

ANALYSIS OF ABDOMINAL SURGICAL SITE INFECTIONS

**DISSERTATION SUBMITTED FOR
BRANCH - I M.S (GENERAL SURGERY)**

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CHENNAI**

CERTIFICATE

This is to certify that the dissertation entitled **ANALYSIS OF ABDOMINAL SURGICAL SITE INFECTIONS** is the bonafide work of **Dr.R.Chellapandian** in partial fulfillment of the university regulations of the Tamil Nadu Dr. M.G.R. Medical University, Chennai, for M.S (Branch I) General Surgery examination to be held in April 2012.

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DECLARATION

I, **Dr.R.Chellapandian.**, hereby declare that, I carried out this work on “ **ANALYSIS OF ABDOMINAL SURGICAL SITE INFECTIONS**” at the Department of General Surgery, Govt. Rajaji Hospital, Madurai, under the guidance of **Prof. Dr. M. JEBAMANI, M.S.**, Professor of Surgery, during the period of September 2009 to August 2011. I also declare that this bonafide work has not been submitted in part or full by me or any others for any award, degree or diploma to any other University or Board either in India or abroad.

This is submitted to The Tamil Nadu Dr. M.G.R. Medical University, Chennai in partial fulfillment of the rules and regulations for the M.S degree examination in General Surgery (Branch I) to be held in April 2012.

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INTRODUCTION

Before the mid 19th century, surgical patients commonly developed postoperative Fever followed by purulent drainage from their incisions, overwhelming sepsis and often death. In 1846 Ignaz Semmelweis (Vienna) reduced the mortality in puerperal fever from over 10% to under 2% by advocating the practice of rinsing of hands thoroughly in chlorine water before examining the next patient. It was in 1860's Joseph Lister introduced the principles of antisepsis. His work radically changed surgery from an activity associated with infection and death to a discipline that could eliminate suffering and prolong life. Louis Pasteur in the latter part of nineteenth century gave the Germ theory and was able to elucidate the principle that contagious diseases are caused by specific microbes and these microbes are foreign to the infected organism. He developed techniques of sterilization and identified several bacteria responsible for human illness, including staphylococcus, streptococcus and pneumococcus.

During the twentieth century the discovery of effective antimicrobials added another tool to the armamentarium of Surgeons. Sir Alexander Fleming's discovery of Penicillin, the first effective antibacterial agent subsequently led to the development of hundreds of potent antimicrobial and

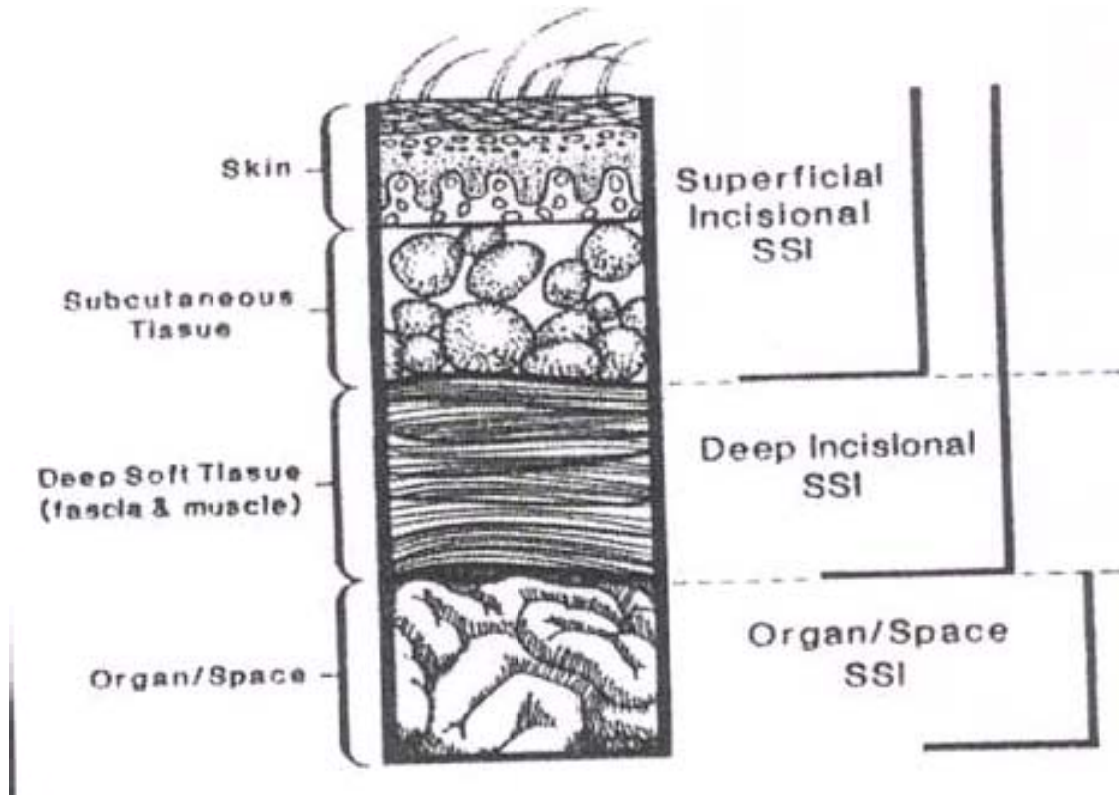
these became a critical component to treat aggressive, lethal surgical infections. In spite of advances in infection control practice including improved operating room ventilation, sterilization methods, barriers, surgical technique and availability of antimicrobial prophylaxis, SSI remains a substantial cause of morbidity and mortality among hospitalized patients. Emergence of antimicrobial resistant pathogens and the increased numbers of surgical patients, who are elderly and have a wide variety of chronic, debilitating or immunocompromised conditions, may be a contributory factor. Increased number of prosthetic implant and organ transplant also add to the risk.

