A COMPARATIVE STUDY BETWEEN TRICLOSAN COATED SUTURE VS CONVENTIONAL SUTURE ON SURGICAL SITE INFECTIONS OF ABDOMINAL FASCIAL CLOSURES IN OPEN APPENDECTOMY

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DISSERTATION SUBMITTED TO B. L. D. E. (DEEMED TO BE UNIVERSITY)'s SHRI B.M. PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE, VIJAYAPURA, KARNATAKA

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SURGERY

IN

GENERAL SURGERY

UNDER THE GUIDANCE OF

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ACKNOWLEDGEMENT

On completion of my post-graduation journey and this scientific document, I would like to acknowledge the immense help received from my mentors in the Department of General Surgery. My guide, Dr. M.S. Kotennavar, Professor and Head of Department, Department of General Surgery, B. L. D. E (Deemed to be university) Shri B.M. Patil Medical College, Hospital & Research Centre, Vijayapura is deeply appreciated for their unwavering inspiration, generous encouragement, and affectionate support throughout my post-graduation studies and dissertation preparation. I am forever grateful to Dr. Aravind Patil, Principal and Professor of Department of General Surgery, B. L. D. E (Deemed to be university) Shri B.M. Patil Medical College, Hospital & Research Centre, Vijayapura for his constant inspiration, moral support, guidance and encouragement in my post-graduation studies with his unique approach to the subject. It is with great respect, I acknowledge Dr. M. B. Patil, Professor, Department of General Surgery, B. L. D. E (Deemed to be university) Shri B. M. Patil medical college, hospital and research centre, Vijayapura for his continuous support and his constant effort in the upliftment of our academics.

I am forever grateful to Professors Dr. Tejaswini Vallabha, Dr. Vijaya Patil and Dr. Girish Kullolli, Dr. Ramakanth Baloorkar, for their guidance and encouragement provided to me to achieve new heights professionally over my course period. I am forever grateful to Associate Professors Dr. Rajendra Benakatti ,Dr. Vikram Sindagikar, Dr. Deepak Chavan, Dr. Dayanand Biradar and Dr. S. S. Patil for their guidance encouragement and inspiration.

I am thankful to Assistant Professors Dr Pradeep Jaju, Dr. Manjunath Savanth, Dr .Sanjeev Rathod, Dr. Shruthi Sheelin, Dr. Anand Suntan and Dr. Shailesh Kannur and, for their great help and encouragement throughout.

I am forever thankful to Dr. Veena Ghanteppagol for her constant support, guidance and motivation. Also, I would like to extend my sincere gratitude to my amazing seniors

Dr Jagadish, Dr. Santhan, Dr. Arun, Dr. Saket , Dr. Narendra, Dr. Rohan, Dr. Aswin for their guidance and help.

I am extremely thankful to my colleagues Dr. Divyang, Dr. Eswar, Dr. Linette, Dr. Venkata, Dr. Hemanth, Dr. Satvik, Dr. Radhika, Dr. Rahul, Dr. Dr. Sai Teja, Dr. Shrinath, who became my family and only with their constant support and help, residency was a joyful ride.

I express my gratitude to my junior colleagues, Alljin, Smith, Nilan, and Gaurav for their unwavering support and assistance.

I also thank Mrs. Vijaya Sorganvi, Lecturer Statistician for her guidance during my dissertation work. I would like to thank Mr. Subhash and Mr. Siddanagouda Patil , Mrs Rajeshwari for their constant support and co-operation in my dissertation work. I also thank all other nursing staff and non-teaching staff of hospital for their help in my dissertation work. I convey my heartfelt gratitude to my patients who are endless source of learning throughout my graduation.

I thank my Family Rishabh, Shreeraj, Shradha, Shrutika, Purvendra, Khushi, Riya for their constant encouragement and help throughout. And last but not the least, I thank my parents Mr. Shivanand Doddannavar and Mrs. Shalan Doddannavar, for their constant support, guidance, sacrifice, patience, love and belief in me.

- **Dr. Shreeya Doddannavar**

CONTENTS

ABBREVIATIONS

BMI: Body Mass Index

CDC: Centers for Disease Control and Prevention

CI: Confidence Interval

E. coli: Escherichia coli

FabI: Enoyl-acyl carrier protein reductase

MRSA: Methicillin-Resistant Staphylococcus Aureus

NICE: National Institute for Health and Care Excellence

OR: Odds Ratio

PDS: Polydioxanone Suture

PDS Plus: Triclosan-coated Polydioxanone Suture

RCT: Randomized Controlled Trial

RR: Relative Risk

SD: Standard Deviation

SSI: Surgical Site Infection

USD: United States Dollar

WHO: World Health Organization

INTRODUCTION

Surgical site infections (SSIs) remain one of the most common and challenging complications following both open and laparoscopic surgical procedures, representing a significant burden to healthcare systems worldwide. Despite advances in surgical techniques, perioperative care, and antimicrobial prophylaxis, SSIs continue to affect approximately 2-5% of patients undergoing clean extra-abdominal operations and up to 20% of patients undergoing intra-abdominal procedures, with considerable variation depending on the type of surgery, patient risk factors, and the criteria used for defining infection.

These infections are associated with prolonged hospitalization, increased healthcare costs, additional surgical interventions, and in some cases, life-threatening complications leading to significant morbidity and mortality. The economic impact of SSIs is substantial, with studies estimating that each SSI adds an average of 7-10 additional hospital days and approximately $20,000-$30,000 in extra costs per patient.[1] The Centres for Disease Control and Prevention (CDC) has established SSIs as the most common healthcare-associated infection, accounting for 31% of all nosocomial infections among hospitalized patients, highlighting the magnitude of this problem in modern surgical practice.

Appendectomy, the surgical removal of the appendix, is one of the most commonly performed emergency surgical procedures worldwide, with an estimated lifetime risk of 7-8%. Acute appendicitis affects all age groups but is most prevalent in the second and third decades of life. The procedure can be performed using either open or

laparoscopic techniques, with laparoscopic appendectomy gaining increasing popularity due to reported advantages including reduced postoperative pain, shorter hospital stays, earlier return to daily activities, and potentially lower infection rates. However, despite these advances, SSIs following appendectomy remain a significant concern, with reported incidence rates ranging from 1-10% in laparoscopic procedures to 3-15% in open appendectomy, particularly in cases of complicated appendicitis with perforation or abscess formation.[2] The development of SSIs following appendectomy not only affects patients' quality of life but also contributes significantly to healthcare resource utilization, making prevention strategies a priority in surgical care.

The pathogenesis of SSIs is multifactorial and involves complex interactions between patient-related factors, surgical techniques, and microbial characteristics. Patient factors associated with increased risk include obesity, diabetes mellitus, advanced age, malnutrition, immunosuppression, and the presence of remote infections. Procedure-related factors include emergency surgery, prolonged operative time, inadequate antimicrobial prophylaxis, hypothermia, and poor surgical technique. Among the various aspects of surgical technique, the method of wound closure and the choice of suture material have been recognized as modifiable factors potentially influencing SSI rates.

Surgical sutures, while necessary for tissue approximation and wound healing, can paradoxically serve as a nidus for bacterial attachment and colonization, potentially contributing to wound infection.[3] This phenomenon is particularly relevant in

contaminated or potentially contaminated procedures such as appendectomy, where bacterial load is inherently higher than in clean procedures.

The ideal suture material for fascial closure should provide adequate tensile strength to support wound healing while minimizing tissue reactivity and bacterial adherence. Conventional suture materials, including both absorbable and non-absorbable varieties, have been extensively studied in various surgical settings, with each type offering specific advantages and limitations. Polydioxanone (PDS), polyglactin 910 (Vicryl), polypropylene (Prolene), and nylon are among the most commonly used suture materials for fascial closure in abdominal surgeries. While these materials have demonstrated acceptable performance in terms of handling, tensile strength, and tissue reactivity, they lack inherent antimicrobial properties, potentially allowing bacterial colonization along the suture line. This recognition has led to the development of antimicrobial-coated sutures as a potential strategy to reduce suture-related infections.[4]

Triclosan, a broad-spectrum antimicrobial agent effective against many gram-positive and gram-negative bacteria, has been incorporated into various suture materials to create antimicrobial sutures. Triclosan (2,4,4'-trichloro-2'-hydroxydiphenyl ether) acts by inhibiting bacterial fatty acid synthesis at the enoyl-acyl carrier protein reductase (FabI) step, thereby disrupting cell membrane integrity and leading to bacterial cell death. This mechanism provides activity against common surgical pathogens, including Staphylococcus aureus, Staphylococcus epidermidis, n methicillin resistant. Staphylococcus aureus (MRSA), Escherichia coli, and Klebsiella pneumoniae, many of which are frequently implicated in SSIs following abdominal procedures.[5] Triclosan-coated sutures were first introduced in 2002, and since then, various triclosan-impregnated versions of commonly used suture materials, including

polyglactin 910 (Vicryl Plus), poliglecaprone 25 (Monocryl Plus), and polydioxanone (PDS Plus), have become commercially available. These sutures are designed to create a "zone of inhibition" around the suture line, potentially reducing bacterial colonization and subsequent infection development.

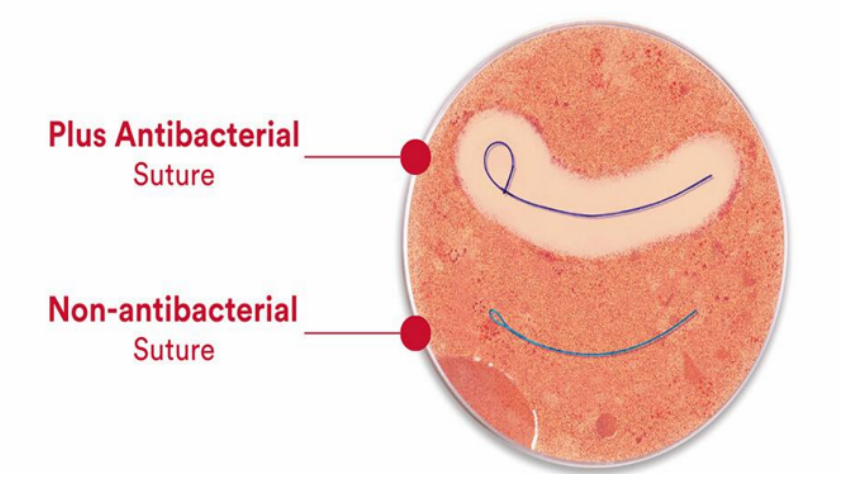

Figure 1 : In Vitro activity of Triclosan inhibiting bacterial colonisation of suture.

The theoretical benefits of triclosan-coated sutures have been investigated in numerous in vitro and animal studies, demonstrating reduced bacterial adherence and colonization compared to conventional non-coated sutures. Wang et al. conducted an in vitro study showing that triclosan-coated polyglactin 910 sutures significantly reduced adherence of MRSA, Staphylococcus epidermidis, and Escherichia coli compared to non-coated controls.[6] Similarly, animal studies have demonstrated reduced inflammatory response and bacterial colonization with triclosan-coated sutures. Ming et al. reported significantly lower bacterial counts on triclosan-coated sutures compared to non-coated sutures in a guinea pig model of surgical wound infection.[7] These preclinical studies provided the foundation for subsequent clinical investigations into the efficacy of triclosan-coated sutures in various surgical settings. However, the translation of these promising laboratory findings into clinical practice has yielded inconsistent results. While some clinical studies have demonstrated significant

reductions in SSI rates with the use of triclosan-coated sutures, others have failed to show meaningful benefits. These disparities may be attributed to variations in study design, surgical procedures evaluated, patient populations, definitions of SSI, and methodological quality. In 2017, a comprehensive meta-analysis by de Jonge et al. included 21 randomized controlled trials (RCTs) involving 6,462 patients across various surgical disciplines and found that triclosan-coated sutures reduced the risk of SSI by 33% compared to non-coated sutures (relative risk [RR], 0.67; 95% confidence interval [CI], 0.54-0.84; $p < 0.001$).[8] This significant effect was consistent across different types of surgery, including abdominal, cardiac, and orthopedic procedures. Based on such evidence, the World Health Organization (WHO) included a conditional recommendation for the use of triclosan-coated sutures in its 2018 guidelines for the prevention of SSIs, particularly in clean and clean-contaminated procedures.

Antibacterial-coated suture materials have evolved beyond triclosan-based systems to include several innovative alternatives. Silver-based options, such as nanoparticle-coated or silver-doped bioactive glass sutures, offer broad-spectrum activity against both gram-positive and gram-negative bacteria. Chlorhexidine coatings provide another effective alternative. Directly incorporating conventional antibiotics like gentamicin, vancomycin, and tetracycline into suture materials enables targeted delivery at surgical sites. Natural antimicrobial compounds, including chitosan, essential oils, and medical-grade honey, represent sustainable alternatives with promising antimicrobial and wound-healing properties. Emerging technologies include photoactivated antimicrobial coatings, enzyme-based systems that degrade bacterial biofilms, antimicrobial peptides, and bacteriophage-coated sutures.

The most recent innovations focus on dual-function coatings that combine antimicrobial properties with anti-inflammatory or pro-healing capabilities, aiming to simultaneously prevent infection while promoting faster wound recovery.

Despite this general recommendation, the efficacy of triclosan-coated sutures in specific surgical procedures, including appendectomy, remains a subject of ongoing investigation. The existing literature on the use of triclosan-coated sutures specifically in appendectomy is relatively limited, with few studies focusing exclusively on this procedure. Furthermore, most studies have evaluated the impact of triclosan-coated sutures on overall wound infection rates without specifically examining their effect on fascial closure infections, which represent a distinct and potentially more serious complication. Fascial dehiscence and subsequent incisional hernia development are significant long-term sequelae of fascial infection, with serious implications for patient morbidity and healthcare costs. Diener et al. conducted the PROUD trial (Prevention of Incisional Hernia by Using an Antiseptic-Coated Suture) and found no significant reduction in incisional hernia development with triclosan-coated sutures compared to conventional sutures in midline laparotomy closures, raising questions about the long-term benefits of these specialized sutures.[9]

The distinction between open and laparoscopic approaches to appendectomy adds another layer of complexity to this question with potentially lower wound infection rates compared to open procedures. Some research suggests that the advantages of antimicrobial sutures may be more pronounced in procedures with higher baseline infection risks, such as open appendectomy, particularly in complicated cases. This creates a need for comparative studies evaluating the efficacy of triclosan-coated sutures in open appendectomy procedures, with specific attention to fascial closure outcomes.

Cost-effectiveness considerations further complicate the decision-making process regarding the routine use of triclosan-coated sutures. These specialized sutures are generally more expensive than their conventional counterparts, with price differentials varying by manufacturer and geography. While the additional cost might be justified if offset by reductions in SSI-related expenses, the economic value proposition remains unclear, particularly in resource-limited settings. Singh et al. conducted a cost-analysis study suggesting that triclosan-coated sutures could be cost-effective in high-risk procedures where the baseline SSI rates exceed 10%, but they may not represent judicious resource allocation in low-risk clean procedures with minimal infection rates.[10] Therefore, procedure-specific and context-specific evaluations of both clinical efficacy and economic impact are essential to inform evidence-based recommendations.

Furthermore, as with any antimicrobial agent, concerns have been raised regarding the potential for development of bacterial resistance to triclosan with widespread and prolonged use. While current evidence does not indicate significant clinical resistance development, the theoretical risk remains a consideration in antimicrobial stewardship discussions. Some researchers advocate for selective use of triclosan-coated sutures in high-risk patients and procedures rather than universal application across all surgical settings. This targeted approach aligns with broader antimicrobial stewardship principles while potentially maximizing clinical benefits in populations most likely to benefit from intervention.

The selection of appropriate suture material for fascial closure in appendectomy also involves considerations beyond infection prevention, including handling characteristics, tensile strength, knot security, and tissue reactivity. Surgeons must balance the potential infection-prevention benefits of triclosan-coated sutures against these other performance

characteristics, as well as cost considerations. Additionally, patient-specific factors such as age, nutritional status, immunocompetence, presence of comorbidities, and wound classification must inform individualized decision-making regarding suture selection. This complex interplay of factors underscores the need for comprehensive, well-designed clinical studies evaluating multiple outcomes associated with different suture choices in specific procedural contexts.

In light of these considerations, this study aims to address an important knowledge gap by directly comparing triclosan-coated sutures with conventional sutures for abdominal fascial closure in open appendectomy procedures, with a primary focus on surgical site infection rates. By focusing specifically on fascial closure in a commonly performed procedure with substantial variation in infection risk (depending on the severity of appendicitis and surgical approach), this research attempts to provide clinically relevant, procedure-specific evidence to guide surgical practice. The inclusion of open appendectomy approach allows for evaluation of whether the impact of triclosan-coated sutures differs based on surgical technique, potentially informing more nuanced recommendations. Furthermore, this study aims to contribute to the ongoing discussion regarding the cost-effectiveness and appropriate clinical niche for antimicrobial suture technology in contemporary surgical practice.

AIM & OBJECTIVES

AIM: To determine the clinical efficacy of Triclosan coated suture versus conventional suture in identifying the incidence and prevention of complications of post-operative SSI.

OBJECTIVES:

1. Determine the incidence of SSI in control group and case group.
2. Investigating the cost effectiveness of Triclosan coated PDS suture versus Conventional PDS suture
3. To compare the following parameters between TCS and conventional suture:
    a. Post-operative pain.
    b. Associated post-operative complications like:
        i. Fever
        ii. Swelling
        iii. Redness
        iv. Discharge.
    c. Duration of the Hospital stay- from the day of surgery to the day of discharge.
    d. Re-intervention

REVIEW OF LITERATURE

Miyoshi, N et al (2023)[52] evaluated the effectiveness of triclosan-coated sutures in fascia closure in preventing postoperative SSI in elective gastrointestinal surgery. A meta-analysis included present outcomes, evaluating the advantages of triclosan-coated compared with non-coated sutures in preventing SSIs for fascia closure of laparotomy in abdominal gastrointestinal surgery. This meta-analysis included eleven phase-III and two prospective studies, which comprised 9588 patients. The aggregated phase-III results of the trials demonstrate a significant superiority of triclosan-coated sutures compared with non-coated sutures (random-effect model, OR 0.71, 95 % CI 0.56-0.90, $P = 0.0052$).The meta-analysis showed benefit with triclosan-coated sutures in preventing SSI after gastrointestinal surgery.)

