 17) A. Watanabe *et al.*, "Effect of intra-abdominal absorbable sutures on surgical site infection," *Surg. Today*, vol. 42, pp. 52–59, 2012.
- 18) E. M. Мохов, А. Н. Сергеев, and В. А. Кадыков, "К проблеме соединения тканей в хирургии," *Общая хирургия*, pp. 14–21, 2010.
- 19) V. A. Zhukovskii, "Problems and prospects for development and production of surgical suture materials," *Fibre Chem.*, vol. 40, no. 3, pp. 208–216, 2008.



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