Incidence

Among surgical patients, SSI were the most common nosocomial infection accounting for 38%. Of all such infections of these SSIs, two thirds were confined to the incision and one third involved organ or spaces accessed during the operation. Available SSI surveillance data indicate that laparoscopic operations generally have a lower SSI risk in contrast to open operations

Definition

Surgical site infections are infections of the tissues, organs or spaces exposed by surgeon during performance of an invasive procedure. SSIs are classified as being either Incisional or organ/space. Incisional SSIs are further divided into those involving only skin and subcutaneous tissue (superficial Incisional SSI) and those involving deeper soft tissues of the incision (deep Incisional SSI). Organ/Space SSIs involve any part of the anatomy (e.g.organ or space) other than incised body wall layers that was opened or manipulated during an operation. For example, in a patient who had an appendectomy and subsequently developed an intra abdominal abscess not draining through the incision, the infection would be reported as an organ/space SSI at the intra abdominal site.



Criteria for Defining a Surgical Site Infection

Superficial incisional SSI

Infection occurs within 30 days after the operation and infection involves only skin or subcutaneous tissue of the incision with at least one of the following signs or symptoms of infection pain or tenderness, localized swelling, redness, or heat and purulent discharge when the incision is deliberately opened.

Stitch abscess with minimal inflammation and discharge confined to the points of suture penetration and newborn circumcision site and infected burn wound should not be included in SSI.

Deep incisional SSI

Infection occurs within 30 days after the operation if no implant is left in place or within 1 year if implant is in place and the infection appears to be related to the operation.

Infection involves deep soft tissues (e.g., fascial and muscle layers) of the incision. The patient has at least one of the following signs or symptoms: fever (>38 deg. C), localized pain, tenderness. Deep incision spontaneously dehisces or is deliberately opened by a surgeon with a purulent drainage or evidence of an abscess or infection involving the deep incision on radiological examination.

Organ / space SSI

Infection involves any part of the anatomy (e.g., organs or spaces), other than the incision, which was opened or manipulated during an operation with either purulent drainage from a drain that is placed through a stab wound into the organ/space or evidence of abscess or infection

involving the organ/space that is found on direct examination during re-operation or by radiological examination.

The surgical wound classification system includes four categories:

Class I - clean.

Uninfected operative wound with no inflammation and in which the respiratory, gastrointestinal (GI), genital and urinary tracts were not entered. Clean wounds are closed at surgery and, if necessary, drained with closed drainage.

Class II- clean-contaminated.

Wound in which the respiratory, GI, genital or urinary tract(s) were entered under controlled conditions but without unusual contamination or spillage of contents.

Class III- contaminated

Open, fresh accidental wound or an operation with a major break(s) in aseptic technique (e.g., open cardiac massage) or gross spillage from the GI tract. Also included are incisions in which acute, non purulent inflammation is found.

Class IV - dirty or infected

Old wounds with dead tissue and those that involve existing clinical infection or a perforated bowel, suggesting that the pathogens causing the postoperative infection were present in the wound before the surgery.

TABLE : Wound class. Representative procedures, and expected infection rates

Wound Class	Example of cases	Expected Infection rates
Clean (class I)	Hernia repair, breast biopsy	1.0 – 5.4 %
Clean/contaminated (Class II)	Cholecystectomy, elective GI surgery	2.1 – 9.5 %
Contaminated (Class III)	Penetrating abdominal trauma, large tissue injury, enterotomy during bowel obstruction	3.4 – 13.2 %
Dirty (Class IV)	Perforated diverticulitis, necrotizing soft tissue infections	3.1 – 12.8%

REVIEW OF LITERATURE

EPIDEMIOLOGY AND MICROBIOLOGY

Among surgical patients, SSIs are the most common nosocomial infection, accounting for about two thirds of all such infections. In most studies about two thirds of these can be classified as superficial incisional, while the remaining involve either organs or spaces entered during surgery or are deep incisional SSIs. On average, having an SSI increases a patient's hospital stay by 7–10 days, with organ/space and deep incisional SSIs accounting for the longest stays and highest costs.

Organisms associated with SSIs vary with the type of procedure and the anatomic location of the operation. *Staphylococcus aureus* (coagulase-negative staphylococci), enterococcus species and *Escherichia coli* are the three most frequently isolated pathogens. An increasing number of SSIs are caused by antimicrobial-resistant pathogens, and the incidence of fungal SSI have risen significantly in the last decade in part because of the dramatic increase in the number of HIV/AIDS patients. For most SSIs, the source of the pathogen(s) comes from the patient's skin, mucous membranes or bowel and rarely from another infected site in the body(endogenous sources).