Kouzu, K et al (2023)[53] The aim of this study was to conduct a systematic review and meta-analysis of the efficacy of fascial closure using antimicrobial-sutures specifically for the prevention of surgical site infections (SSIs) in gastrointestinal surgery. The use of antimicrobial-coated sutures significantly lowered the risk of incisional SSIs compared with non-coated suture (risk ratio: 0.79, 95% confidence intervals: 0.64–0.98). In subgroup analyses, antimicrobial-coated sutures reduced the risk of SSIs for open surgeries, and when monofilament sutures were used. Antimicrobial-coated sutures did not reduce the incidence

of abdominal wall dehiscence and the length of hospital stay compared with non-coated sutures. The certainty of the evidence was rated as moderate according to the GRADE criteria, because of risk of bias. In conclusion, the use of antimicrobial-coated sutures for fascial closure in gastrointestinal surgery is associated with a significantly lower risk of SSI than non-coated sutures.

Erfan MA et al (2023)[54] determined the efficacy of polyglactin 910 suture coated with triclosan in lowering the rate of PSI in some of the clean contaminated wound surgeries. This study included 480 individuals eligible for laparoscopic cholecystectomy, appendicectomy or sleeve operations. Polyglactin 910 sutures coated with triclosan were used in one port site incision while polyglactin 910 sutures were used in the other port sites incisions. In patients who underwent laparoscopic cholecystectomy and appendicectomy, the incidence of PSI was significantly lower in the triclosan coated sutures. In sleeve gastrectomy patients, although a lower number of triclosan coated sutures developed PSI, there was no statistically significant difference between triclosan and non triclosan coated sutures.

This study showed that using sutures coated with antiseptics like triclosan has clinical benefits to prevent SSIs in most of the laparoscopic surgeries.

Manuel Bustamante Montalvo et al (2021)[55] evaluated the effect of triclosan coated sutures in prevention of surgical site infection in a Spanish hospital setting in the year 2021 who underwent surgery in the following specialties: general surgery, urology, neurosurgery, gynecology and traumatology. A prospective, observational study was conducted at Hospital Clínico Universitario de Santiago de Compostela, Spain. 5,081 patients were included in the study, of which 2,591 were treated using non-coated sutures (NCS) and 2,490 using TCS. After adjusting for potential confounders, TCS significantly reduced SSI rate by 36%, compared with NCS (odds ratio [OR]: 0.64; 95% confidence interval [CI]: 0.48-

0.85; *P*<0.003). When stratified by wound classification, a statistically significant reduction in SSI incidence, in favour of TCS use, was observed for Class IV (dirty) wounds (35.6% versus 22.7% for NCS and TCS, respectively; OR: 0.53; 95% CI: 0.31-0.90). They concluded that the use of TCS reduced SSI risk when compared with NCS. This reduction was significant for Class IV wounds, providing evidence that supports the use of TCS for this type of wound.

Ahmed I et al (2019)[56] Triclosan-coated sutures are antibacterial sutures aimed at reducing SSIs. This study's objective is to update the existing literature by systematically reviewing available evidence to assess the effectiveness of triclosan-coated sutures in the prevention of SSIs. Twenty-five RCTs were included involving 11 957 participants. Triclosan-coated sutures were used in 6008 participants and non triclosan-coated sutures were used in 5949. Triclosan-coated sutures significantly reduced the risk of SSIs at 30 days (relative risk 0.73, 95% CI 0.65 to 0.82). Further sensitivity analysis demonstrated that triclosan-coated sutures significantly reduced the risk of SSIs in both clean and contaminated surgery. They concluded that Triclosan-coated sutures have been shown to significantly reduced the risk of SSIs when compared with standard sutures.

Henriksen NA et al (2017)[57] The aim of this systematic review and meta-analysis was to evaluate the evidence from randomized controlled trials (RCT) comparing the rate of SSI in abdominal surgery when using triclosan-coated or uncoated sutures for fascial closure. They concluded that Triclosan-coated Vicryl sutures for abdominal fascial closure decrease the risk of SSI significantly and based on the trial sequential analysis further RCTs will not change that outcome. There was no effect on SSI rate with the use of triclosan-coated PDS sutures for abdominal fascial closure.

Guo J et al (2016)[58] performed a meta-analysis to assess the efficacy of triclosan-coated sutures for reducing risk of SSI in adults. Thirteen randomized clinical trials involving

5256 participants were included. Triclosan-coated sutures were associated with lower risk of SSI than uncoated sutures across all surgeries (risk ratio [RR] 0.76, 95% confidence interval [CI] 0.65-0.88, P < 0.001). Similar proportions of patients experienced wound dehiscence with either type of suture (RR 0.97, 95% CI 0.49-1.89, P = 0.92). Subgroup analysis showed lower risk of SSI with triclosan-coated sutures in abdominal surgeries (RR 0.70, 95% CI 0.50-0.99, P = 0.04) and group with prophylactic antibiotic (RR 0.79, 95% CI 0.63-0.99, P = 0.04). However, such risk reduction was not observed in cardiac surgeries, breast surgeries, or group without prophylactic antibiotic. They concluded that Triclosan-coated sutures can decrease the incidence of SSI in abdominal surgeries and might not interfere with wound healing process.

Toru Nakamura et al (2013)[59] conducted a study in Sopporo, Japan in the year between April 2009 and March 2011 including a sample size of 415 patients. A total of 410 consecutive patients who had undergone elective colorectal operations were enrolled in this trial. Of those patients, the 206 in the study group underwent wound closure with triclosan-coated polyglactin 910 antimicrobial sutures, and the 204 patients in the control group received conventional wound closures with polyglactin 910 sutures. The study group and the control group were comparable regarding risk factors for SSIs. The incidence of wound infection in the study group was 9 of 206 patients (4.3%), and that in the control group was 19 of 204 patients (9.3%). The difference is statistically significant in the 2 groups (P = .047). The median additional cost of wound infection management was $2,310. The actual entire additional cost, therefore, of 9 patients in the study group was $18,370, and that of 19 patients in the control group was $60,814. The study concluded that Triclosan-coated sutures can reduce the incidence of wound infections and the costs in colorectal surgery.

Enora Laas et al[60] in the year 2012 at University Pierre at Marie Curie Paris, France conducted a study with a sample size of 629 patients in each arm. The study concluded that

TC-coated sutures seem to reduce the rate of complications after the surgical treatment of breast pathologies.

SURGICAL SITE INFECTIONS

Historical Aspects of Surgical Site Infections

Surgical site infections have plagued human surgery since its earliest beginnings, evolving alongside our understanding of medicine and surgical practice. In ancient civilizations such as Egypt, Greece, and Rome, wound infections were common but poorly understood phenomena. Early surgeons observed the devastating consequences of post-surgical infections but lacked the theoretical framework to explain or prevent them. The Edwin Smith Papyrus (circa 1600 BCE) and Hippocratic writings contain some of the earliest documented observations of wound infections and empirical treatments using wine, vinegar, and specific herbs that we now know possessed antimicrobial properties.

The medieval and Renaissance periods saw little progress in infection control, with the miasma theory of disease predominating medical thought. Surgeons operated in their everyday clothes, often moving between autopsy rooms and surgical chambers without changing garments or washing hands. Pus formation was considered a normal and even necessary part of wound healing, captured in the phrase "laudable pus," reflecting the belief that purulent discharge was a positive sign of healing rather than a dangerous complication.

The 19th century marked a turning point with several revolutionary developments. Ignaz Semmelweis in Vienna demonstrated in 1847 that handwashing with chlorinated lime solution dramatically reduced maternal mortality from puerperal fever in obstetric clinics.

Despite his compelling evidence, Semmelweis faced ridicule and resistance from the medical establishment, illustrating how deeply entrenched incorrect medical practices were at the time.

Louis Pasteur's germ theory of disease in the 1860s provided the theoretical foundation for understanding infections. His work demonstrated that microorganisms were not spontaneously generated but came from pre-existing microbes, fundamentally changing how physicians conceptualized infectious diseases. This theoretical breakthrough set the stage for practical applications in surgical practice.

Joseph Lister pioneered antiseptic surgery in the 1860s after reading Pasteur's work. Recognizing that microorganisms caused wound infections, Lister introduced carbolic acid (phenol) sprays in the operating room and for wound dressings. His principles of antisepsis dramatically reduced post-surgical mortality rates from approximately 45% to 15% at Glasgow Royal Infirmary. Lister's work represented the first systematic approach to preventing surgical site infections through environmental control.

By the late 19th century, aseptic techniques began replacing antiseptic methods. Surgeons adopted sterilized instruments, surgical gowns, masks, and gloves. Notable among these developments was William Stewart Halsted's introduction of rubber surgical gloves at Johns Hopkins Hospital in 1889, initially to protect his nurse's (later wife's) hands from harsh antiseptics but soon recognized for their infection control benefits.

The early 20th century saw the standardization of operating room protocols and the development of autoclave sterilization. Ernst von Bergmann in Germany championed steam sterilization of instruments and dressings, further reducing infection rates. The discovery of antibiotics, beginning with Alexander Fleming's observation of penicillin in 1928, created another powerful weapon against surgical infections, though their widespread use didn't occur until the 1940s.

The post-World War II era witnessed the establishment of systematic surveillance and prevention programs for surgical infections. The Centers for Disease Control and Prevention's National Nosocomial Infections Surveillance (NNIS) System, established in 1970, began tracking hospital-acquired infections including SSIs, providing crucial epidemiological data that informed prevention strategies.

Modern approaches to SSI prevention represent the culmination of this historical evolution, combining evidence-based practices from multiple domains: antimicrobial prophylaxis, advanced sterilization techniques, improved surgical materials including antimicrobial-impregnated sutures, minimally invasive surgical approaches, and comprehensive perioperative care protocols. The historical progression from complete ignorance of infection causes to today's multifaceted prevention strategies reflects one of medicine's most significant achievements, saving countless lives through the systematic application of scientific principles to surgical practice.[11]

Definition: Surgical site infection (SSI) is defined by the Centers for Disease Control and Prevention as a wound infection that occurs within 30 days of an operative procedure or within a year if an implant is left in place and the infection is thought to be secondary to surgery.[12]

Epidemiology: Approximately 0.5% to 3% of all surgical patients will develop a surgical site infection. However, the growing prevalence of outpatient surgery poses challenges in gathering comprehensive postoperative data. To address this, the NHSN has recently initiated protocols to collect data on surgical site infections resulting from procedures conducted in ambulatory surgical centers. Notably, surgical site infections often manifest after visits to ambulatory surgical centers or hospital discharge, documented in outpatient notes that may

not be integrated into the hospital record. Therefore, any data reported by the CDC and NHSN should be interpreted within this contextual framework.[13]

Although the adoption of enhanced preventive measures has led to a decline in the incidence of surgical site infections over time, they still significantly impact morbidity and mortality. Surgical site infections contribute to 20% of all healthcare-associated infections. Patients who develop surgical site infections face higher chances of requiring admission to an intensive care unit (ICU) and are associated with mortality risks ranging from 2 to 11 times greater. Additionally, they are 5 times more likely to experience hospital readmission. Surgical site infections constitute the most common cause of unplanned hospital readmissions in the postoperative period.[14, 15]

In 2018, the reported incidence of surgical site infections in the United States was 157,500, with an estimated mortality of 8205. Within intensive care units (ICUs), 11% of all deaths were linked to surgical site infections. Patients with a surgical site infection typically require an additional 10 to 11 days of hospitalization on average and incur an extra financial burden exceeding $20,000 per admission. Consequently, the additional financial strain on the United States healthcare system approximates $3.3 billion annually.[16]

Surgical site infection rates are correlated with the degree of contamination of a surgical wound at the time of the surgical procedure.[17]

The classification, according to the Canadian Agency for Drugs and Technologies in Health (CADTH) Report 2011, is defined as follows:

Clean: A procedure characterized by the absence of inflammation and maintenance of sterility. The gastrointestinal, urogenital, and pulmonary tracts are not accessed.

Clean-contaminated: A procedure involving entry into the gastrointestinal, urogenital, or pulmonary tracts in a controlled manner, with no existing contamination.

Contaminated: A procedure where a breach in sterile technique occurs and/or there is gross spillage from the gastrointestinal tract, or an incision through acutely inflamed (non-purulent) tissue. This category also includes open traumatic wounds that are 12 to 24 hours old.

Dirty or infected: A procedure performed on perforated viscera or an incision through acutely inflamed and purulent tissue. Open traumatic wounds older than 24 hours with necrotic tissue or fecal contamination also fall into this category.[28]

Table 1:Surgical Site Infection Rates by Degree of Contamination

Degree of Contamination	**Surgical Site Infection Rates per 1000 Procedures**
Clean	2.1
Clean-contaminated	3.3
Contaminated	6.4
Dirty or infected	7.1

Epidemiology of SSI in Appendicectomy

SSI accounts for 20% of all healthcare-associated infections (HAIs) and is associated with a 2- to 11-fold increase in the risk of mortality, with 75% of SSI-associated deaths directly attributable to the SSI. Surgical site infection is the most costly HAI type, with an estimated annual cost of $3.3 billion and extending hospital length of stay by 9.7 days, with the cost of hospitalization increasing by more than $20,000 per admission. The rates of SSI are much higher with abdominal surgery than with other types of surgery, with several prospective studies indicating an incidence of 15%–25% depending on the level of contamination.[18] The incidence of surgical site infection in appendectomies is variable in different settings. Lower infection rates have been reported by the National Healthcare Safety Network (Center for Disease Control and Prevention/United States) and the International Nosocomial Infection Control Consortium (1.4% and 2.9%, respectively).[19]

Classification of Surgical Site Infections

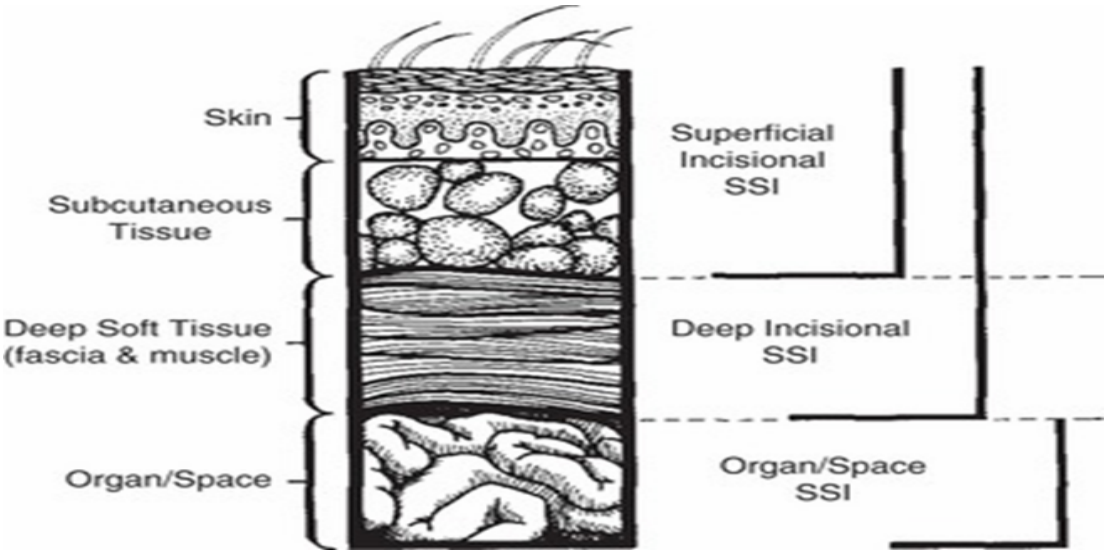

Figure 2 : Surgical site Infection Classification

The Centres for Disease Control and Prevention (CDC) classify surgical site infections into categories such as superficial, deep incisional, or organ/space infections. Any surgical wounds declared infected or opened by the surgeon are designated as surgical site infections.

Superficial Incisional Infections: These surgical site infections exclusively affect the skin and subcutaneous tissues, constituting over 50% of all surgical site infections. Diagnosis of a superficial incisional infection necessitates meeting one of the following criteria:

- Presence of purulent discharge from the surgical site.
- Identification of an organism from the surgical site.
- Clinical diagnosis of a surgical site infection by the surgeon.
- Deliberate opening of the wound by the surgeon, accompanied by at least one associated infectious symptom, such as swelling, erythema, or localized pain or warmth.

Deep Incisional Infections: These infections involve soft tissues deep into the subcutaneous tissue, including muscles and fascial planes. This diagnosis requires 1 of the following criteria:

- Presence of purulent discharge from the surgical site.
- Wound dehiscence.
- Deliberate re-opening of a deep incision by the surgeon due to suspicion of infection or wound spontaneously dehisces, and a positive wound culture and at least one infectious symptom is present (eg, fever, localized pain, or tenderness)

- Evidence of abscess formation or infection involving deep tissues, as observed on a computed tomography (CT) scan.

Organ/Space Infections: These infections may involve any organ or anatomical space beyond the incision site but deeper than the fascial or muscle layers, including implant-related infections. Diagnosis requires meeting one of the following criteria:

- Presence of purulent discharge from a drain placed in the organ, space, or cavity.
- Identification of an isolated organism from the involved organ, cavity, or related abscess.
- Evidence of abscess formation or infection involving the organ, cavity, or anatomical space, as observed on a CT scan.
- Notably, a wound is not considered infected if only a stitch abscess, localized cellulitis, or an infected superficial stab puncture is present.

Most surgical site wound infections originate from endogenous flora typically found on mucous membranes, skin, or hollow viscera. Generally, when the concentration of microbiological flora exceeds 10,000 microorganisms per gram of tissue, the risk of wound infection escalates.[20]

ETIOLOGY: The causes of postoperative wound infections are diverse, ranging from direct contact or airborne transmission to contamination with endogenous microbes, with susceptibility influenced by various factors. Infection patterns may vary based on the surgical procedure, operative approach, and geographical location. Risk factors can be categorized into patient and procedural factors.

Patient risk factors for wound infection include, but are not limited to, advanced age, malnutrition, hypovolemia, obesity, steroid use, poorly controlled diabetes, immunocompromised state, smoking, trauma, procedure site (intraabdominal, pelvic, or extremity), extended preoperative hospitalization, inadequate preoperative skin hygiene, and existing infections at distant sites.

Certain elective conditions can and should be optimized before surgical procedures. These factors include smoking cessation, weight loss, coagulation cascade normalization, glucose control optimization, and stabilization of other comorbidities.

Procedure-related risk factors include:

- Abnormal fluid collection such as hematoma or seroma
- Contamination of the surgical site, equipment, or personnel
- Utilization of drains
- Presence of foreign material in the surgical site
- Hypothermia
- Improper hair removal
- Inadequate antibiotic prophylaxis
- Insufficient application of the skin prep
- Short duration of surgical preoperative scrub
- Prolonged surgical time
- Poor operating room (OR) ventilation
- History of prior infection or contaminated case
- Prolonged perioperative inpatient stay

Unsatisfactory surgical practices and techniques, including:

- Failure to maintain tissue hydration by periodic saline irrigation
- Direct organ or tissue injury
- Excessive tension when using traction or closing tissue
- Excessive tissue trauma
- Failure to remove dead or dying tissue
- Inadequate haemostasis
- Leaving excessive dead space
- Overuse of cautery
- Tissue devascularization
- Unintended spillage of bowel contents
- Unnecessary or prolonged use of drains[21, 22]

Adherence to the preoperative and operative checklist is crucial in minimizing the rates of surgical site infections. The operating room team collectively bears the responsibility for adhering to best practices. Optimal ventilation is paramount, achieved through positive pressurization with adequate filtration, flow, and air exchange (ideally at least 15 exchanges per hour). Incoming air should be HEPA filtered and directly sourced from the outside, entering the operating room from the ceiling or a high position on the wall, while exhausts should be located near floor level.[23, 24]

Reducing patient skin flora through a preoperative chlorhexidine shower is commonly advised the night before and/or on the day of surgery. Hair removal is recommended, preferably using clippers, immediately before surgery. However, clippers are not recommended before scrotal surgery due to the potential for excessive skin trauma. In most

procedures and specialties, chlorhexidine and alcohol-based agents are typically preferred and recommended for skin preparation.

Tools and accessories, including stethoscopes, blood pressure cuffs, patient transfer slides, tourniquets, and computer keyboards, should be regularly cleaned to prevent bacterial contamination.[25, 26] Surgical devices such as anaesthesia or cautery units, suction machines, operating room lighting, and patient transfer aids can also serve as potential sources of contamination.

Towels, sheets, and similar materials should be stored in closed cabinets or outside the operating room. Utilizing appropriate scrubbing techniques and double gloving can help reduce the incidence of postoperative infections.[27]

The World Health Organization (WHO) surgical checklist aims to enhance communication, prevent complications, and improve safety and outcomes, including the prevention of surgical site infections. Surgical procedures are categorized as clean, clean-contaminated, contaminated, and dirty-infected, each associated with varying rates of postoperative wound infections.

Risk factors for surgical site infection (SSI) following an appendectomy include:

- A complex appendicitis,
- Open surgical approach (compared to laparoscopic),
- Prolonged operative time,
- Low serum albumin,
- Obesity,
- Diabetes mellitus,
- Smoking,

- Malnutrition,
- advanced age,
- Poor nutritional status,
- Pre-existing infection, and improper timing of antibiotic prophylaxis;
- With the most significant risk being a ruptured or complicated appendix requiring a more extensive procedure.

PATHOPHYSIOLOGY

The inciting event in developing a surgical site infection typically begins with microbial contamination of the wound. Factors such as the virulence and quantity of the contaminating organism contribute to infection, often defined as exceeding more than 105 microorganisms per gram of tissue without a foreign body. Etiologic agents of surgical site infections can be either endogenous or exogenous. Endogenous microbes originate from the patient's skin, mucous membranes, or nearby hollow viscera or may be introduced via hematogenous spread. The most common endogenous causative organisms of surgical site infections vary depending on the procedural anatomical site. For instance, following cardiac, breast, ophthalmic, orthopaedic, and vascular surgeries, *Staphylococcus aureus* and coagulase-negative staphylococci are frequently implicated. Conversely, following abdominopelvic procedures, Enterococcus, gram-negative bacilli, and anaerobes are more commonly encountered etiologic agents.[29]

Exogenous microbes may originate from the operating theatre or its inhabitants, potentially transmitted through airborne means, on instruments or materials, or via hospital staff. Among the exogenous organisms commonly identified in surgical site

infections are staphylococci and streptococci. However, the prevalence of highly virulent hospital-acquired microorganisms such as methicillin-resistant *S aureus* (MRSA) or extended-spectrum β-lactamase microbes isolated from surgical site infections is on the rise. This trend is likely attributed to the widespread and sometimes inappropriate use of broad-spectrum antibiotics. For instance, in a study conducted in community hospitals in the southeastern US, the incidence of MRSA-associated surgical site infections increased from 12% in 2000 to 23% in 2005. Furthermore, in the 2010 NHSN update, the proportion of surgical site infections attributed to MRSA was reported to be 43.7%.[30]

Suture Materials and SSI[31]

Suture materials can directly impact the risk of surgical site infections (SSIs) as they provide a surface where bacteria can adhere, colonize, and potentially lead to infection; different suture types, particularly their composition and structure, can vary in their susceptibility to bacterial biofilm formation, with multifilament sutures generally having a higher risk of infection compared to monofilament sutures.

Bacterial adhesion:

The surface of a suture acts as a foreign body in the wound, allowing bacteria to readily attach and form biofilms, which can be difficult to treat with antibiotics.

Suture type matters:

Multifilament sutures: These braided sutures have more crevices for bacteria to hide in, increasing the risk of infection.

Monofilament sutures: Smooth, single-strand sutures tend to have less bacterial adherence and are generally preferred in situations where infection risk is high.

Suture Materials and Wound Closure Techniques in Appendicectomy

Abdominal fascial closure techniques have evolved significantly alongside advances in suture materials, with each innovation aiming to improve wound healing while minimizing complications. Traditional suture materials for fascial closure include absorbable options such as polyglycolic acid (Dexon), polyglactin 910 (Vicryl), polydioxanone (PDS), and non-absorbable materials like polypropylene (Prolene), nylon, and stainless steel—each offering distinct handling properties, tensile strength profiles, and tissue reactivity characteristics.[32]

Wound closure techniques in appendectomy have progressed from the traditional interrupted mass closure using natural materials like catgut and silk to continuous running techniques with monofilament sutures that distribute tension more evenly across the fascial closure. Suture selection has been demonstrated to significantly impact surgical outcomes, with studies showing monofilament sutures generally elicit less tissue reaction and bacterial adherence than multifilament alternatives. Recent research has highlighted how the physical characteristics of sutures—including diameter, tensile strength, elasticity, and knot security—directly influence wound dehiscence rates, incisional hernia formation, and surgical site infection incidence. The emergence of specialized sutures, such as those with antimicrobial coatings like triclosan, represents the latest advancement in this field, with growing evidence suggesting their potential to reduce surgical site infections in contaminated and clean-contaminated procedures like appendectomy, though debate continues regarding their cost-effectiveness and clinical significance across different surgical scenarios and patient populations.[33]

History and Physical Examination

Symptoms of surgical site infections typically manifest within 3 to 7 days following a procedure. However, by definition, these symptoms must arise within either 30 or 90 days of

the procedure, depending on the specific type of surgical procedure performed. The precise timeframe varies based on the nature of the surgical intervention.[34]

Procedures warranting a 90-day surveillance period for the development of a surgical site infection include breast surgery, cardiac surgery, coronary artery bypass graft with both chest and donor site incisions, coronary artery bypass graft with chest incision only, craniotomy, spinal fusion, open reduction of fracture, herniorrhaphy, hip prosthesis, knee prosthesis, pacemaker surgery, peripheral vascular bypass surgery, and ventricular shunt placement.

Technically challenging, prolonged, contaminated, or emergent surgical procedures of any type carry an increased risk of surgical site infection development. Patients with superficial or deep incisional surgical site infections frequently present with a gradual onset of pain around the surgical site and general malaise or fatigue. They may or may not describe incisional discharge or frequently saturated dressings. Patients with organ/space infections may describe localized or generalized pain and systemic symptoms of fevers, chills, night sweats, fatigue, or malaise. The physical examination may reveal incisional erythema, purulent or nonpurulent discharge, wound dehiscence, or delayed healing. Tenderness with palpation may be localized or more diffuse.

The physical examination of a patient with a presumptive surgical site infection should be performed in person whenever possible. However, if an in-person examination is impossible, visualization of the affected area is imperative. A study measuring the effect of introducing wound photography for situations where face-to-face meetings are impossible demonstrated improvements in diagnostic accuracy and helped prevent overtreatment.[35]

All dressings must be removed during the physical examination, and the wound should be inspected for blisters, wound tension, edema, inappropriate tenderness, excessive erythema, fluctuance, blackish-gray tissue, and evidence of ischemia or necrosis. Palpation

should be performed employing a sterile technique. Whether intentional or secondary, openings in the wound should be carefully probed with a sterile cotton swab to assess for dead space, deep closure integrity, pockets of fluid, and tissue undermining. If discharge is present, purulent or otherwise, it should be sampled and sent for culture, sensitivity, and microbiological analysis.

Evaluation

The diagnosis of a surgical site infection is predominately clinical. However, wound cultures should be performed whenever possible to isolate a potential etiologic agent and guide antibiotic therapy. Imaging with ultrasound, CT, or magnetic resonance imaging (MRI) is helpful if a deep space infection is suspected. Tools are employed to predict the likelihood of developing an infection based on risk factors. Internationally recognized traditional predictive models include the National Nosocomial Infection Surveillance System, the Australian Clinical Risk Index, and the European System for Cardiac Operative Risk Evaluation. However, the clinical value of these tools is limited by the omission of many risk factors from the calculations. Additionally, some tools have weak discriminatory abilities or do not risk-stratify for specific surgeries. Specialty- and operation-specific scoring systems are emerging, including but not limited to the two-variable Infection Risk Index in Cardiac Surgery and the Surgical Site Infection Risk Score.[36, 37]

Patients with superficial incisional infections typically do not demonstrate systemic signs of infection. However, fever and leukocytosis may be present. Imaging of the affected area is of limited utility and generally not recommended. Patients with deep incisional infections are likelier to demonstrate systemic signs of infection, such as fever. Laboratory evaluation typically shows leukocytosis with a left shift, and if conducted, elevated procalcitonin and C-reactive protein levels may be observed. However, inflammatory markers are not essential for diagnosis. While diagnosing a superficial incisional infection is

usually straightforward, identifying a deep incisional infection solely based on clinical grounds may pose challenges, especially in patients with obesity. Imaging the affected area with ultrasound or CT can help establish the depth, extent, and anatomical involvement. Image-guided aspiration and drainage with culture can facilitate antibiotic therapy and improve outcomes.

Patients with organ/space surgical site infections typically present with systemic signs and symptoms of inflammation and infection, though superficial incisions appear uninfected. Accurately diagnosing an organ/space surgical site infection almost always requires imaging, frequently demonstrating a fluid collection or abscess in or around the surgical site. As with deep incisional infections, image-guided aspiration is of clinical utility; when available, interventional radiology should be consulted to assess suitability for drain placement.

Patients affected by necrotizing soft tissue infections represent a distinctive subset within the surgical site infection population, posing a grave threat to life with markedly elevated morbidity and mortality rates. Typically, these patients present as critically ill within the initial 48 to 72 hours following surgery and often exhibit signs of sepsis. The physical examination usually reveals pain out of proportion to the typical postoperative course, dusky or erythematous skin, peri-incisional edema, crepitus, ecchymosis, hypovascularity, blistering, or frank tissue necrosis. Incisional drainage may be present in excessive amounts. Laboratory evaluation may reveal leukocytosis or leukopenia.[38, 39]

Necrotizing soft tissue infections may involve any tissue, including the fascia and musculature, and spread quickly along fascial or tissue planes. Imaging studies can help confirm the diagnosis but should not delay surgical wound exploration with debridement in suspected cases. Fournier gangrene is a typical example of a postoperative necrotizing soft tissue infection and is a surgical emergency.[40]

Treatment / Management

Preventive Measures

Preventive measures should be taken to mitigate postoperative infections, with a checklist approach and attention to known risk factors being paramount. The "CDC and Health Infection Control Practice Advisory Committee Guideline for the Prevention of Surgical Site Infections," a comprehensive, evidence-based guideline published in 2017, is highly recommended for this purpose. These measures can be categorized into pre-procedural, perioperative, and intraoperative phases. Key pre-procedural considerations include optimizing chronic health issues such as glucose control, medication assessment, addressing chronic wounds/infections, and smoking cessation. Perioperative steps may entail preoperative showers, hair clipping, administering operation-specific antibiotics, and appropriate skin preparation. Additionally, maintaining optimal intraoperative conditions, including temperature, air circulation, and sterility, is imperative for preventing wound infections.[41]

A large study from Japan demonstrated a significant reduction in surgical site infections by including a perioperative oral cleaning regimen. This included removal of tartar, plaque, and scale, professional dental cleaning, optimal denture care, including adjustments, and high-quality general dental care, including extractions as needed before surgery. In a large trial, the practice of changing surgical gloves and instruments immediately before abdominal wound closure resulted in a statistically significant decrease in the rate of surgical site infections. Although preliminary, these findings suggest the need for further studies to validate this approach.[42]

The routine use of surgical drains is discouraged due to uncertainty regarding their efficacy in preventing surgical site infections, and they may impede early patient

mobilization. If utilized, surgical drains should be promptly removed. Various measures have been taken to reduce the incidence of surgical site infections, including antibiotic irrigation, topical antimicrobial gels, antibiotic-impregnated suture material, and antiseptic dressings, among others. However, no definitive evidence currently exists demonstrating the significant efficacy of these interventions.[43]

Delayed primary closure, commonly utilized in cases of significant contamination, has historically been employed to mitigate surgical site infections in specific patient populations. However, a meta-analysis of randomized studies did not demonstrate any significant clinical benefit associated with this practice. Additionally, antibiotic selection tailored to the type of surgical procedure and the prevalent microbes encountered remains crucial in preventing surgical site infections.[44]

The utilization of prophylactic negative pressure therapy in post-surgical wounds has been proposed for specific high-risk surgical cases and contaminated wounds. Although data generally support this practice in high-risk surgeries, outcomes vary, likely due to differences in wound contamination levels and patient and wound characteristics. Data do not suggest that the selection of surgical dressings for closed incisions significantly affects the incidence of surgical site infections.[45, 46]

Treatment of Surgical Site Infections

Treatment decisions are influenced by factors such as the specific procedure performed, the types of microbes involved, anatomical considerations, and the patient's characteristics. In cases involving foreign bodies such as mesh, implants, stents, or metalwork, removal may be necessary due to contamination and the formation of

biofilms. Cultures are indicated for open wounds and drainage, especially if purulent, as the results will affect antibiotic selection. A negative wound culture might suggest an unusual infection with acid-fast bacteria or fungal organisms, particularly in immunocompromised patients. In such scenarios, specific cultures for these organisms should be obtained.[47]

Systemic antibiotics are required for cases with systemic signs of infection such as fever, significant skin erythema, cellulitis, or if evidence of deeper soft tissue involvement is found. In cases where patients exhibit systemic signs of infection, obtaining blood cultures should be considered. Timely interventions in patients diagnosed with sepsis have been demonstrated to be life-saving. If the infection is superficial, treatment may be limited to local wound care. The primary treatment for superficial wound infections involves opening the incision, examining the wound, draining any infected fluid collections, and debriding (removing) all necrotic tissue. This procedure is typically performed at the bedside or in the office setting. If evidence suggests deeper involvement, drainage may be conducted via interventional radiology or, if needed, in the operating room.[48]

Once a wound has been opened, dressings must create a clean, moisture-balanced environment while ensuring tissue is appropriately debrided and maintained at an optimal temperature to facilitate healing. A balanced wound matrix prevents tissue necrosis caused by desiccation and contains growth factors that support healing, epithelial regeneration, and autolysis of dead tissue. Wound dressings tailored to specific wound environments are available. The choice of dressing type and frequency of changes depend on the wound's condition and stage of healing. Topical antiseptics such as hydrogen peroxide, dilute sodium hypochlorite, and povidone-iodine solutions may be sparingly used in infected, open wounds, but their application should be limited due to the cytotoxicity they pose to the wound matrix.[49]

In cases where mechanical debridement cannot be performed, enzymatic agents are used. Cleaning and debridement should be repeated until no necrotic or devitalized material

remains and healthy granulation tissue forms. Removing any infected foreign material or implants is prioritized.

Vacuum-assisted wound therapy utilizes negative pressure to minimize dressing changes, avoid excess fluid accumulation, and promote granulation. Vacuum-assisted wound therapy has been successfully used after major trauma, orthopedic procedures, burn surgeries, and open abdominal wounds. A meta-analysis revealed a statistically significant decrease in surgical site infections following spinal surgery, along with fewer postoperative complications and shorter hospitalization durations when vacuum-assisted wound therapy was employed. Similarly, another meta-analysis focusing on surgical site infections in women following cesarean sections reported similar positive outcomes with the use of vacuum-assisted closure (VAC) of wounds.[50]

Wounds managed with VAC dressings may necessitate intermittent mechanical debridement. However, the use of VAC therapy requires specialized oversight, particularly when underlying organs or major blood vessels are exposed. Deep surgical site infections, especially in abdominal wounds, present unique challenges due to the risk of wound dehiscence. Consequently, exploring these wounds may be more safely conducted in the operating room. Percutaneous drainage may be considered for some cases of infected fluid collections. Notably, organ/space surgical site infections are associated with higher morbidity and mortality rates compared to other types of surgical site infections. Ultrasound and/or CT scans can facilitate the percutaneous placement of closed drains into infected fluid collections and abscesses, which may be linked to anastomotic leaks following bowel surgery. The presence of air or contrast within an intrabdominal abscess strongly suggests a bowel perforation or anastomotic leak.