Exogenous sources of SSI pathogens are occasionally responsible. These include: organisms from members of the surgical team (e.g., hands, nose or other body parts); contaminated surfaces in the operating room, even the air; and contaminated instruments, surgical gloves or other items used in the surgery

Exogenous organisms are primarily aerobic staphylococci or streptococci species (with the exception of tetanus endospores). Although fungi are widely present in the environment, they rarely cause SSI. The mechanisms by which microorganisms infect tissue and produce disease are complex and incompletely understood. For example, some pathogens may contain or produce toxins and other substances that increase their ability to invade a patient's tissue, produce damage or survive in the tissue.

PATHOGENESIS

By the end of an operation, bacteria and other microorganisms contaminate all surgical wounds, but only a small number of patients actually develop a clinical infection (Fry 2003). Infection does not develop in most patients because their defense mechanisms effectively eliminate the contaminating organisms at the surgical site. Whether a potential infection occurs depends on several factors, with the most important being: number of

bacteria entering the wound; type and virulence (ability to cause infection) of the bacteria; host defense mechanisms (e.g., effectiveness of inflammatory response and status of the immune system); and external factors, such as being in the hospital several days before surgery or the operation lasting more than 4 hours.

Two factors that can help minimize the number of organisms entering the wound are the skill and experience of the surgeon and use of good surgical technique. Both are important because if a surgical site is contaminated with more than 10^5 (100,000) organisms per gram of tissue, the risk of SSI is markedly increased (Krizek and Robson 1975). The dose required for infection can be even lower, however, if foreign material is present at the site (e.g., only 10^2 or about 100 staphylococci are enough if silk suture is used for closure or to control bleeding) (James and MacLeod 1961).

While the type and virulence of the bacteria cannot be controlled, the other factors can be controlled to a large extent. For example, tissue injury caused by making the wound incision triggers a chain of events, called the inflammatory response, that take place even before bacterial contamination occurs. The effectiveness of the inflammatory response to mobilize patient

defense mechanisms (e.g., activation of various types of white blood cells that contain and destroy the bacteria before infection can occur) depends to large extent on the patient's general health, age, obesity, smoking, some chronic diseases and the status of the immune system.

RISK FACTORS

Patient and Operation Characteristics That May Influence the Risk of Developing a Surgical Site Infection

PATIENT

- Nutritional status, poor
- Diabetes, uncontrolled
- Smoking or use of other tobacco products
- Obesity
- Coexistent infections at a remote body site
- Colonization with microorganisms
- Altered immune response (HIV/AIDS and chronic corticosteroid use)
- Length of preoperative stay

OPERATION

- Preoperative shaving
- Preoperative skin preparation
- Duration of operation
- Antimicrobial prophylaxis
- Operating room ventilation
- Instrument processing (cleaning, HLD or sterilization)
- Foreign material in the surgical site
- Surgical drains
- Surgical technique

- Poor hemostasis
- Failure to obliterate dead space
- Tissue trauma

Adapted from: SHEA, APIC, CDC and SIS 1990.

Patient Factors

Obesity increases risk substantially when the subcutaneous abdominal fat layer exceeds 3 cm (1.5 inches) (Nyström et al 1987). The risk is increased by the need for a larger incision, decreased circulation to the fat tissue or the technical difficulty of operating through a large fat layer.

Infection at another site may increase the risk of spreading infection through the bloodstream.

Immunocompromised patients (e.g., those with HIV/AIDS, those with chronic corticosteroid use such as occurs with asthma and heavy smokers or users of other tobacco products) are at significantly greater risk of SSIs.

Malnutrition may or may not be a contributing factor. Unfortunately, most studies have not been conducted in developing countries where severe malnutrition is more common. Sex, race, socioeconomic status and chronic diseases, such as malignancy, are difficult to assess because they are frequently associated with other factors that independently contribute to risk.

Diabetes

Recent preliminary findings from a study of patients who underwent coronary artery bypass graft showed a significant relationship between increasing levels of glycosylated haemoglobin and SSI rates. Also, increased glucose levels (>200 mg/dL) in the immediate postoperative period (<48 hours) were associated with increased SSI risk.

Smoking or use of other tobacco products should be stopped at least 30 days before elective surgery if possible.

Patients with infections **remote to the surgical site** should be treated if possible or their surgery postponed.

Women using combined (estrogen- and progestogen-containing) contraceptives (oral or injectable) should be switched to a nonhormonal method at least 30 days before major elective surgery to minimize the risk of deep vein thrombophlebitis and nonfatal pulmonary embolism (Blumenthal and McIntosh 1996).

Preoperative - factor

Prolonged preoperative hospitalization exposes patients to hospital flora, including multidrug-resistant organisms. Completing pre surgical

evaluations and correcting underlying conditions before admission to a hospital decreases this risk. Also, performing elective surgery, where feasible, in ambulatory surgery centers rather than acute care hospitals decreases the risk of exposure to hospital flora.

Preoperative hair removal should be avoided if it is unnecessary. If hair must be removed, clip it with scissors just before the surgery. Shaving is a proven risk factor for SSIs (Cruse and Foord 1980).

Wide preparation of the proposed incision site with **antiseptic solution** preoperatively helps keep microorganisms from migrating into the wound (breakthrough) if the site towels or drapes become wet during surgery.

Intra operative – factor:

Good surgical technique minimizes tissue trauma, controls bleeding, eliminates dead space, removes dead tissue and foreign bodies, uses minimal suture and maintains adequate blood supply and oxygenation.