TRICLOSAN[51]

Since the invention of antimicrobial chemicals in the mid 1900's, their incorporation into a multitude of consumer products has significantly increased. Most of these chemicals are added to consumer products in the absence of a fully encompassed toxicological profile. Triclosan (TCS) is an antimicrobial that, since its original use in hospital settings in 1972, has been incorporated into a variety of consumer products including soaps, hand sanitizers, toothpaste, and mouthwash. In 1977, TCS production (covered by the United States Toxic Substances Control Act) was between 0.5 and 1 million pounds per year. This production increased to 1 to 10 million pounds in 1998. Estimated global production of TCS in 2011 was 14 million pounds, which decreased to 10.5 million pounds in 2015. Between 1999 and 2000, 75% of 178 liquid soaps sampled contained TCS and 30% of over 300 samples of bar soaps contained TCS. In the late 2000's (2008–2010), TCS as an active ingredient was found in 93% of liquid, gel, or foam soaps. Consumer products containing antimicrobial active ingredients totalled $886 million in total sales.

Triclosan exhibits broad-spectrum antibacterial properties through its primary mechanism of inhibiting bacterial fatty acid synthesis by blocking the enzyme enoyl-acyl carrier protein reductase (ENR), essential for bacterial cell membrane formation. At higher concentrations, it demonstrates bactericidal effects by disrupting bacterial cell membranes and causing cytoplasmic leakage. This dual-action mechanism provides activity against numerous pathogens including Staphylococcus aureus (including MRSA), Escherichia coli, and other common surgical site infection pathogens, making it particularly valuable in surgical contexts where polymicrobial contamination often occurs. Unlike many antibiotics that target specific bacterial processes, triclosan's multiple mechanisms of action have

historically contributed to its lower resistance development rates, though concerns about emerging resistance have increased with its widespread use in consumer products.

The pharmacokinetics of triclosan are characterized by moderate absorption through skin and mucous membranes, with significant variability depending on the delivery vehicle and exposure duration. Once absorbed, triclosan undergoes extensive first-pass metabolism in the liver, primarily through glucuronidation and sulfation, creating water-soluble metabolites that are predominantly excreted through urine and bile. Studies indicate triclosan's biological half-life ranges from 21 to 36 hours, with potential for bioaccumulation in adipose tissue due to its lipophilic properties. When incorporated into surgical sutures, triclosan demonstrates controlled local release into surrounding tissues, maintaining effective antimicrobial concentrations for approximately 7-10 days post-implantation—a duration that aligns well with the critical period for surgical site infection development—while minimizing systemic absorption and associated risks.

Adverse effects and safety concerns regarding triclosan have evolved significantly in recent years. While local tissue reactions such as contact dermatitis occur rarely, broader ecological and potential health impacts have prompted regulatory scrutiny. Animal studies suggesting potential endocrine disruption, particularly affecting thyroid and reproductive hormone function, have raised questions about long-term human exposure effects. Additionally, concerns about potential contributions to antimicrobial resistance development, particularly cross-resistance to clinically important antibiotics, have emerged despite limited definitive evidence in clinical settings. Environmental persistence and aquatic toxicity represent external concerns primarily related to consumer product applications rather than medical uses. In the specific context of triclosan-coated suture materials, however, the limited localized exposure and clear therapeutic benefit have maintained a favorable risk-benefit

profile, with major regulatory bodies including the FDA continuing to support their clinical use despite restrictions on triclosan in other applications.

Triclosan-coated suture materials

Triclosan-coated suture materials represent a significant innovation in surgical site infection prevention, combining conventional suture technology with controlled antimicrobial delivery. These sutures typically incorporate triclosan into absorbable materials like polyglactin 910 (Vicryl Plus), polydioxanone (PDS Plus), and poliglecaprone 25 (Monocryl Plus) through proprietary manufacturing processes that ensure uniform distribution without compromising mechanical properties. The resulting sutures create a "zone of inhibition" around the wound closure, effectively preventing bacterial colonization during the critical early healing phase. Clinical studies demonstrate particular efficacy in contaminated and clean-contaminated procedures, with meta-analyses suggesting reduction in surgical site infection rates ranging from 26% to 33% across various surgical specialties. Implementation considerations include slightly higher acquisition costs compared to conventional counterparts, though cost-effectiveness analyses increasingly support their use when accounting for the substantial financial burden of surgical site infections. Furthermore, antimicrobial sutures align with the contemporary surgical approach of multimodal infection prevention, complementing rather than replacing fundamental practices like appropriate antibiotic prophylaxis, meticulous surgical technique, and evidence-based perioperative care protocols.

MATERIALS & METHOD

SOURCE OF DATA

All patients admitted in the Department of surgery at B.L.D.E. (Deemed to be University) Shri B.M. Patil Medical College Hospital and Research Centre, Vijayapura between March 2023 to January 2025, undergoing open Appendectomy.

STUDY DESIGN

Prospective Comparative Study

INCLUSION CRITERIA

All the patients of age group between 18 - 60 years of age who present to BLDE (Deemed to be University) SHRI B M PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTRE, VIJAYAPURA, at the Department of General Surgery OPD or Casualty/Emergency with Appendicitis, undergoing Open Appendectomy.

EXCLUSION CRITERIA

- Patients with compromised immune system.
- Pregnant women with Acute Appendicitis.

SAMPLE SIZE CALCULATION

The software used for sample size calculation is G*Power version 3.1.9.4. The proportion of appendix for Triclosan Group is 10.7% (1) and Control Group 33.1% (1), this study requires a total sample size of minimum 114 patients (57 for each group by assuming equal group sizes), so to achieve a power of 85% for detecting a difference in Proportions. Exact -

Proportions: Inequality, two independent groups (unconditional) with 5% level of significance.

STATISTICAL ANALYSIS

The data obtained is entered in a Microsoft Excel sheet, and statistical analyses are performed using a statistical package for the social sciences (SPSS) (Version 20). Results are presented as Mean, SD, counts and percentages, and diagrams. An independent sample t-test will be used to compare the variable between two groups for normally distributed continuous variables. The Mann-Whitney U test is used for not-normally distributed variables. For Categorical variables between the two groups, comparison is done using the Chi-square test/Fisher's exact test. If $p<0.05$, then it will be considered statistically significant. All statistical analyses are performed two-tailed.

METHODOLOGY:

This is a Prospective Comparative study between patients undergoing abdominal fascial closures with Triclosan Coated PDS Suture Vs Conventional PDS suture in Open Appendectomy surgeries in B.L.D.E. (Deemed to be University) Shri B.M. Patil Medical College Hospital and Research Centre.

The period of study is from March 2023 to January 2025

For the duration of about 2 years, patients undergoing appendectomies are allocated into two separate groups:

1. Group 1 subjects will undergo abdominal fascial closure with conventional PDS suture.

2. fascia

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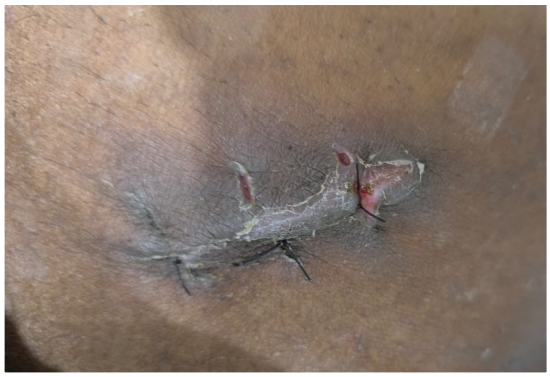

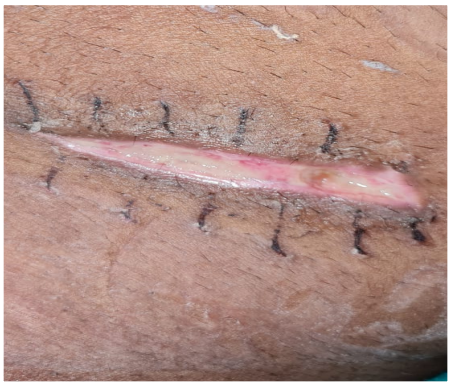

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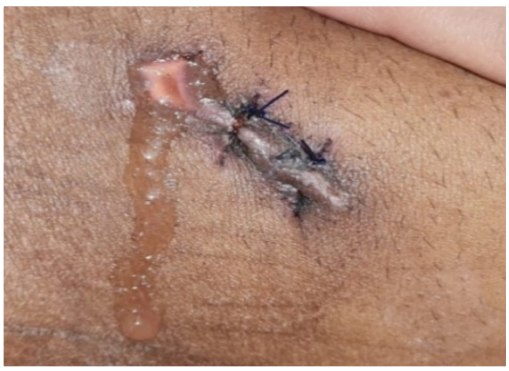
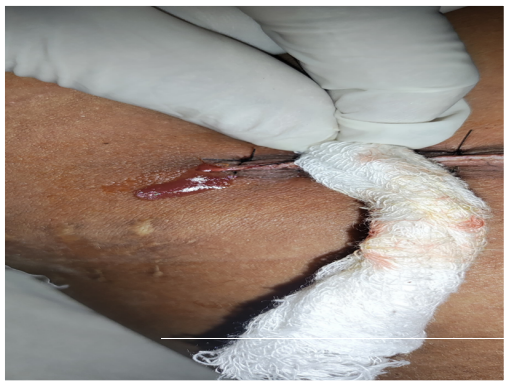
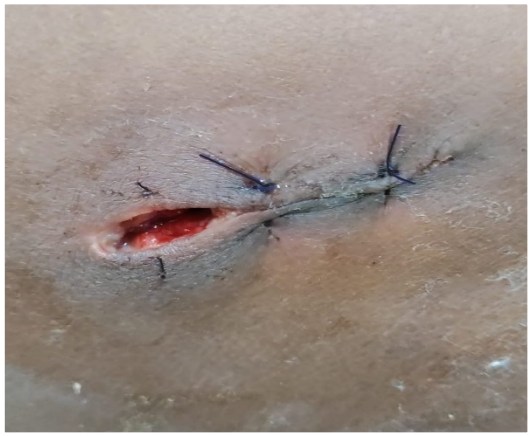




RESULTS

The present study was conducted in the department of General surgery at BLDE (DU) Shri.B.M.Patil Medical college Hospital and Research centre, Vijayapura from March 2023 to January 2025 to determine the clinical efficacy of Triclosan coated suture vs conventional suture in identifying the incidence and prevention of complications of post operative SSI.

Total of 114 patients with 57 in each group were considered for the study.

- **PDS suture:**57 Patients
- **PDS plus + Triclosan coated:**57 patients

Following were the results of the study:

Table 1: Comparison of age among groups

Age (in years)	PDS	PDS plus	p-value
18-20	11 (19.3%)	10 (17.5%)	0.89
21-40	27 (47.4%)	31 (54.4%)	
41-60	18 (31.6%)	15 (26.3%)	
61-80	1 (1.8%)	1 (1.8%)	
Total	**57 (100%)**	**57 (100%)**	

Table 1 and graph 1 shows that age distribution was similar between both groups, with most patients (47.4% in PDS and 54.4% in PDS plus) being between 21-40 years old, followed by 41-60 years (31.6% in PDS and 26.3% in PDS plus), and with no statistically significant difference between groups (p=0.89).

Graph 1: Comparison of age among groups

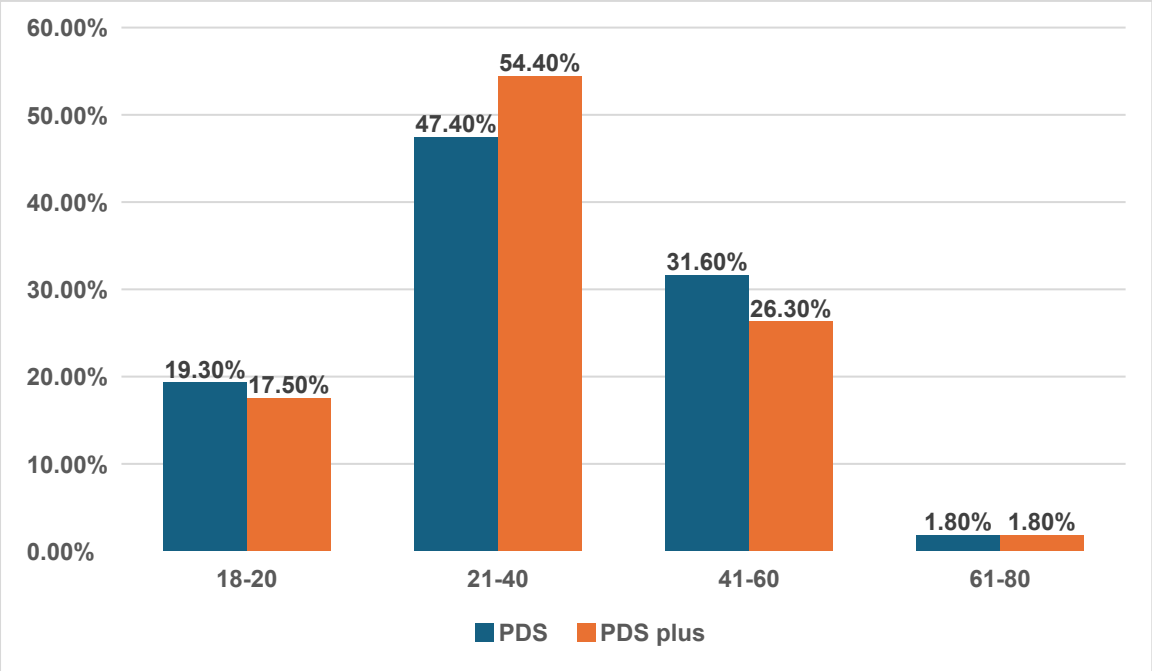


Table 2: Comparison of gender among groups

Gender	PDS	PDS plus	p-value
Female	18 (31.6%)	15 (26.3%)	0.53
Male	39 (68.4%)	42 (73.7%)	
Total	**57 (100%)**	**57 (100%)**	

Table 2 and graph 2 indicates that gender distribution was comparable between groups with male predominance in both (68.4% in PDS and 73.7% in PDS plus), and female patients comprising 31.6% of the PDS group and 26.3% of the PDS plus group, showing no significant difference (p=0.53).

Graph 2: Comparison of gender among groups

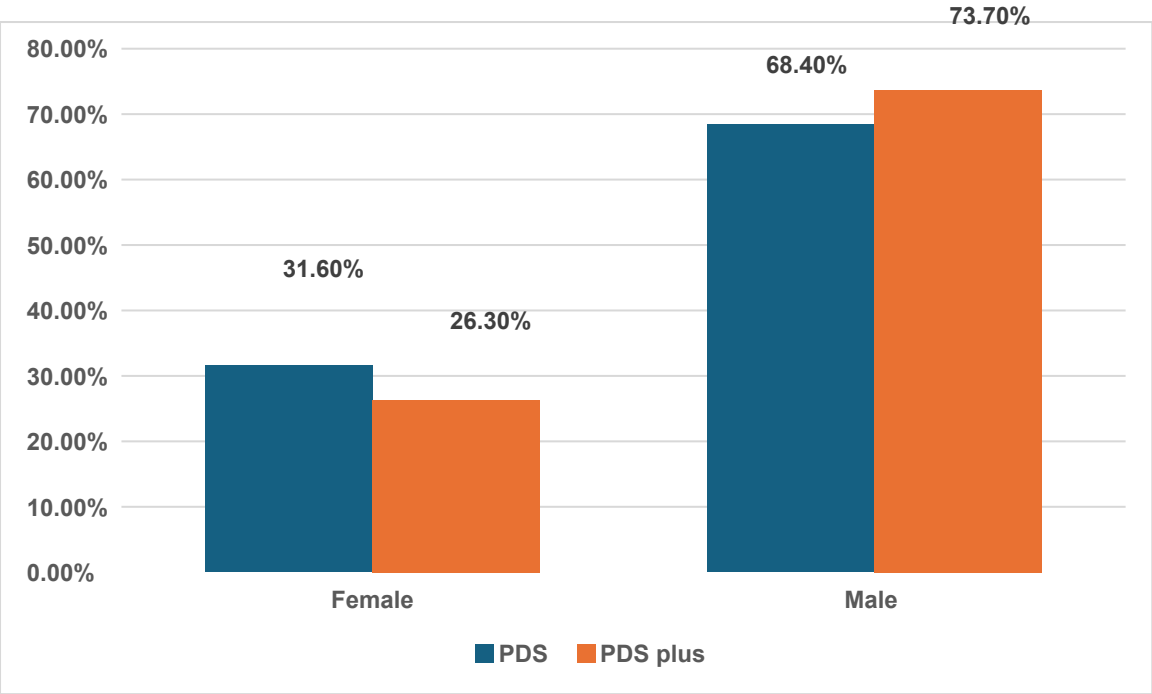


Table 3: Comparison of co-morbidities among groups

Co-morbidities	PDS	PDS plus	p-value
Diabetes mellitus	1 (1.8%)	1 (1.8%)	0.64
Hypertension	6 (10.5%)	3 (5.3%)	
Obesity	48 (84.2%)	49 (86%)	
None	2 (3.5%)	4 (7%)	
Total	**57 (100%)**	**57 (100%)**	

Table 3 and graph 3 demonstrates that obesity was the most common comorbidity in both groups (84.2% in PDS and 86% in PDS plus), followed by hypertension, with no significant difference in comorbidity distribution between groups (p=0.64).

Graph 3: Comparison of co-morbidities among groups

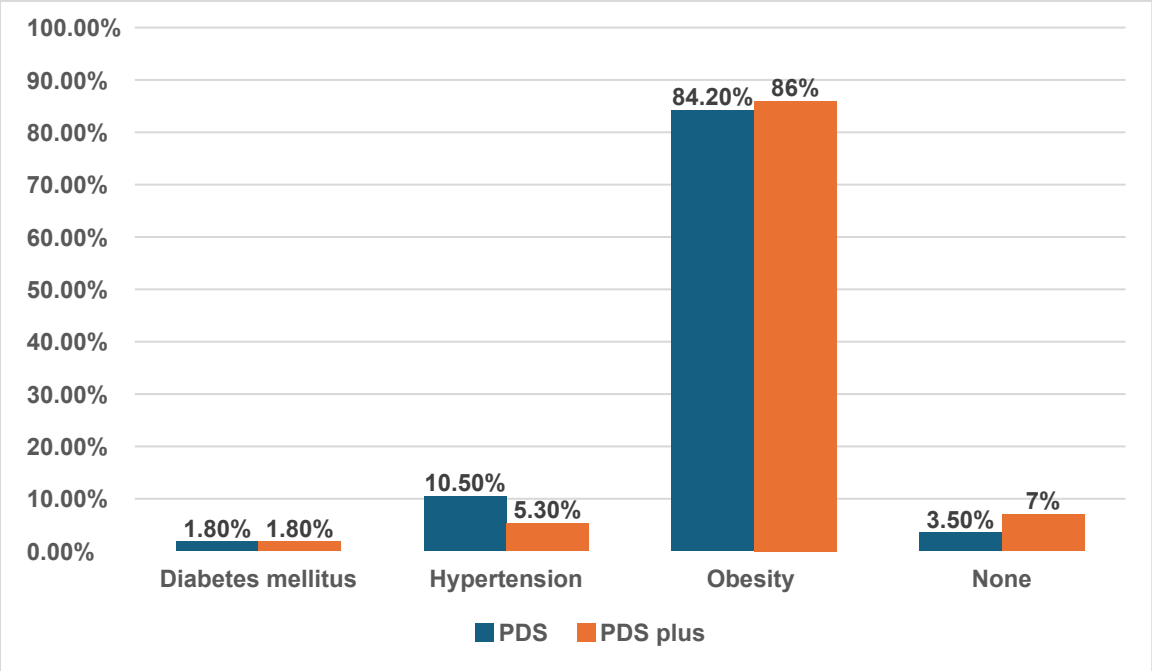


Table 4: Comparison of diagnosis among groups

Diagnosis	PDS	PDS plus	p-value
Acute appendicitis	21 (36.8%)	20 (35.1%)	0.81
Early Appendicular mass (Intra operative)	5 (8.8%)	7 (12.3%)	
Chronic appendicitis	5 (8.8%)	9 (15.8%)	
perforated appendicitis	6 (10.5%)	6 (10.5%)	
Recurrent appendicitis	11 (19.3%)	8 (14%)	
Subacute appendicitis	9 (15.8%)	7 (12.3%)	
Total	**57 (100%)**	**57 (100%)**	

Table 4 and graph 4 reveals that acute appendicitis was the most common diagnosis in both groups (36.8% in PDS and 35.1% in PDS plus), followed by recurrent appendicitis in the PDS group (19.3%) and chronic appendicitis in the PDS plus group (15.8%), with no significant difference in diagnosis distribution between groups (p=0.81).

Graph 4: Comparison of diagnosis among groups

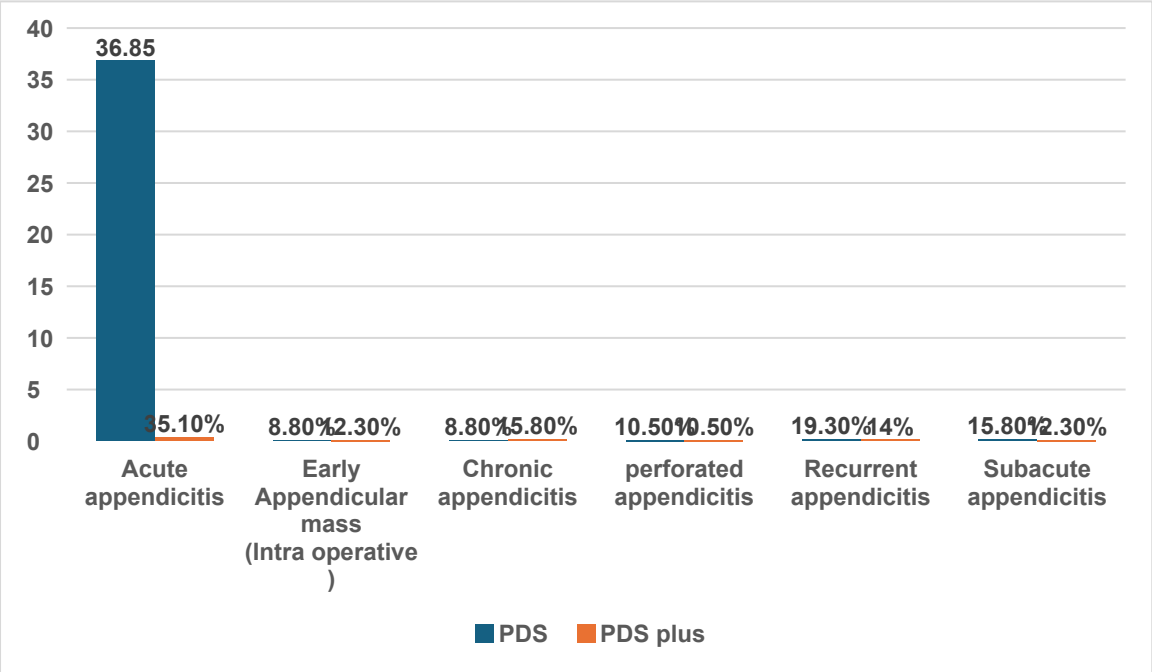


Table 5: Comparison of occurrence of SSI among groups

Occurrence of SSI	PDS	PDS plus	p-value
Yes	11 (19.3%)	1 (1.8%)	**0.002**
No	46 (80.7%)	56 (98.2%)	
Total	**57 (100%)**	**57 (100%)**	

Table 5 and graph 5 demonstrates a significantly lower surgical site infection (SSI) rate in the PDS plus group (1.8%) compared to the PDS group (19.3%), indicating a statistically significant benefit of triclosan-coated sutures in reducing SSI (p=0.002).

Graph 5: Comparison of occurrence of SSI among groups

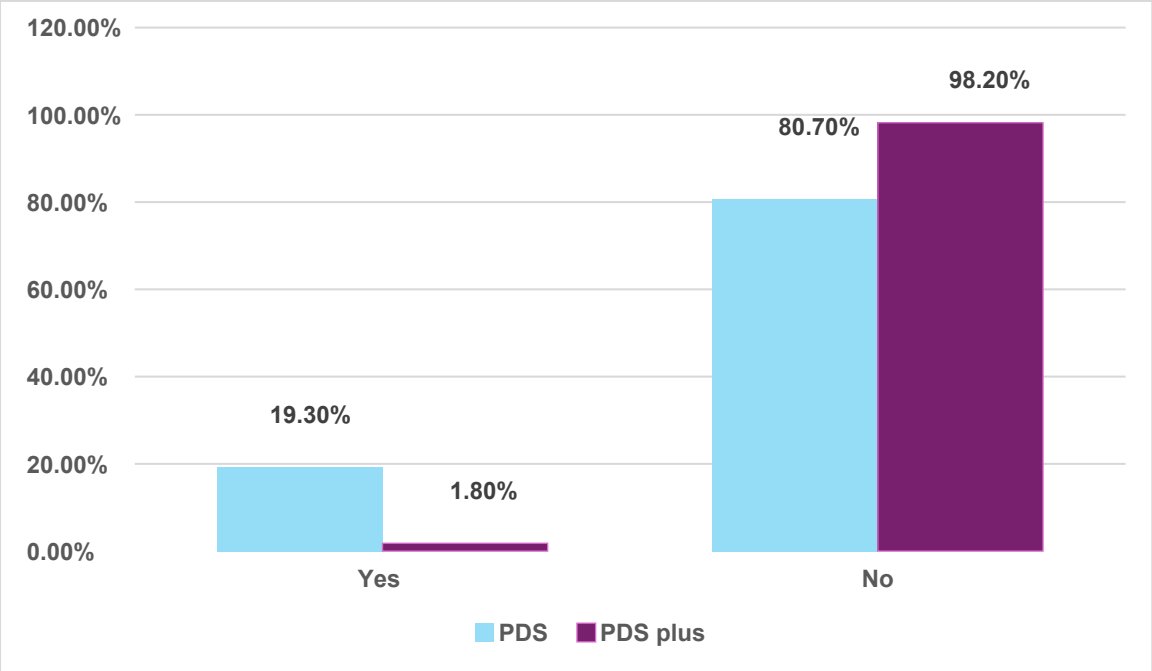


Table 6: Comparison of type of SSI among groups

Type of SSI	PDS	PDS plus	p-value
Deep	5 (8.8%)	0	**0.008**
Superficial	46 (80.7%)	56 (98.2%)	
None	6 (10.5%)	1 (1.8%)	
Total	**57 (100%)**	**57 (100%)**	

Table 6 and graph 6 shows that deep SSIs occurred in 8.8% of patients in the PDS group while none occurred in the PDS plus group, and superficial infections were more common in both groups, with a statistically significant difference in SSI type distribution (p=0.008).

Graph 6: Comparison of type of SSI among groups

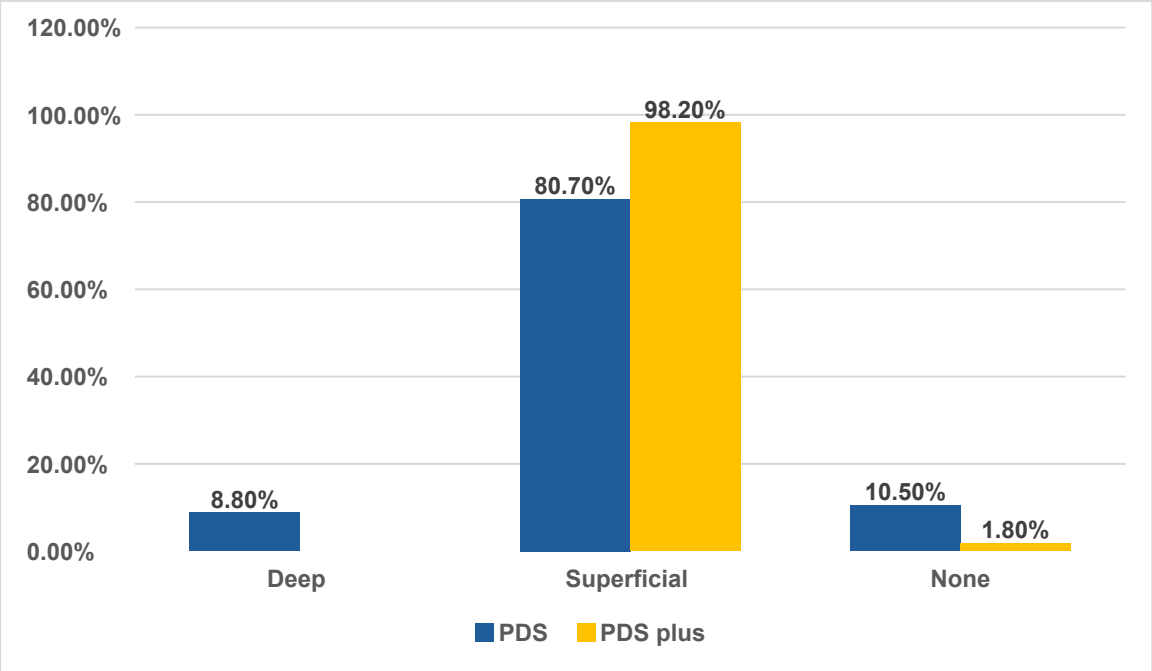


Table 7: Comparison of wound culture results among groups

Wound culture	PDS	PDS plus	p-value
Proteus vulgaris	3 (5.3%)	0	**0.04**
E. Coli	2 (3.5%)	0	
Klebsiella pneumoniae	4 (7%)	0	
Acinetobacter/pseudomonas	2 (3.5%)	1 (1.8%)	
Total	**57 (100%)**	**57 (100%)**	

Table 7 and graph 7 indicates that pathogenic bacteria were isolated more frequently in the PDS group, with Klebsiella pneumoniae (7%), Proteus vulgaris (5.3%), E. coli (3.5%), and

Acinetobacter/pseudomonas (3.5%) present, while the PDS plus group had only one case (1.8%) of Acinetobacter/pseudomonas, representing a statistically significant difference (p=0.04).

Graph 7: Comparison of wound culture results among groups

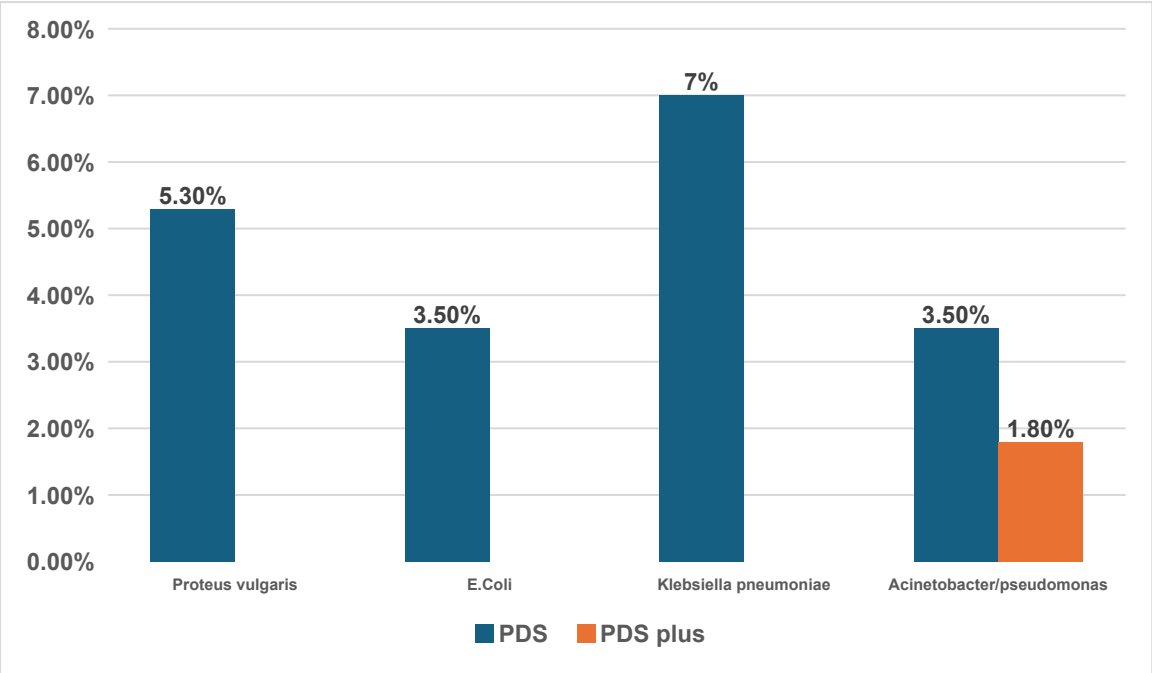


Table 8: Comparison of length of hospital stay among groups

length of hospital stay (days)	PDS	PDS plus	p-value
Mean±SD	5.51±1.6	3.58±1.17	**<0.001**

Table 8 and graph 8 reveals that the mean length of hospital stay was significantly shorter in the PDS plus group (3.58±1.17 days) compared to the PDS group (5.51±1.6 days), with a highly significant difference (p<0.001).

Graph 8: Comparison of length of hospital stay among groups

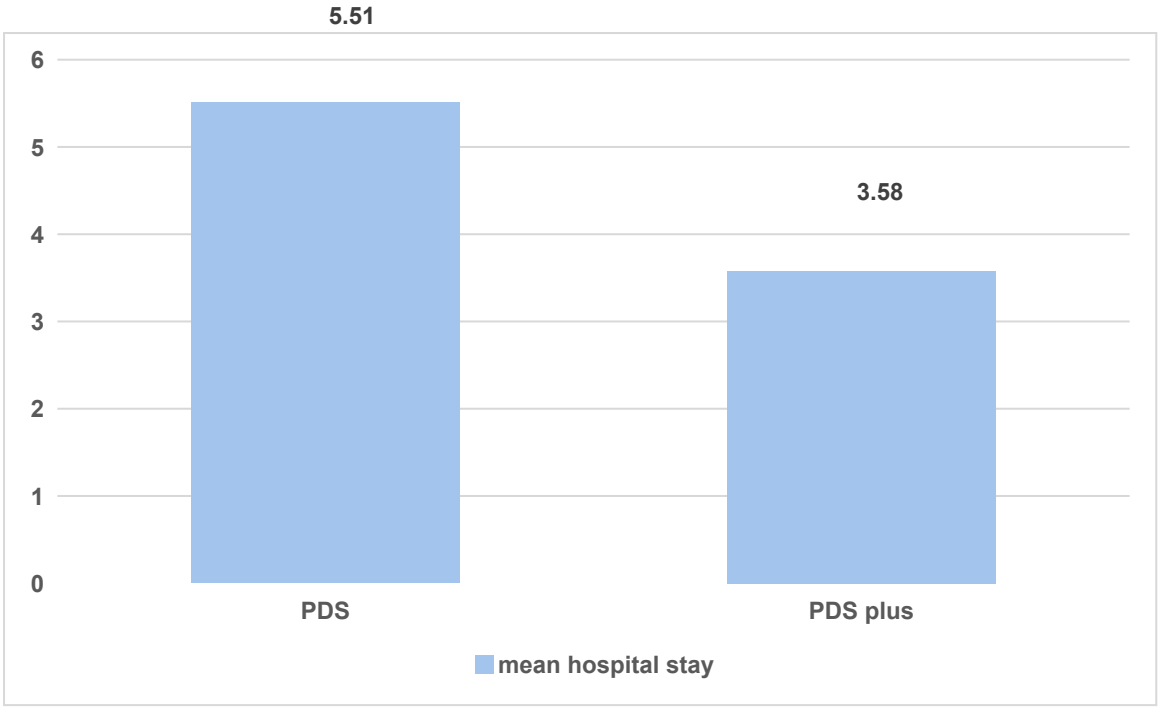


Table 9: Association of SSI with comorbidities

Comorbidities	SSI		p-value
	Absent	Present	
Diabetes mellitus	2 (2%)	0	0.92
Hypertension	8 (7.8%)	1 (8.3%)	
Obesity	87 (85.3%)	10 (83.3%)	
None	5 (4.9%)	1 (8.3%)	
Total	**102 (100%)**	**12 (100%)**	

Table 9 and graph 9 shows no significant association between specific comorbidities and SSI occurrence (p=0.92), with obesity being the most common comorbidity in both patients with SSI (83.3%) and without SSI (85.3%).