Specifically, it is important to handle soft tissue gently to avoid crushing that can result in tissue death (necrosis); use electrocautery sparingly to control bleeding because it leaves behind dead tissue that is

more likely to become infected; use absorbable suture whenever possible because permanent suture, especially silk suture, reduces the number of bacteria necessary to cause infection (James and MacLeod 1961); and use closed suction drains that exit through a separate stab wound to help prevent accumulation of tissue fluid in the dependent portion of the wound.

Preventing this is especially important in obese patients and may reduce SSIs (Fry 2003). (Passive drains, such a Penrose drain, exiting through the bottom of the incision should not be used.)

Increased length of surgical procedures is associated with increased risk of SSIs. It is estimated that the infection rate nearly doubles with each hour of surgery (Cruse and Foord 1980.)

Prompt discharge postoperatively, provided patients are able to return to home care, reduces the risk of infection as well.

These factors, coupled with the experience and skill of the surgeon and assistant, are known to reduce the risk of SSI.

ANTIBIOTIC PROPHYLAXIS IN SURGERY

The use of antibiotics preoperatively can reduce the rate of infection, particularly wound infections, after certain operations. The benefit, however,

must be weighed against the risks of toxic and allergic reactions, the emergence of resistant bacteria, drug interactions, super infection and cost (Nichols 2001). For example, it is estimated that 5% of patients receiving an antibiotic will have a serious reaction to the drug. In general, antibiotic prophylaxis is recommended only for procedures with high infection rates and those in which the consequences of infection are especially serious.

Guidelines for Choosing a Prophylactic Antibiotic Ideally the prophylactic drug(s) should be directed against the most likely infecting organisms, but need not kill or inactivate all pathogens. For most procedures, an inexpensive, first- or second-generation cephalosporin, such as cefazolin, which has a moderately long half-life and is active against staphylococci and streptococci, has been effective when given intravenously (IV) 30 minutes before surgery. Exceptions are for an appendectomy, where cefoxitin or cefotetan is preferred because they are more active than cefazolin against bowel anaerobic organisms.

Where methicillin-resistant staphylococci are important postoperative pathogens, vancomycin can be used, but routine use for prophylaxis should be avoided because it may promote the emergence of resistant organisms. Also, third- and fourth-generation cephalosporins (e.g., cefotaxime or

cefepime) should not be used for routine surgical prophylaxis because: they are expensive, some are less active than cefazolin against staphylococci; their spectrum of activity includes organisms rarely encountered in elective surgery; and their widespread use may promote the emergence of resistance.

Number of Doses

In most instances, a single intravenous (IV) dose of an antibiotic completed 30 minutes or less before the skin incision provides adequate tissue levels throughout the operation. (If vancomycin is used, at least 1 hour is required.) Clearly the concept of “on call” infusion of prophylactic antibiotics is not acceptable because delays in starting the operation can occur, resulting in ineffective tissue levels when the surgery actually does start. If surgery is prolonged (more than 4 hours), major blood loss occurs or an antibiotic with a short half-life such as cefoxitin is used, one or more additional doses should be given during the procedure

Postoperative antibiotics

In the present day management protocols, most surgical procedures shall not require postoperative antibiotics. Whenever postoperative antibiotics are used, the aim of therapy is to achieve adequate levels at the

site of infection. It is again stressed, that antibiotics do not replace surgical interventions like drainage and debridement of infected wound. Open drainage may be adequate for most superficial SSIs. Antibiotics are required if there is evidence of systemic infection (fever and leukocytosis) or cellulitis that extends beyond two centimetres from incision. Antibiotics are also indicated as an adjunct for various surgical and medical complications.

For most mild infections, control can be achieved on outpatient basis with the help of oral antibiotics. But in severe infections, it is necessary to use parenteral antibiotics. Each patient requiring therapeutic antibiotics should be assessed daily for response to treatment. If no improvement is seen, one has to reevaluate choice of antibiotics. As the patient improves, clinician must decide when to stop antibiotic therapy. Although no specific duration of antibiotic therapy is advised, for most procedures, a general guide is to continue antibiotics until the patient has shown an obvious clinical improvement based on clinical examination and has had a normal temperature for 48 hours or more. Signs of clinical improvement include improved mental status, return of bowel function reduction of tachycardia and spontaneous diuresis.

Use of antibiotics during "contaminated" or "dirty" procedures is

considered therapy rather than prophylaxis. Treatment rather than prophylaxis is indicated for procedures with obvious preexisting infection (abscess, pus, necrotic tissue). Depending upon the severity of infection, antibiotics may be administered for variable duration.

- a) Contamination (gastroduodenal peptic perforations operated within 12 hours, traumatic enteric perforations operated with 12 hours, peritoneal contamination with bowel contents during elective or emergency procedures, early or phlegmonous appendicitis or phlegmonous cholecystitis): single dose prophylaxis.
- b) Resectable infection (appendectomy for gangrenous appendicitis, cholecystectomy for gangrenous cholecystitis, bowel resection for ischaemic or strangulated dead bowel without frank perforation): 24 hours postoperative antibiotics.
- c) Advanced infection (intra-abdominal infection from diverse sources): 48 hours to 5 days, based on operative findings and patient's condition.
- d) Severe intra-abdominal infection with the source not easily controllable (infected pancreatic necrosis, postoperative intra-abdominal infection): longer courses may be necessary.

Guidelines for choosing an antibiotic for empiric treatment include:

- a) Coverage of presumed microorganisms should be ensured.
- b) The antibiotic chosen should be able to reach the site of infection
- c) Toxicity should be considered especially in critically ill patients.
- d) A time limit for antibiotic administration should be set while starting treatment.

RECOMMENDATIONS FOR PREVENTION OF SURGICAL SITE INFECTION

Rationale:

The guideline for prevention of surgical site infection 1999, provides recommendations concerning reduction of surgical site infection risk. Each recommendation is categorized on the basis of existing scientific data, theoretical rationale, and applicability.

Category I A. Strongly recommended for implementation and supported by well-designed experimental, clinical, or epidemiological studies.

Category I B. Strongly recommended for implementation and supported by some experimental ,clinical, or epidemiological studies and strong theoretical rationale.

Category II. Suggested for implementation and supported by suggestive clinical or epidemiological studies or theoretical rationale.

No recommendation; unresolved issue. Practices for which insufficient evidence or no consensus regarding efficacy exists.

Recommendations:

1. Preoperative

a. Preparation of the patient

1. Whenever possible, identify and treat all infections remote to the surgical site before elective operation and postpone elective operations on patients with remote site infections until the infection has resolved. Category IA
2. Do not remove hair preoperatively unless the hair at or around the incision site will interfere with the operation. Category IA
3. If hair is removed, remove immediately before the operation, preferably with electric clippers. Category IA
4. Adequately control serum blood glucose levels in all diabetic patients and particularly avoid hyperglycaemia perioperatively. Category IB
5. Encourage tobacco cessation. At minimum, instruct patients to abstain for at least 30 days before elective operation from smoking cigarettes, cigars, pipes, or any other form of tobacco consumption (e.g., chewing/dipping).
Category IB
6. Do not withhold necessary blood products from surgical patients as a means to prevent SSIs. Category IB

7. Require patients to shower or bath with an antiseptic agent on at least the night before the operative day. Category IB

8. Thoroughly wash and clean at and around the incision site to remove gross contamination before performing antiseptic skin preparation. Category IB

9. Use an appropriate antiseptic agent for skin preparation. Category IB

10. Apply preoperative antiseptic skin preparation in concentric circles moving toward the periphery. The prepared area must be large enough to extend the incision or create new incisions or drain sites, if necessary.

Category II

11. Keep preoperative hospital stay as short as possible while allowing for adequate preoperative preparation of the patient. Category II

12. No recommendation to taper or discontinue systemic steroid use (when medically permissible) before elective operation. Unresolved issue

13. No recommendation to enhance nutritional support for surgical patients solely as a means to prevent SSIs. Unresolved issue

14. No recommendation to preoperatively apply mupirocin to nares to prevent SSIs. Un resolved issue

15. No recommendation to provide measures that enhance wound space oxygenation to prevent SSI. Unresolved issue

b. Hand/forearm antisepsis for surgical team members

1. Keep nails short and do not wear artificial nails .Category IB
2. Perform a preoperative surgical scrub for at least 2 to 5 minutes using an appropriate antiseptic. Scrub the hands and forearms up to the elbows.

Category IB

3. After performing the surgical scrub, keep hands up and away from the body (elbows in flexed position) so that water runs from the tips of the fingers toward the elbows. Dry hands with a sterile towel and don a sterile gown and gloves. Category IB

4. Clean underneath each fingernail prior to performing the first surgical scrub of the day .Category II

5. Do not wear hand or arm jewellery. Category 11

6. No recommendation on wearing nail polish .Unresolved Issue

c. Management of infected or colonized surgical personnel

1. Educate and encourage surgical personnel who have signs and symptoms of a transmissible infectious illness to report conditions promptly to their supervisory and occupational health personnel. Category IB

2. Develop well-defined policies concerning patient care responsibilities when personnel have potentially transmissible infectious conditions. These policies should govern (a) personnel responsibility in using the health service and reporting illness, (b) work restrictions, and (c) clearance to resume work after an illness that required work restriction. The policies also should identify persons who have the authority to remove personnel from duty. Category IB

3. Obtain appropriate cultures from, and exclude from duty, surgical personnel who have draining skin lesions until infection has been ruled out or personnel have received adequate therapy and infection has resolved. Category IB

4. Do not routinely exclude surgical personnel who are colonized with organisms such as *Staph. aureus* (nose, hands, or other body site) or group A *Streptococcus*, unless such personnel have been linked epidemiologically to dissemination of the organism in the healthcare setting .Category IB

d. Antimicrobial prophylaxis

1. Administer a prophylactic antimicrobial agent only when indicated, and select it based on its efficacy against the most common pathogens causing SSI for a specific operation and published recommendations. Category 1A

2. Administer by the intravenous route the initial dose of prophylactic antimicrobial agent, timed such that a bactericidal concentration of the drug is established in serum and tissues when the incision is made. Maintain therapeutic levels of the agent in serum and tissues throughout the operation and until, at most, a few hours after the incision is closed in the operating room. Category 1A

3. Before elective colorectal operations in addition to the above, mechanically prepare the colon by use of enemas and cathartic agents. Administer non absorbable oral antimicrobial agents in divided doses on the day before the operation. Category 1A

4. For high-risk Caesarean section, administer the prophylactic antimicrobial agent immediately after the umbilical cord is clamped. Category 1A