Graph 9: Association of SSI with comorbidities

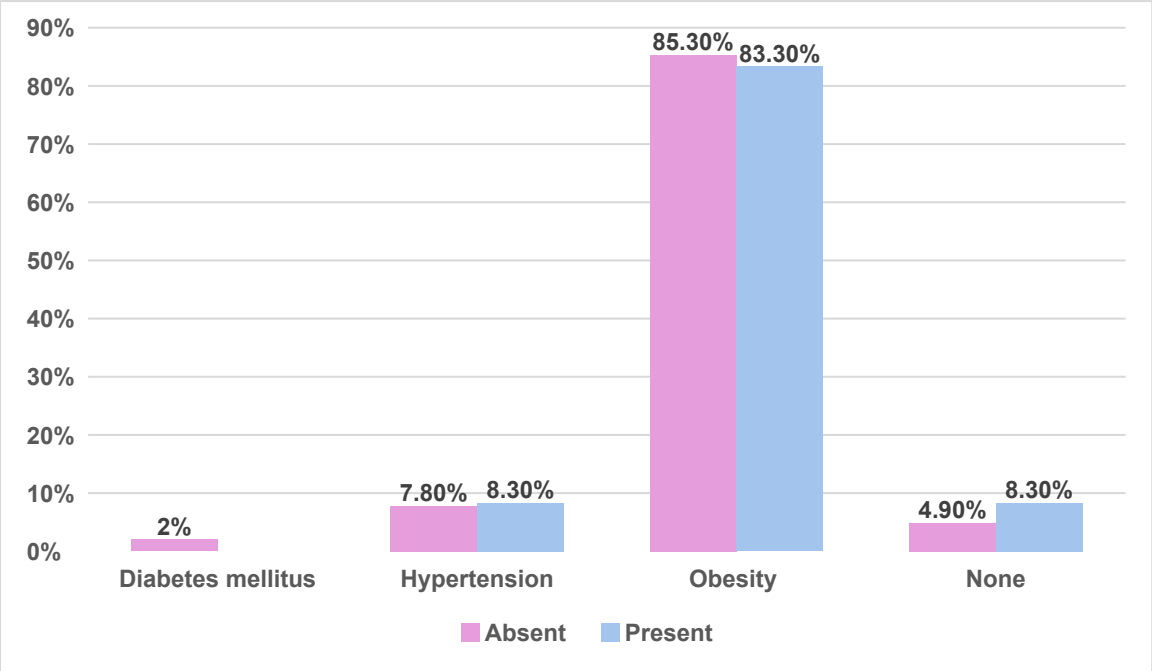


Table 10: Association of SSI with diagnosis

Diagnosis	SSI		p-value
	Absent	Present	
Acute appendicitis	36 (35.3%)	5 (41.7%)	0.83
Early Appendicular mass (Intra operative)	11 (10.8%)	1 (8.3%)	
Chronic appendicitis	13 (12.7%)	1 (8.3%)	
perforated appendicitis	11 (10.8%)	1 (8.3%)	

Recurrent appendicitis	18 (17.6%)	1 (8.3%)	
Subacute appendicitis	13 (12.7%)	3 (25%)	
Total	**102 (100%)**	**12 (100%)**	

Table 10 and graph 10 indicates no significant association between specific diagnoses and SSI occurrence (p=0.83), though subacute appendicitis had a slightly higher proportion among patients with SSI (25%) compared to those without SSI (12.7%).

Graph 10: Association of SSI with diagnosis

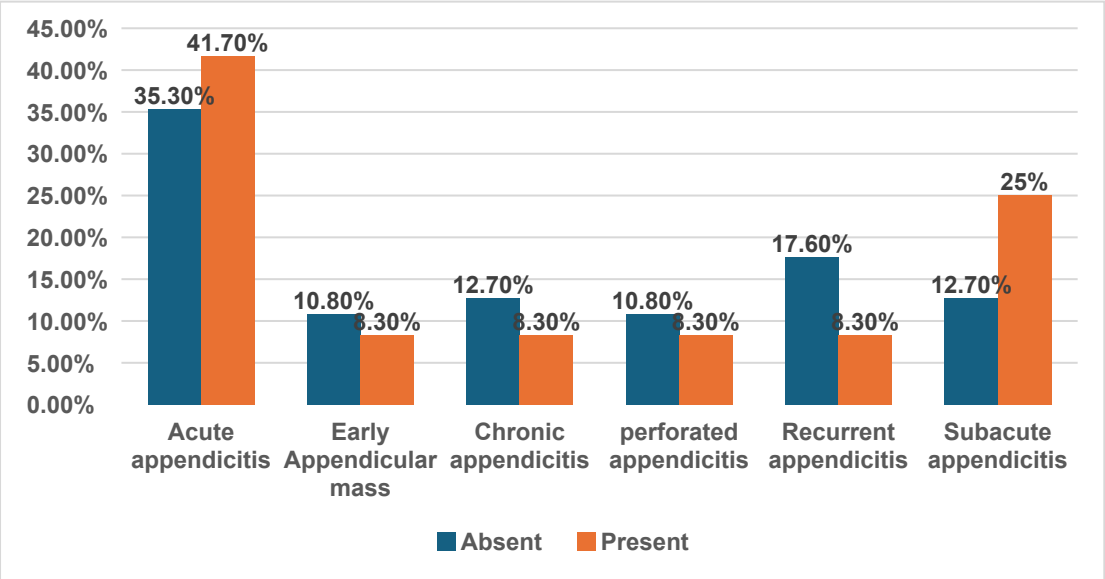
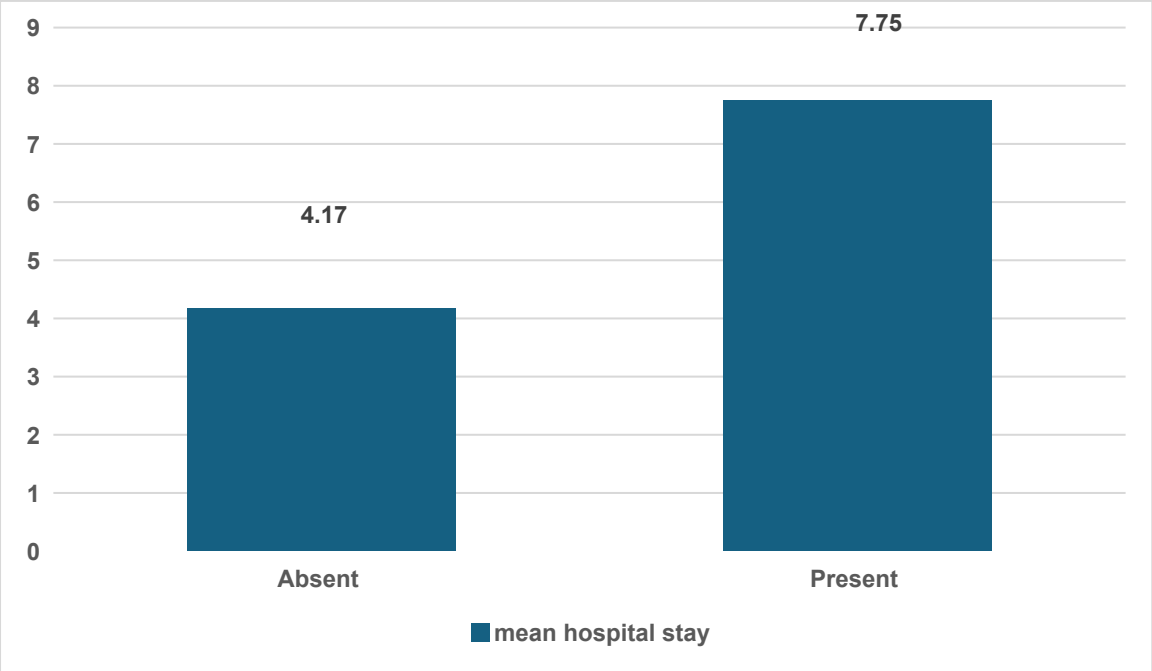


Table 11: association of SSI with length of hospital stay

length of hospital stay (days)	**SSI**		**p-value**
	Absent	**Present**	
Mean±SD	4.17±1.2	7.75±1.7	**<0.001**

Table 11 and graph 11 demonstrates that patients who developed SSI had significantly longer hospital stays (7.75±1.7 days) compared to those without SSI (4.17±1.2 days), indicating a strong association between SSI occurrence and prolonged hospitalization (p<0.001).

Graph 11: Association of SSI with length of hospital stay



DISCUSSION

Surgical site infections (SSIs) remain one of the most prevalent healthcare-associated infections, affecting millions of patients globally each year. Despite significant advancements in surgical techniques, sterilization practices, and perioperative care, SSIs continue to be a substantial burden on healthcare systems, contributing to increased morbidity, mortality, prolonged hospital stays, and escalated healthcare costs. The prevention of SSIs has therefore emerged as a critical priority in surgical practice. Among various preventive strategies, antimicrobial-coated sutures, particularly those impregnated with triclosan, have garnered considerable attention in recent years as a potential tool to mitigate the risk of SSIs. This study aimed to evaluate the efficacy of triclosan-coated polyglyconate sutures (PDS Plus)

compared to conventional polyglyconate sutures (PDS) in reducing the incidence of SSIs following abdominal fascial closure in open appendectomy procedures.

Incidence of Surgical Site Infections

Our study demonstrated a significant reduction in the incidence of SSIs with the use of triclosan-coated sutures. The PDS Plus group experienced an SSI rate of merely 1.8%, compared to 19.3% in the conventional PDS group (p=0.002). This substantial difference highlights the potential beneficial role of antimicrobial-coated sutures in infection prevention strategies.

These findings align with those reported by Nakamura et al., who conducted a randomized controlled trial evaluating triclosan-coated sutures in colorectal surgery and observed a significant reduction in SSI rates from 9.3% in the conventional suture group to 4.3% in the triclosan-coated suture group (p=0.047).[62] Similarly, Diener et al. in the PROUD trial, which involved 1,185 patients undergoing midline laparotomy, reported a reduction in SSI rates from 16.1% with conventional sutures to 12.5% with triclosan-coated sutures, though the difference did not reach statistical significance (p=0.064).[63]

A systematic review and meta-analysis by de Jonge et al. encompassing 21 randomized controlled trials with 6,462 patients revealed that triclosan-coated sutures were associated with a 33% lower risk of developing SSIs compared to non-coated sutures (RR 0.67, 95% CI 0.54-0.84, p<0.001).[64] The more pronounced effect observed in our study (90.7% reduction) compared to previous literature may be attributed to our focus specifically on appendectomy, the surgical technique employed, patient population characteristics, or other factors influencing wound healing and infection susceptibility.

Interestingly, Ruiz-Tovar et al. reported an SSI rate of 11.4% with conventional sutures versus 2.9% with triclosan-coated sutures (p=0.018) in bariatric surgery[65], which closely

mirrors our findings. This substantial reduction suggests that triclosan-coated sutures may be particularly effective in surgical procedures involving potentially contaminated fields, as is often the case in appendectomy and bariatric surgery.

Types of Surgical Site Infections

Our analysis of SSI types revealed that deep SSIs occurred in 8.8% of patients in the conventional PDS group, while no deep SSIs were observed in the PDS Plus group. Superficial infections were more common in both groups, with a statistically significant difference in SSI type distribution (p=0.008). This finding is particularly notable as deep SSIs are associated with greater morbidity, requiring more intensive interventions and prolonged hospitalization.

Guo et al. conducted a meta-analysis of 13 randomized controlled trials including 5,256 patients and found that triclosan-coated sutures significantly reduced not only overall SSI rates but also specifically deep incisional SSIs (RR 0.61, 95% CI 0.37-0.99, p=0.04).[66] Similarly, Konstantelias et al. in their meta-analysis of 30 randomized controlled trials with 8,091 patients observed that triclosan-coated sutures were effective in preventing both superficial (RR 0.75, 95% CI 0.61-0.93) and deep/organ-space SSIs (RR 0.65, 95% CI 0.44-0.97).[67]

The complete absence of deep SSIs in our PDS Plus group is noteworthy and suggests that triclosan-coated sutures may provide enhanced protection against more serious infections. This effect may be attributable to triclosan's broad-spectrum antimicrobial activity against many common surgical wound pathogens, and its sustained release from the suture material, which creates a "zone of inhibition" around the suture that prevents bacterial colonization and subsequent biofilm formation.[68]

Microbiology of Surgical Site Infections

The microbiological analysis of wound cultures in our study revealed a significant difference between the two groups. In the conventional PDS group, we isolated various pathogenic bacteria including Klebsiella pneumoniae (7%), Proteus vulgaris (5.3%), Escherichia coli (3.5%), and Acinetobacter/Pseudomonas species (3.5%). In contrast, the PDS Plus group had only one case (1.8%) of Acinetobacter/Pseudomonas infection. This difference was statistically significant ($p=0.04$) and provides insights into the antimicrobial spectrum of triclosan.

Edmiston et al. investigated the in vitro antimicrobial activity of triclosan-coated sutures against clinical wound isolates and demonstrated significant antimicrobial activity against staphylococci (including methicillin-resistant Staphylococcus aureus), gram-negative bacilli such as E. coli and Klebsiella pneumoniae, and some strains of Pseudomonas aeruginosa.[69] The efficacy against various gram-negative bacteria observed in our study corroborates these findings and suggests that triclosan-coated sutures may be particularly valuable in surgeries with a high risk of gram-negative bacterial contamination, such as appendectomy.

However, Wang et al. noted variability in triclosan's effectiveness against different bacterial species, with particularly good activity against staphylococci but less consistent activity against some gram-negative species, especially Pseudomonas.[70] This observation may explain the solitary case of Acinetobacter/Pseudomonas infection in our PDS Plus group, as these organisms are known for their intrinsic resistance to many antimicrobial agents, including potentially triclosan.

The predominance of gram-negative organisms in our study differs somewhat from the findings of Sánchez-Manuel et al., who reported Staphylococcus aureus as the most common causative agent of SSIs in abdominal surgery.[71] This difference may reflect regional or

institutional variations in microbial flora, antibiotic usage patterns, or other factors influencing the microbial ecology of surgical wounds.

Impact on Hospital Stay

Our study demonstrated a significant reduction in the mean length of hospital stay with the use of triclosan-coated sutures (3.58±1.17 days) compared to conventional sutures (5.51±1.6 days, $p<0.001$). This finding has substantial clinical and economic implications, as reduced hospital stays translate to decreased healthcare costs, lower risk of hospital-acquired complications, and improved patient satisfaction.

Thimour-Bergström et al. investigated triclosan-coated sutures in sternal wound closure following cardiac surgery and reported a significantly shorter hospital stay in the triclosan group compared to the control group (11.6±7.0 vs. 16.4±15.8 days, $p=0.004$).[72] Similarly, Singh et al. observed a reduction in average hospital stay from 7.8 days with conventional sutures to 6.6 days with triclosan-coated sutures ($p<0.001$) in abdominal surgeries.[73]

A health economic analysis by Leaper et al. estimated that the use of triclosan-coated sutures could result in cost savings of approximately €1,340 per patient undergoing colorectal surgery in France and €910 per patient in Germany, primarily due to reduced SSI-related costs including hospital stay.[74] These findings, along with our observations, suggest that despite the higher initial cost of triclosan-coated sutures, their use may result in net cost savings for healthcare systems when considering the overall economic burden of SSIs.

Furthermore, our analysis revealed that patients who developed SSI had significantly longer hospital stays (7.75±1.7 days) compared to those without SSI (4.17±1.2 days, $p<0.001$), irrespective of the suture type used. This finding is consistent with a large body of literature documenting the impact of SSIs on healthcare utilization. For instance, Kusachi et al. reported that patients with SSIs after gastrointestinal surgery had an average additional

hospital stay of 14.3 days compared to those without SSIs[75], while Namba et al. found that SSIs following orthopedic surgery were associated with a 7.5-day increase in hospital stay.[76]

Role of Comorbidities

Our study found no significant association between specific comorbidities and SSI occurrence (p=0.92). Obesity was the most common comorbidity in both patients with SSI (83.3%) and without SSI (85.3%), followed by hypertension. The high prevalence of obesity in our study population (84.2% in PDS and 86% in PDS Plus groups) is noteworthy and reflects the increasing global burden of this condition.

These findings contrast somewhat with the existing literature, which has consistently identified obesity as a significant risk factor for SSIs. Thelwall et al. analyzed data from the English Surveillance Programme for Surgical Site Infection and found that obesity (BMI ≥30 kg/m²) was associated with a significantly increased risk of SSI across various surgical procedures (adjusted odds ratio 1.53, 95% CI 1.45-1.62).[77] Similarly, Yuan et al. conducted a meta-analysis of 14 studies and reported that obesity increased the risk of SSI by 91% (OR 1.91, 95% CI 1.76-2.06).[78]

The lack of a significant association between obesity and SSI in our study may be due to the high baseline prevalence of obesity in our study population, which might have limited the statistical power to detect differences. Alternatively, the protective effect of triclosan-coated sutures might have mitigated the increased risk typically associated with obesity, particularly in the PDS Plus group.

Diabetes mellitus, another well-established risk factor for SSIs, was present in only two patients in our study (1.8% in each group), none of whom developed SSI. This low prevalence might explain the lack of association observed in our study, in contrast to findings

by Martin et al., who reported that diabetes increased the risk of SSI by 53% (RR 1.53, 95% CI 1.11-2.12) in a meta-analysis of 94 studies.[79]

Relationship with Diagnostic Categories

Our analysis found no significant association between specific diagnostic categories and SSI occurrence (p=0.83). While subacute appendicitis had a slightly higher proportion among patients with SSI (25%) compared to those without SSI (12.7%), and acute appendicitis accounted for the majority of cases in both groups, these differences did not reach statistical significance.