5. Do not routinely use Vancomycin for antimicrobial prophylaxis. Category IB

2. Intraoperative

a. Ventilation

1. Maintain positive-pressure ventilation in the operating room with respect to the corridors and adjacent areas. Category IB

2. Maintain a minimum of 15 air changes per hour, of which at least 3 should be fresh air .Category IB

3. Filter all air, re circulated and fresh, through the appropriate filters per the American Institute of Architects' recommendations. Category IB

4. Introduce all air at the ceiling, and exhaust near the floor. Category IB

5. Keep operating room doors closed except as needed for passage of equipment, personnel, and the patient. Category IB

6. Consider performing orthopaedic implant operations in operating rooms supplied with ultra clean air. Category 11

7. Limit the number of personnel entering the operating room to necessary personnel. Category II

b. Cleaning and disinfection of environmental surfaces

1. When visible soiling or contamination with blood or other body fluids of surfaces or equipment occurs during an operation, use an EPA-approved hospital disinfectant to clean the affected areas before the next operation.

Category IB

2. Do not perform special cleaning or closing of operating rooms after contaminated or dirty operations. Category IB

3. Do not use tacky mats at the entrance to the operating room suite or individual operating rooms for infection control. Category IB

4. Wet-vacuum the operating room floor after the last operation of the day or night with an EPA-approved hospital disinfectant. Category II

5. No recommendation on disinfecting environmental surfaces or equipment used in operating rooms between operations in the absence of visible soiling.

Unresolved issue

c. Microbiologic sampling

1. Do not perform routine environmental sampling of the operating room. Perform microbiologic sampling of operating room environmental surfaces or air only as part of an epidemiologic investigation. Category IB

d. Sterilization of surgical instruments

1. Sterilize all surgical instruments according to published guidelines.

Category IB

2. Perform flash sterilization only for patient care items that will be used immediately (e.g., to reprocess an inadvertently dropped instrument). Do not use flash sterilization for reasons of convenience, as an alternative to purchasing additional instrument sets, or to save time. Category IB

e. Surgical attire and drapes

1. Wear a surgical mask that fully covers the mouth and nose when entering the operating room if an operation is about to begin or already under way, or if sterile instruments are exposed .Wear the mask throughout the operation.

Category IB

2. Wear a cap or hood to fully cover hair on the head and face when entering the operating room. Category IB

3. Do not wear shoe covers for the prevention of SSIs Category IB

4. Wear sterile gloves if a scrubbed surgical team member. Put on gloves after donning a sterile gown. Category IB

5. Use surgical gowns and drapes that are effective barriers when wet (i.e., materials that resist liquid penetration). Category IB

6. Change scrub suits that are visibly soiled, contaminated and penetrated by blood or other potentially infectious materials .Category IB.

7. No recommendations on how or where to launder scrub suits, on restricting use of scrub suits to the operating suite, or for covering scrub suits when out of the operating suite. Unresolved issue

f. Asepsis and surgical technique

1. Adhere to principles of asepsis when placing intravascular devices (e.g., central venous catheters), spinal or epidural anaesthesia catheters, or when dispensing and administering intravenous drugs. Category IA

2. Assemble sterile equipment and solutions immediately prior to use.
Category II

3. Handle tissue gently, maintain effective haemostasis, minimize devitalized tissue and foreign bodies (i.e., sutures, charred tissues, necrotic debris), and eradicate dead space at the surgical site. Category IB

4. Use delayed primary skin closure or leave an incision open to heal by second intention if the surgeon considers the surgical site to be heavily contaminated (e.g., Class III and Class IV).Category IB

5. If drainage is necessary, use a closed suction drain. Place a drain through a separate incision distant from the operative incision. Remove the drain as soon as possible. Category IB

3. Postoperative incision care

a. Protect with a sterile dressing for 24 to 48 hours postoperatively an incision that has been closed primarily. Category IB

b. Wash hands before and after dressing changes and any contact with the surgical site. Category IB

c. When an incision dressing must be changed, use sterile technique. Category II

d. Educate the patient and family regarding proper incision care, symptoms of SSI, and the need to report such symptoms. Category II

e. No recommendation to cover an incision closed primarily beyond 48 hours, nor on the appropriate time to shower or bathe with an uncovered incision. Unresolved Issue

4. Surveillance

a. Use CDC definitions of SSI without modification for identifying SSI among surgical inpatients and outpatients. Category IB

b. For inpatient case-finding (including readmissions), use direct prospective observation, indirect prospective detection, or a combination of both direct and indirect methods for the duration of the patient's hospitalization. Category IB

c. When post-discharge surveillance is performed for detecting SSI following certain operations(e.g., coronary artery bypass graft), use a method that accommodates available resources and data needs. Category II

d. For outpatient case-finding, use a method that accommodates available resources and data needs. Category IB

e. Assign the surgical wound classification upon completion of an operation. A surgical team member should make the assignment. Category II

f. For each patient undergoing an operation chosen for surveillance, record those variables shown to be associated with increased SSI risk (e.g., surgical wound class, ASA class, and duration of operation). Category IB

National Nosocomial Infection Surveillance

In the United States hospitals are required to conduct surveillance for the development of SSIs for a period of 30 days after the operative procedure, such surveillance has been associated with greater awareness and a reduction in SSI rates.