Xiao et al. conducted a retrospective analysis of 1,196 patients undergoing appendectomy and reported that complicated appendicitis (gangrenous or perforated) was associated with a significantly higher risk of SSI compared to uncomplicated appendicitis (OR 1.95, 95% CI 1.41-2.70).[80] Similarly, Giesen et al. found that perforated appendicitis increased the risk of SSI nearly fourfold compared to non-perforated appendicitis (OR 3.7, 95% CI 2.1-6.7).[81]

The absence of a significant association between diagnostic categories and SSI risk in our study may be attributable to various factors. First, the relatively small sample size and low overall incidence of SSI in the triclosan group may have limited the statistical power to detect differences across diagnostic categories. Second, the standardized surgical technique and perioperative care protocols employed in our study might have mitigated some of the infection risk typically associated with complicated appendicitis. Finally, the antimicrobial effect of triclosan-coated sutures may have been particularly beneficial in cases with higher baseline infection risk, such as complicated appendicitis, thereby attenuating the expected association between diagnostic severity and SSI occurrence.

Mechanisms of Action and Resistance Concerns

While our study did not specifically investigate the mechanism of action of triclosan-coated sutures, it is important to consider this aspect in the broader context of antimicrobial resistance concerns. Triclosan exerts its antimicrobial effect primarily by inhibiting bacterial fatty acid synthesis, specifically targeting the enoyl-acyl carrier protein reductase (FabI) enzyme, which is essential for bacterial cell membrane formation.[82] This mechanism differs from that of most antibiotics used in clinical practice, potentially offering a complementary approach to infection prevention.

However, concerns have been raised regarding the potential for bacteria to develop resistance to triclosan. Laboratory studies have demonstrated the emergence of triclosan-resistant strains of various bacteria, including E. coli, S. aureus, and P. aeruginosa, through mechanisms such as target site modification, efflux pump overexpression, and metabolic bypass.[82] Additionally, some studies have suggested potential cross-resistance between triclosan and certain antibiotics, although the clinical relevance of these findings remains unclear.

Leaper et al. addressed these concerns in a comprehensive review and concluded that while theoretical risks exist, there is currently no evidence that the use of triclosan-coated sutures in clinical practice has contributed to increased antimicrobial resistance.[74] The authors noted that triclosan has been used in various consumer products for decades without clear evidence of clinically significant resistance development. Furthermore, the localized and time-limited exposure to triclosan from coated sutures likely poses a lower risk for resistance development compared to widespread environmental exposure from consumer products.

Nevertheless, prudent use of all antimicrobial agents, including triclosan-coated sutures, is warranted. Their use should be considered within the context of comprehensive infection prevention strategies rather than as a standalone measure. Regular surveillance for potential resistance development should also be incorporated into infection control programs.

Cost-Effectiveness Considerations

Although our study did not include a formal cost-effectiveness analysis, the observed reduction in SSI rates and hospital stay duration with triclosan-coated sutures suggests potential economic benefits. SSIs impose a substantial economic burden on healthcare systems through direct costs (prolonged hospitalization, additional procedures, and antimicrobial therapy) and indirect costs (productivity losses and quality of life impairment).

Singh et al. conducted a cost analysis in the Indian healthcare context and found that despite the higher unit cost of triclosan-coated sutures (approximately 2.7 times that of conventional sutures), their use resulted in net cost savings of approximately USD 2,297 per 100 patients due to reduced SSI-related expenses.[73] Similarly, Leaper et al. estimated that the use of triclosan-coated sutures in colorectal surgery could save €4.9 million per 10,000 procedures in France and €4.0 million in Germany.[74]

However, it is important to note that cost-effectiveness may vary across different healthcare settings, surgical procedures, and patient populations. Factors such as baseline SSI risk, local cost structures, and availability of alternative infection prevention measures should be considered when making decisions about the routine use of triclosan-coated sutures.

Wang et al. conducted a systematic review of economic evaluations of triclosan-coated sutures and found that while most studies reported cost savings, the magnitude varied considerably across different surgical procedures and healthcare systems.[70] The authors emphasized the need for high-quality economic evaluations with transparent methodologies and context-specific assumptions to inform policy decisions.

Integration with Other Infection Prevention Strategies

The significant reduction in SSI rates observed with triclosan-coated sutures in our study and others raises questions about how this intervention should be integrated with existing

infection prevention strategies. Current guidelines from organizations such as the World Health Organization (WHO), the Centers for Disease Control and Prevention (CDC), and the National Institute for Health and Care Excellence (NICE) recommend a multifaceted approach to SSI prevention, including appropriate antibiotic prophylaxis, strict adherence to aseptic techniques, proper skin preparation, normothermia maintenance, and glycemic control.[77,81]

Allegranzi et al. published the WHO global guidelines for the prevention of surgical site infection, which conditionally recommend the use of triclosan-coated sutures based on moderate-quality evidence, particularly in procedures with high SSI risk.[83] Similarly, the CDC guidelines suggest that triclosan-coated sutures may reduce the risk of SSI and can be considered as part of a comprehensive prevention strategy.[84]

It is worth noting that while our study demonstrated a dramatic reduction in SSI rates with triclosan-coated sutures, the absolute risk reduction may vary depending on baseline risk and the effectiveness of other preventive measures in place. Healthcare institutions with already low SSI rates due to stringent infection control practices might observe smaller absolute benefits from the introduction of antimicrobial sutures.

Edmiston et al. proposed a risk stratification approach, suggesting that antimicrobial sutures might be most cost-effective when targeted to high-risk procedures or patient populations.[69] This strategic use based on risk assessment aligns with antimicrobial stewardship principles and may optimize resource allocation while minimizing potential concerns about resistance development.

Strengths and Limitations

Our study has several strengths, including the prospective design, balanced baseline characteristics between groups, standardized surgical technique, and comprehensive follow-up. However, certain limitations should be acknowledged.

First, while our sample size (57 patients per group) was sufficient to detect the observed difference in SSI rates, it may have limited the power to identify associations between SSIs and specific risk factors or to detect rarer complications. Second, although the groups were well-matched for most baseline characteristics, the observational nature of the study cannot entirely eliminate the possibility of unmeasured confounding factors influencing the results.

Third, our study was conducted at a single institution, which may limit the generalizability of findings to other healthcare settings with different patient populations, surgical practices, or microbial ecology. Finally, we focused specifically on the use of triclosan-coated sutures for abdominal fascial closure in open appendectomy, and the results may not be directly applicable to other surgical procedures or anatomical sites.

Despite these limitations, our findings contribute meaningfully to the growing body of evidence supporting the use of triclosan-coated sutures as part of comprehensive SSI prevention strategies, particularly in procedures with a substantial baseline infection risk such as appendectomy.

Implications for Clinical Practice and Future Research

The significantly lower SSI rates and reduced hospital stay observed with triclosan-coated sutures in our study have important implications for clinical practice. For surgical procedures with moderate to high SSI risk, such as open appendectomy, the use of antimicrobial-coated

sutures appears to offer substantial benefits that likely outweigh the additional cost. However, implementation decisions should consider local factors including baseline SSI rates, patient risk profiles, and resource constraints.

Several directions for future research emerge from our findings. Larger multicenter randomized controlled trials with stratification by surgical procedure type, contamination class, and patient risk factors would provide more definitive evidence regarding the effectiveness of triclosan-coated sutures across different clinical scenarios. Long-term surveillance studies are needed to monitor for potential emergence of resistance associated with widespread use of antimicrobial sutures.

Additionally, comparative effectiveness research evaluating different types of antimicrobial-coated sutures (e.g., those containing silver or chlorhexidine instead of triclosan) could identify optimal materials for specific surgical applications. Finally, implementation science research could help develop strategies for appropriate integration of antimicrobial sutures into comprehensive SSI prevention bundles, potentially through risk-stratified approaches that target their use to situations with the highest likelihood of benefit.

SUMMARY

This prospective comparative study was conducted at Shri B.M. Patil Medical College Hospital and Research Centre, Vijayapura, from March 2023 to January 2025, involving 114

patients undergoing open appendectomy. The patients were equally divided into two groups: 57 received conventional polydioxanone sutures (PDS) and 57 received triclosan-coated polydioxanone sutures (PDS Plus) for abdominal fascial closure. The primary objective was to evaluate the efficacy of triclosan-coated sutures in reducing surgical site infections compared to conventional sutures.

The demographic characteristics were comparable between the two groups, with no significant differences in age distribution ($p=0.89$) or gender distribution ($p=0.53$). The majority of patients in both groups were between 21-40 years of age, with a predominance of male patients. The diagnostic categories were also similarly distributed across both groups ($p=0.81$), with acute appendicitis being the most common diagnosis in both the PDS group (36.8%) and the PDS Plus group (35.1%).

The study demonstrated a significant reduction in the incidence of surgical site infections with triclosan-coated sutures. The SSI rate in the PDS Plus group was markedly lower at 1.8% compared to 19.3% in the conventional PDS group ($p=0.002$). Furthermore, the distribution of SSI types differed significantly between the groups ($p=0.008$), with deep SSIs occurring in 8.8% of patients in the PDS group while completely absent in the PDS Plus group.

Microbiological analysis of wound cultures revealed a significant difference between the groups ($p=0.04$). Pathogenic bacteria were isolated more frequently in the PDS group, with

Klebsiella pneumoniae (7%), Proteus vulgaris (5.3%), E. coli (3.5%), and Acinetobacter/Pseudomonas (3.5%) being identified. In contrast, the PDS Plus group had only one case (1.8%) of Acinetobacter/Pseudomonas infection.

The length of hospital stay was significantly reduced in patients who received triclosan-coated sutures, with a mean stay of 3.58 ± 1.17 days compared to 5.51 ± 1.6 days in

the conventional suture group ($p<0.001$). Additionally, irrespective of the suture type used, patients who developed SSI had significantly longer hospital stays (7.75±1.7 days) compared to those without SSI (4.17±1.2 days, $p<0.001$).

Analysis of comorbidities showed obesity was the most prevalent condition in both groups (84.2% in PDS and 86% in PDS Plus), followed by hypertension. However, no significant association was found between specific comorbidities and SSI occurrence ($p=0.92$). Similarly, no significant association was observed between specific diagnostic categories and SSI development ($p=0.83$), although subacute appendicitis had a slightly higher proportion among patients with SSI compared to those without.

These results demonstrate that triclosan-coated polydioxanone sutures significantly reduce the incidence of surgical site infections, particularly deep SSIs, following abdominal fascial closure in open appendectomy. This reduction in infection rates translates to shorter hospital stays, which has important implications for patient outcomes and healthcare resource utilization.

CONCLUSION

This study demonstrates that triclosan-coated polydioxanone sutures (PDS Plus) significantly reduce surgical site infections (SSIs) following open appendectomy. Surgical site infection rates were significantly lower with triclosan-coated sutures

compared to conventional sutures, with no deep infections occurring in the group using the antimicrobial sutures. Microbiological data support this, showing fewer pathogenic bacteria in the PDS Plus group. Additionally, patients with triclosan-coated sutures had a shorter hospital stay, improving patient recovery and reducing healthcare costs. While cost-effectiveness was not directly assessed, the benefits suggest potential overall savings. The results support routine use of antimicrobial sutures in high-risk procedures like open appendectomy. Further research is needed to confirm these findings in different settings and assess long-term impacts.

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PROFORMA

SL. NO.:

NAME: PHONE NO.:

AGE: IP NO:

SEX: UNIT:

RELIGION: DOA:

OCCUPATION: DOS:

UNIT/WARD: DOD:

ADDRESS:

COMPLAINTS:

HISTORY OF PRESENT ILLNESS:

PAST HISTORY:

PERSONAL HISTORY:

GENERAL PHYSICAL EXAMINATION

BUILT: WELL / MODERATE / POOR

BODY MASS INDEX:

NOURISHMENT: WELL / MODERATE / POOR

PALLOR

ICTERUS

CYANOSIS

CLUBBING

PEDAL EDEMA

GENERAL LYMPHADENOPATHY

VITAL DATA:

TEMPERATURE:

PULSE

RESPIRATORY RATE

BLOOD PRESSURE:

SYSTEMIC EXAMINATION:

PER ABDOMEN:

RESPIRATORY SYSTEM:

CARDIOVASCULAR SYSTEM:

CENTRAL NERVOUS SYSTEM:

PER RECTAL EXAMINATION:

CLINICAL DIAGNOSIS:

INDICATION FOR EMERGENCY SURGERY:

SURGERY DETAILS:

LABORATORY TESTS:

HB%:

TOTAL COUNT:

DIFFERENTIAL COUNT:

RENAL FUNCTION TEST:

LIVER FUNCTION TEST (if and when needed):

ECG:

USG ABDOMEN AND PELVIS:

CHEST XRAY:

SEROLOGY:

(HIV, HCV, HBSAG):

PUS CULTURE AND SENSITIVITY (If discharge is present):

OTHER INVESTIGATIONS:

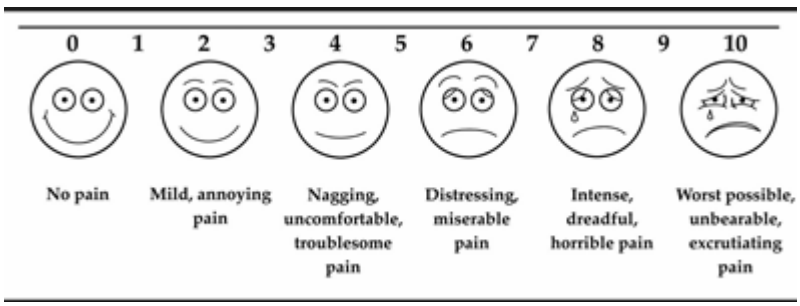
OPERATIVE PROCEDURE:

DATE:

POSTOPERATIVE COMPLICATIONS:

1) POSTOPERATIVE PAIN:

VISUAL ANALOG SCALE:



DURATION OF THE HOSPITAL STAY FROM THE DAY OF SURGERY TO THE DATE OF DISCHARGE: _____Days.

SAMPLE INFORMED CONSENT FORM

B.L.D.E.(D.U.)'s SHRI B.M. PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTRE, VIJAYAPUR – 586103, KARNATAKA

TITLE OF THE PROJECT : A COMPARATIVE STUDY BETWEEN TRICLOSAN COATED SUTURE VS CONVENTIONAL SUTURE ON SURGICAL SITE INFECTIONS OF ABDOMINAL FASCIAL CLOSURES IN OPEN APPENDECTOMY.

PRINCIPAL INVESTIGATOR: DR. SHREEYA S. DODDANNAVAR,

DEPARTMENT OF GENERAL SURGERY

PG GUIDE : Dr. M S KOTENNAVAR

M.S. GENERAL SURGERY PROFESSOR & HOD

DEPARTMENT OF GENERAL SURGERY

PURPOSE OF RESEARCH:

I have been informed that this study will be on **TRICLOSAN COATED SUTURE VS CONVENTIONAL SUTURE ON SURGICAL SITE INFECTIONS OF ABDOMINAL FASCIAL CLOSURES IN OPEN APPENDECTOMY.**

I have been explained about the reason for doing this study and selecting me/my ward as a subject for this study. I have also been given free choice for either being included or not in the study.

PROCEDURE:

I understand that relevant history will be taken and I will undergo detailed clinical examination and will also be explained about the required investigations as per standard protocol.

RISKS AND DISCOMFORTS:

I understand that /my ward may experience pain and discomfort during the examination or any intervention. This is mainly the result of my condition, and the procedure of this study is not expected to exaggerate these feelings, which are associated with the usual course of diagnosis and treatment.

ALTERNATIVES:

Even if you decline to participate, you will get the routine management line.

BENEFITS:

I understand that /my ward's participation in this study will help determine the efficacy of intraoperative use of **TRICLOSAN COATED SUTURE VS CONVENTIONAL SUTURE ON SURGICAL SITE INFECTIONS OF ABDOMINAL FASCIAL CLOSURES IN OPEN APPENDECTOMY**.

CONFIDENTIALITY.

I understand that medical information produced by this study will become a part of this hospital's records and will be subjected to the confidentiality and privacy regulations. Information of a sensitive, personal nature will not be a part of the medical records but will be stored in the investigator's research file and identified only by a code number. The code key connecting names to numbers will be kept in a separate secure location.

If the data are used for publication in the medical literature or for teaching purposes, no names will be used and other identifiers such as photographs and audio or video tapes will be used only with my special written permission. I understand that I may see the photograph and videotapes and hear audiotapes before giving this permission.

REQUEST FOR MORE INFORMATION:

I understand that I may ask more questions about the study at any time.

Dr. SHREEYA DODDANNAVAR is available to answer my questions or concerns. I understand that I will be informed of any significant new findings discovered during this study, which might influence my continued participation.

If during this study, or later, I wish to discuss my participation in or concerns regarding this study with a person not directly involved, I am aware that the hospital's social worker is available to talk with me.

And that a copy of this consent form will be given to me to keep it and for careful reading.

REFUSAL OR WITHDRAWAL OF PARTICIPATION:

I understand that my participation is voluntary and I may refuse to participate or may withdraw consent and discontinue participation in the study at any time without prejudice to my present or future care at this hospital.

I also understand that Dr. SHREEYA DODDANNAVAR will terminate my participation in this study at any time after she has explained the reasons for doing so and has helped arrange for my continued care by my physician or therapist if this is appropriate.

INJURY STATEMENT:

I understand that in the unlikely event of injury to me/my ward, resulting directly in my participation in this study, if such injury were reported promptly, then medical treatment would be available to me, but no further compensation would be provided.

I understand that by my agreement to participate in this study, I am not waiving any of my legal rights.

I have explained to _____ the purpose of this research, the procedures required, and the possible risks and benefits, to the best of my ability in the patient's own language.

Date: Dr. MS KOTENNAVAR Dr. SHREEYA DODDANNAVAR

(Guide) (Investigator)

STUDY SUBJECT CONSENT STATEMENT:

I confirm that Dr. SHREEYA DODDANNAVAR has explained to me the purpose of this research, the study procedure that I will undergo, and the possible discomforts and benefits that I may experience, in my own language.

I have explained all the above in detail in my own language and understand the same. Therefore, I agree to give my consent to participate as a subject in this research project.

_____ _____

(Participant) Date

_____ _____

(Witness) Date

INVESTIGATOR

NAME : DR. SHREEYA S. DODDANNAVAR

QUALIFICATION: M.B.B.S

KRISHNA INSTITUTE OF MEDICAL SCIENCES, KARAD, MAHARASHTRA.

K.M.C. REG. NO. : 180102

ADDRESS : DEPARTMENT OF GENERAL SURGERY, B.L.D.E.U.'s SHRI B.M.PATIL MEDICAL COLLEGE

HOSPITAL AND RESEARCH CENTRE,

VIJAYAPUR – 586103

KARNATAKA.

ETHICAL CLERANCE CERTIFICATE

BLDE

(DEEMED TO BE UNIVERSITY)

Declared as Deemed to be University u/s 3 of UGC Act, 1956

Accredited with 'A' Grade by NAAC (Cycle-2)

The Constituent College

SHRI B. M. PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE, VIJAYAPURA

BLDE (DU)/IEC/ 923/2023-24

10/4/2023

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Ethical Committee of this University met on **Saturday, 18th March, 2023 at 11.30 a.m. in the CAL Laboratory, Dept. of Pharmacology,** scrutinizes the Synopsis/ Research Projects of Post Graduate Student / Under Graduate Student /Faculty members of this University /Ph.D. Student College from ethical clearance point of view. After scrutiny, the following original/ corrected and revised version synopsis of the thesis/ research projects has been accorded ethical clearance.

TITLE: "A COMPARATIVE STUDY BETWEEN TRICLOSAN COATED SUTURE V/S CONVENTIONAL SUTURE ON SURGICAL SITE INFECTIONS OF ABDOMINAL FASCIAL CLOSURES IN APPENDECTOMY".

NAME OF THE STUDENT/PRINCIPAL INVESTIGATOR: DR.SHREEYA SHIVANAND DODDANNAVAR

NAME OF THE GUIDE: DR.M.S.KOTENNAVAR, PROFESSOR,
DEPT. OF GENERAL SURGERY.

Dr. Santoshkumar Jeevangi
Chairperson
IEC, BLDE (DU),
VIJAYAPURA

Chairman,
Institutional Ethical Committee,
BLDE (Deemed to be University)
Vijayapura

Dr.Akram A. Naikwadi
Member Secretary
IEC, BLDE (DU),
VIJAYAPURA

MEMBER SECRETARY
Institutional Ethics Committee
BLDE (Deemed to be University)
Vijayapura-586103, Karnataka

Following documents were placed before Ethical Committee for Scrutinization.

- Copy of Synopsis/Research Projects
- Copy of inform consent form
- Any other relevant document

Smt. Bangaramma Sajjan Campus, B. M. Patil Road (Sholapur Road), Vijayapura - 586103, Karnataka, India.
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College: Phone: +918352-262770, Fax: +918352-263019, E-mail: bmpmc.principal@bldedu.ac.in

Sl No	Name	Age	Sex	IP No	Diagnosis	Suture Type	SSI Occurrence	SSI Type	Length of Hospital Stay	Wound Culture Results	Comorbidities
1	BHIMASHANKAR BASANNA	22	M	133953	Acute Appendicitis	PDS	No	None	4	N/A	None
2	JYOTHI	21	F	109720	Acute Appendicitis	PDS Plus	No	None	2	N/A	Hypertension
3	JAYKANTH	25	M	133595	Acute Appendicitis	PDS	No	None	5	N/A	None
4	CHETAN BASAVRAJ	19	M	136399	Acute Appendicitis	PDS Plus	No	None	4	N/A	None
5	HANMANT	35	M	142465	Acute Appendicitis	PDS	No	None	6	N/A	Obesity
6	SIDDARAY	21	M	151811	Appendicular Mass	PDS Plus	No	None	4	N/A	None
7	THOUSHIF HANSIGI	30	M	179968	Acute Appendicitis	PDS	No	None	6	N/A	None
8	NIRMALA GURBASAPPA	61	F	200547	Chronic Appendicitis	PDS Plus	No	None	4	N/A	None
9	SHASHIKUMAR HARYAGI	27	M	232332	Acute Appendicitis	PDS	No	None	5	N/A	Hypertension
10	SAIKUMAR BABU DODAMANI	24	M	32657	Acute Appendicitis	PDS Plus	No	None	2	N/A	None
11	MAMTASHREE CHALAWADI	19	F	251891	Acute Appendicitis	PDS	No	None	5	N/A	None
12	SACHIN WADDAAR	29	M	260489	Subacute Appendicitis	PDS Plus	No	None	4	N/A	None
13	PARSHURAM VITTHAL	32	M	355873	Acute Appendicitis	PDS	Yes	Deep	5	MRSA	Hypertension

14	GANESH KALLAPPA KAMBHAR	35	M	378521	Acute Appendicitis	PDS Plus	No	None	5	N/A	None
15	MALINATH RUGI	18	M	40635	Acute Appendicitis	PDS	No	None	6	N/A	None
16	SABBUDDIN MULLA	28	M	398980	Acute Appendicitis	PDS Plus	No	None	3	N/A	None
17	SOMARAY DODDAMANI	22	M	391910	Acute Appendicitis	PDS	No	None	3	N/A	None
18	SHENU HANAMANTH	21	M	391696	Acute Appendicitis	PDS Plus	No	None	3	N/A	Obesity
19	RESHMA HASAN HUCHYAL	39	F	330141	Subacute Appendicitis	PDS	Yes	Superficial	7	Klebsiella pneumoniae	None
20	BASAVRAJ	30	M	388269	Recurrent Appendicitis	PDS Plus	No	None	2	N/A	None
21	SUVARNA MANE	40	F	388605	Acute Appendicitis	PDS	No	None	6	N/A	None
22	SANTOSH NAGAMURTI	32	M	362102	Acute Appendicitis	PDS Plus	No	None	3	N/A	None
23	REVANSIDDAPPA WALIKAR	32	M	326271	Recurrent Appendicitis	PDS	No	None	5	N/A	None
24	ROHIT YADRAVI	21	M	57292	Acute Appendicitis	PDS Plus	No	None	3	N/A	None
25	AISHWARYA M. HIREMATH	18	F	57741	Acute Appendicitis	PDS	No	None	5	N/A	None
26	POOJA SURESH NAIK	25	F	84827	Acute Appendicitis	PDS Plus	No	None	5	N/A	None
27	GOLLAL M. MADAR	19	M	84832	Acute Appendicitis	PDS	No	None	5	N/A	None
28	SUNIL L. MALAGAR	20	M	123896	Acute Appendicitis	PDS Plus	No	None	2	N/A	Hypertension

29	UMASHREE KEMPBASAPPA GOL	18	F	17298	Recurrent Appendicitis	PDS	No	None	6	N/A	Hypertension
30	VIDYA M. METRI	19	F	386411	Perforated Appendicitis	PDS Plus	No	None	4	N/A	None
31	MRS. SHAKUNTALA	31	F	98847	Subacute Appendicitis	PDS	No	None	3	N/A	None
32	SUVARANA MANE	50	F	388605	Recurrent Appendicitis	PDS Plus	No	None	5	N/A	None
33	SAYAD LALESAB KONDI	26	M	28805	Acute Appendicitis	PDS	No	None	5	N/A	None
34	SHREESHAIL	19	M	2625	Acute Appendicitis	PDS Plus	No	None	2	N/A	Diabetes Mellitus
35	BABU G. KANKANAVADI	70	M	2024 4982	Acute Appendicitis	PDS	No	None	5	N/A	None
36	SHWETA DATUSINGH RAJAPUTH	19	M	202427579	Acute Appendicitis	PDS Plus	No	None	4	N/A	None
37	SIMRAN KAZI	24	F	252114	Subacute Appendicitis	PDS	No	None	6	N/A	Hypertension
38	SAVITA C.	33	F	203087	Acute Appendicitis	PDS Plus	No	None	3	N/A	Obesity
39	ABID MULLA	18	M	28716	Acute Appendicitis	PDS	No	None	6	N/A	None
40	SUFIYAN INTIYAZ JAMADAR	19	M	71082	Chronic Appendicitis	PDS Plus	No	None	4	N/A	None
41	SUBRAYYA	50	M	245968	Acute Appendicitis	PDS	Yes	Deep	10	Proteus vulgaris	None
42	MR VINOD PATIL	18	M	438958	Chronic Appendicitis	PDS Plus	No	None	2	N/A	None

43	LAXMAN	19	F	631948	Chronic Appendicitis	PDS	No	None	6	N/A	None
44	SHARADA	30	M	2025 4982	Perforated Appendicitis	PDS Plus	No	None	2	N/A	None
45	GEETA	24	M	80884402	Recurrent Appendicitis	PDS	No	None	5	N/A	None
46	RAJU RATHOD	53	M	121378041	Subacute Appendicitis	PDS Plus	No	None	3	N/A	None
47	RAMESH NATIKAR	23	M	161871680	Perforated Appendicitis	PDS	No	None	3	N/A	None
48	MRS MAMATA INDI	22	F	202365320	Acute Appendicitis	PDS Plus	No	None	4	N/A	None
49	MRS. NITA AGARWAL	45	M	242858959	Appendicular Mass	PDS	No	None	4	N/A	None
50	MRS VEENA SHINDE	26	M	824938	Acute Appendicitis	PDS Plus	No	None	5	N/A	None
51	MR BHIMRAYA	42	M	1017928	Acute Appendicitis	PDS	Yes	Superficial	9	Klebsiella pneumoniae	None
52	MRS DEEPA MAHENDRAKUMAR	26	M	1210918	Subacute Appendicitis	PDS Plus	No	None	3	N/A	None
53	MR. SURYA KEMBHAVI	39	F	2026 4982	Appendicular Mass	PDS	No	None	6	N/A	None
54	MR SANGAYYA HIREMATH	58	M	283352598	Recurrent Appendicitis	PDS Plus	No	None	2	N/A	None
55	MRS SAVITRI PATTAR	52	F	323846237	Subacute Appendicitis	PDS	No	None	6	N/A	None
56	MR BASAVARAJ AMITGOUDAR	34	M	364339876	Recurrent Appendicitis	PDS Plus	No	None	3	N/A	None
57	MRS SHARADA S DHARAMSATTI	49	M	404833516	Recurrent Appendicitis	PDS	Yes	Deep	10	Proteus vulgaris	None
58	MR PRASHANTH MAMDAOUR	46	F	445327155	Subacute Appendicitis	PDS Plus	No	None	5	N/A	None

59	MR KUMAR CHANDRAPPA PUJAAR	35	M	1403908	Recurrent Appendicitis	PDS	No	None	5	N/A	None
60	MR PRADEEP PATTANASHETTI	35	M	1596898	Chronic Appendicitis	PDS Plus	No	None	4	N/A	None
61	MRS REKHA	48	M	1789888	Appendicular Mass	PDS	No	None	5	N/A	None
62	MR M H MULLAL	36	M	2027 4982	Subacute Appendicitis	PDS Plus	No	None	2	N/A	None
63	MR RAMANNA SALAHALI	19	F	485820794	Acute Appendicitis	PDS	No	None	4	N/A	None
64	MRS SHOBHA VEERESH JOGUR	18	F	526314433	Acute Appendicitis	PDS Plus	No	None	2	N/A	None
65	MR ANIL GANAPATI	52	M	566808072	Perforated Appendicitis	PDS	No	None	3	N/A	None
66	MR RAJKUMAR NAGARGOJE	26	M	607301712	Acute Appendicitis	PDS Plus	No	None	4	N/A	None
67	VISHWANATH	34	F	647795351	Perforated Appendicitis	PDS	No	None	6	N/A	None
68	MR SHANKREPPA ARJUNAGI	41	F	1982878	Appendicular Mass	PDS Plus	No	None	4	N/A	None
69	MR ABHISHEK TERADAL	43	F	2175868	Perforated Appendicitis	PDS	No	None	6	N/A	None
70	KENCHAPPA	40	M	2368858	Appendicular Mass	PDS Plus	No	None	4	N/A	None
71	LAXMI	31	F	2028 4982	Acute Appendicitis	PDS	No	None	4	N/A	None
72	SHIVANAGOUDA	57	M	688288990	Perforated Appendicitis	PDS Plus	No	None	2	N/A	None
73	MAHADEV	49	M	728782629	Subacute Appendicitis	PDS	No	None	5	N/A	None

74	MALLIKA	50	F	769276268	Chronic Appendicitis	PDS Plus	No	None	3	N/A	None
75	SIDDARAM	36	M	809769908	Recurrent Appendicitis	PDS	No	None	6	N/A	None
76	MAHADEVI	38	F	850263547	Recurrent Appendicitis	PDS Plus	No	None	3	N/A	Obesity
77	DEVANNA	42	M	2561848	Perforated Appendicitis	PDS	No	None	4	N/A	None
78	YALLAPPA	19	M	2754838	Perforated Appendicitis	PDS Plus	No	None	4	N/A	None
79	SANJAY	37	M	2947828	Appendicular Mass	PDS	Yes	Superficial	7	Acinetobacter /Pseudomonas	None
80	UMESH	29	F	2029 4982	Appendicular Mass	PDS Plus	No	None	4	N/A	None
81	RIYAZ	18	M	890757186	Recurrent Appendicitis	PDS	No	None	6	N/A	None
82	KUBERAPPA	46	M	931250825	Perforated Appendicitis	PDS Plus	Yes	Superficial	8	Acinetobacter/ Pseudomonas	None
83	PRAKASH RATHOD	59	F	971744464	Chronic Appendicitis	PDS	Yes	Superficial	8	Acinetobacter/ Pseudomonas	Obesity
84	PEERMAHAMAD	44	M	1012238104	Recurrent Appendicitis	PDS Plus	No	None	4	N/A	None
85	VITTAL	21	M	1052731743	Acute Appendicitis	PDS	Yes	Deep	10	Klebsiella pneumoniae	None
86	PRAVEEN PATANASHETTY	53	M	3140818	Subacute Appendicitis	PDS Plus	No	None	3	N/A	None

87	BASAVARAJ KAPALLI	28	M	3333808	Recurrent Appendicitis	PDS	No	None	5	N/A	None
88	GOLALAPPA	45	M	3526798	Perforated Appendicitis	PDS Plus	No	None	5	N/A	None
89	DHANU NAIK	42	M	2030 4982	Appendicular Mass	PDS	No	None	4	N/A	None
90	MALLAPPA GOTE	34	F	1093225382	Recurrent Appendicitis	PDS Plus	No	None	5	N/A	None
91	BOGAMMA MADAGI	50	M	1133719021	Subacute Appendicitis	PDS	No	None	5	N/A	None
92	GITA S PATIL	32	M	1174212660	Appendicular Mass	PDS Plus	No	None	4	N/A	None
93	MEERASAB GADYAL	37	F	1214706300	Chronic Appendicitis	PDS	No	None	5	N/A	None
94	KASHINATH KAMBALE	32	M	1255199939	Acute Appendicitis	PDS Plus	No	None	3	N/A	Obesity
95	SANTOSH NAIK	23	F	3719788	Recurrent Appendicitis	PDS	No	None	5	N/A	None
96	VATAN CHAVAN	59	M	3912778	Chronic Appendicitis	PDS Plus	No	None	3	N/A	None
97	MR VENUGOPAL LADDA	42	M	4105768	Chronic Appendicitis	PDS	No	None	5	N/A	Hypertension
98	ZAHEDA	31	M	2031 4982	Chronic Appendicitis	PDS Plus	No	None	5	N/A	None
99	RAVI RATHOD	41	M	1295693578	Perforated Appendicitis	PDS	No	None	3	N/A	None
100	UMESH HANAMANTH	41	M	1336187217	Subacute Appendicitis	PDS Plus	No	None	4	N/A	None
101	NILAWWA	33	M	1376680856	Recurrent Appendicitis	PDS	No	None	5	N/A	Diabetes Mellitus
10	ANNARAY SHAMRAO	53	M	141717449	Chronic	PDS Plus	No	None	4	N/A	None

2				6	Appendicitis						
103	SHARANAPPA BASANNA MALAGI	59	M	1457668135	Recurrent Appendicitis	PDS	No	None	6	N/A	None
104	IRAPPA KUMBAR	39	M	4298758	Acute Appendicitis	PDS Plus	No	None	2	N/A	Hypertension
105	SHIVPUTRYA MATH	31	M	4491748	Perforated Appendicitis	PDS	No	None	6	N/A	None
106	KALYANAPPA	33	M	4684738	Appendicular Mass	PDS Plus	No	None	3	N/A	None
107	MALLIKARJUN MUDDAPUR	52	M	2032 4982	Chronic Appendicitis	PDS	No	None	5	N/A	Hypertension
108	SUDHABAI	22	M	1498161774	Recurrent Appendicitis	PDS Plus	No	None	5	N/A	None
109	DHUNDAPPA K	20	M	1538655413	Subacute Appendicitis	PDS	Yes	Superficial	7	Proteus vulgaris	None
110	SUNIL BIRADAR	18	F	1579149052	Acute Appendicitis	PDS Plus	No	None	5	N/A	None
111	JAGADEVAPPA PUJARI	43	F	1619642692	Subacute Appendicitis	PDS	No	None	4	N/A	None
112	JYOTHI BAGAVATI	43	M	1660136331	Chronic Appendicitis	PDS Plus	No	None	4	N/A	None
113	JAYASHREE BIRADAR	18	M	4877728	Acute Appendicitis	PDS	No	None	3	N/A	None
114	VINOD ARKERI	35	M	5070718	Appendicular Mass	PDS Plus	No	None	4	N/A	None

Shreeya Doddannavar

A COMPARATIVE STUDY BETWEEN TRICLOSAN COATED SUTURE VS CONVENTIONAL SUTURE ON SURGICAL SITE İNFECTIONS OF ABDOMINAL FASCIAL CLOSURES IN OPEN APPENDECTOMY.docx

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