The National Nosocomial Infection Surveillance (NIS) risk index is commonly used and assesses three factors:

1. American Society of Anaesthesiologists (ASA) physical status score > 2
2. Class III/IV wound
3. Duration of operation greater than the 75th percentile for the particular procedure

The risk of SSIs for class I wounds varies from approximately 1 to 2% for patients with low NNIS scores to approximately 15% for patients with high NNIS score (e.g., long operations and /or high ASA scores).

AIM OF STUDY

To determine the risk factors affecting abdominal surgical site infections and their incidence, Different risk factors are including age, sex, type of wound, prophylactic antibiotics, operation type and duration, time of shaving, pre operative bed stay and comorbid condition like DM ,HT

MATERIALS AND METHODS

In this study 200 patients in a govt. Rajaji hospital during the September 2009 to November 2011 underwent abdominal surgery and were studied for SSI and the factors affecting it.

The dependent variable in this study was abdominal surgical site infection, defined as redness, swelling, pain, temperature above 38°C, during the 30 days after operation. The independent variables were: age, sex, site operated, time of shaving, administration of prophylactic antibiotics inj.cefotaxime 1gm 1/2hr before surgery only elective surgeries, type of surgical operation, duration of operation, duration of preoperative bed stay and accompanying comorbid conditions.

The stages for data collection and information completion were as follows: identification of patients; preoperative examination; post operative examination; weekly examinations and follow-ups for 30 days following operation; and pre-discharge examinations. The collected data were analyzed by the using Student's t-test for continuous variables and chi-square test for categorical variables.

OBSERVATION AND RESULTS

Of the 200 patients who had undergone abdominal surgery 40 cases (20%) suffering from SSI in this study. No infection were observed in the other 160 cases (80%). So for as wound type of was, clean wound 32 cases (16%), clean contaminated wound 49 cases (24.5%) contaminated wound in 101 cases (50.5%) Dirty infected in 18 cases (9%).

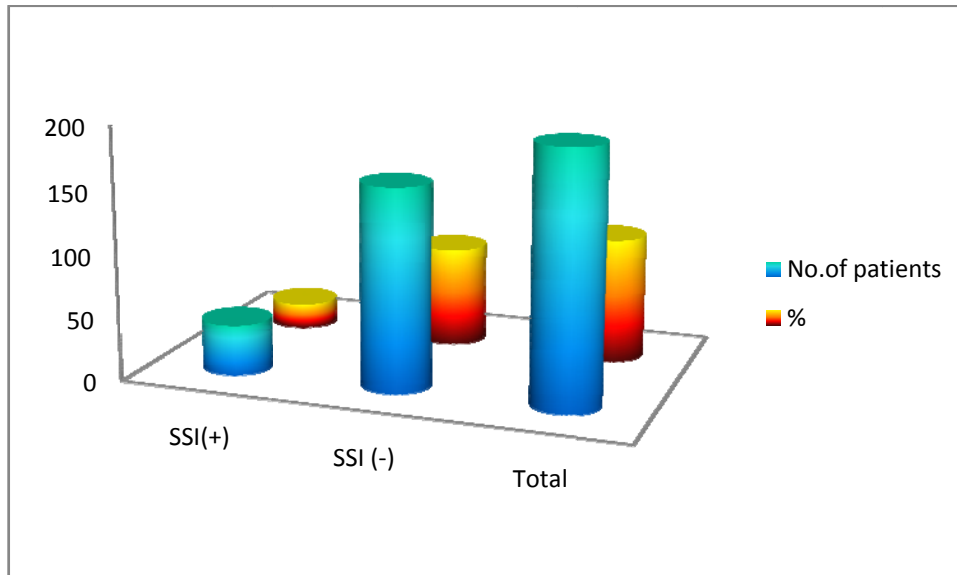
I found no significant correlation between SSI incidence and sex, time of shaving. However, SSI correlation with duration of operation, duration of pre operating bed stay, electiveness of surgery, increases age, type of wound and type of surgery, prophylactic antibiotic administration and accompanying comorbid condition like diabetes.

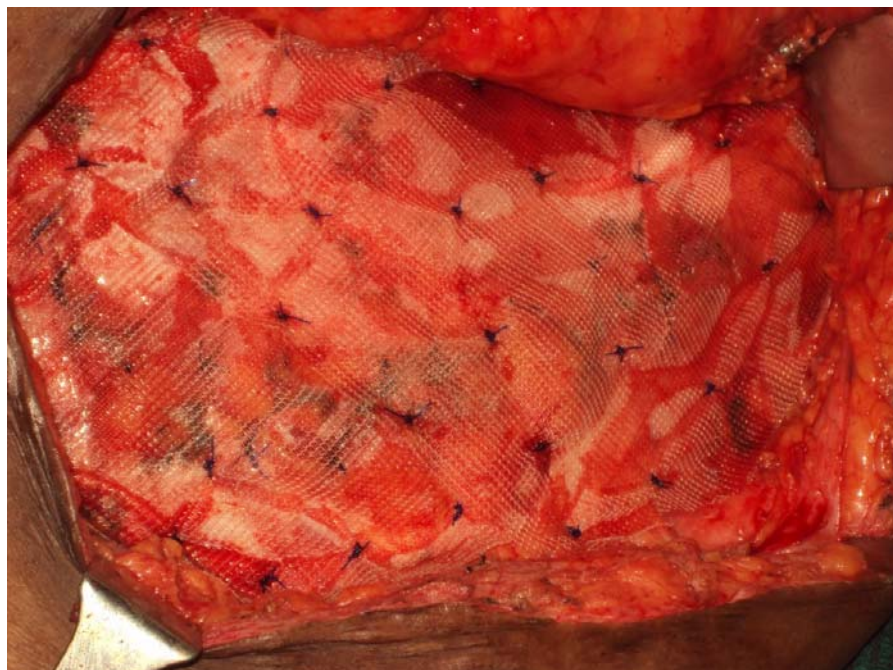
Following tables shows study results:

Table 1. SSI INCIDENCE

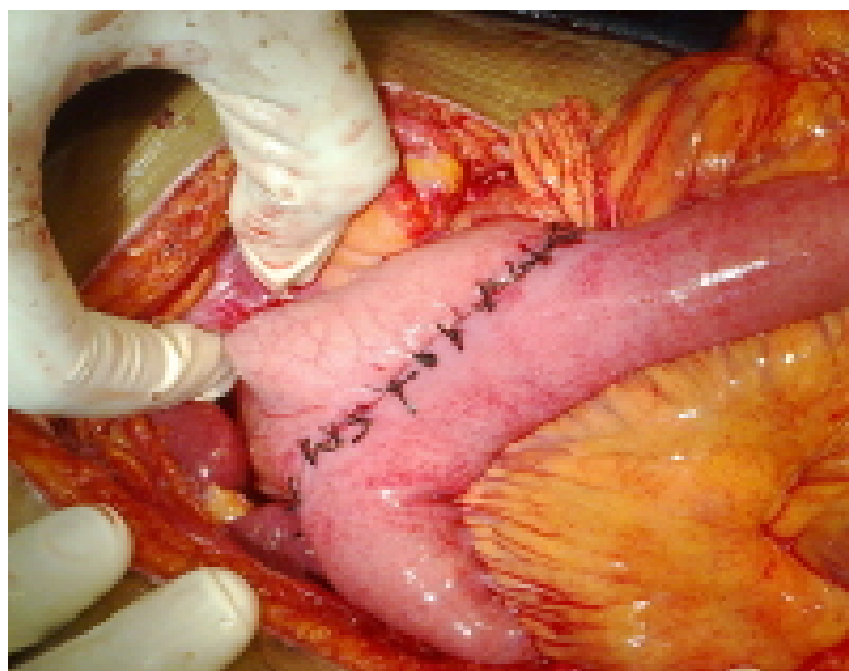
	No.of patients	%
SSI(+)	40	20
SSI (-)	160	80
Total	200	100

Chart 1.SSI INCIDENCE





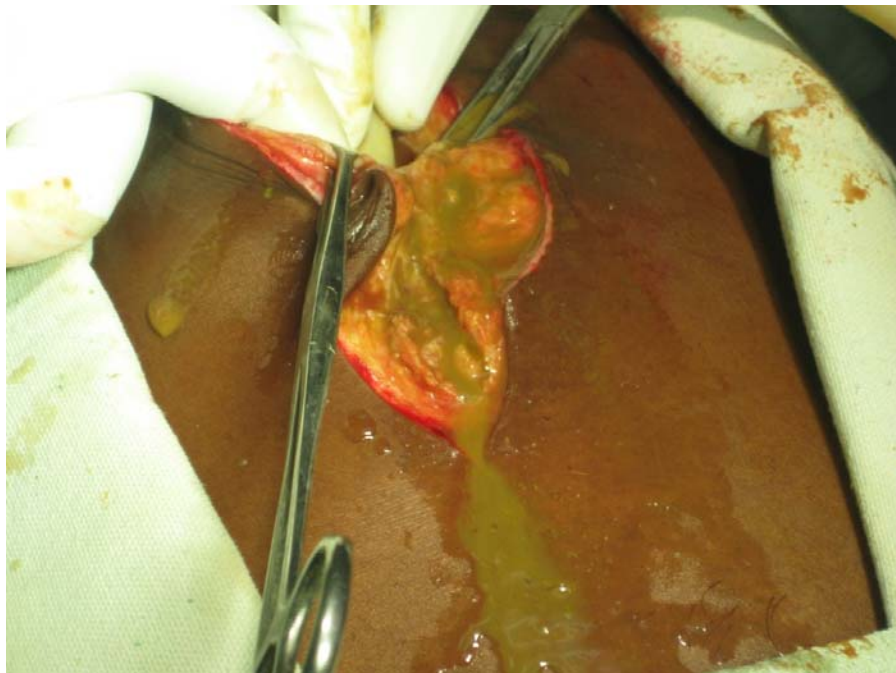
CASE OF INCISIONAL HERNIA MESH REPAIR – CLEAN WOUND



GASTROJEJUNOSTOMY – CLEAN AND CONTAMINATED WOUND



INFLAMMED APPENDIX – CONTAMINATED WOUND



CASE OF ILEAL PERFORATION – DIRTY WOUND

POST LAPAROTOMY – SUPERFICIAL INCISIONAL SSI



POST LAPAROTOMY – DEEP INCISIONAL SSI



**POST LAPAROTOMY – ORGAN / SPACE SSI
(PELVIC ABSCESS CT IMAGE)**

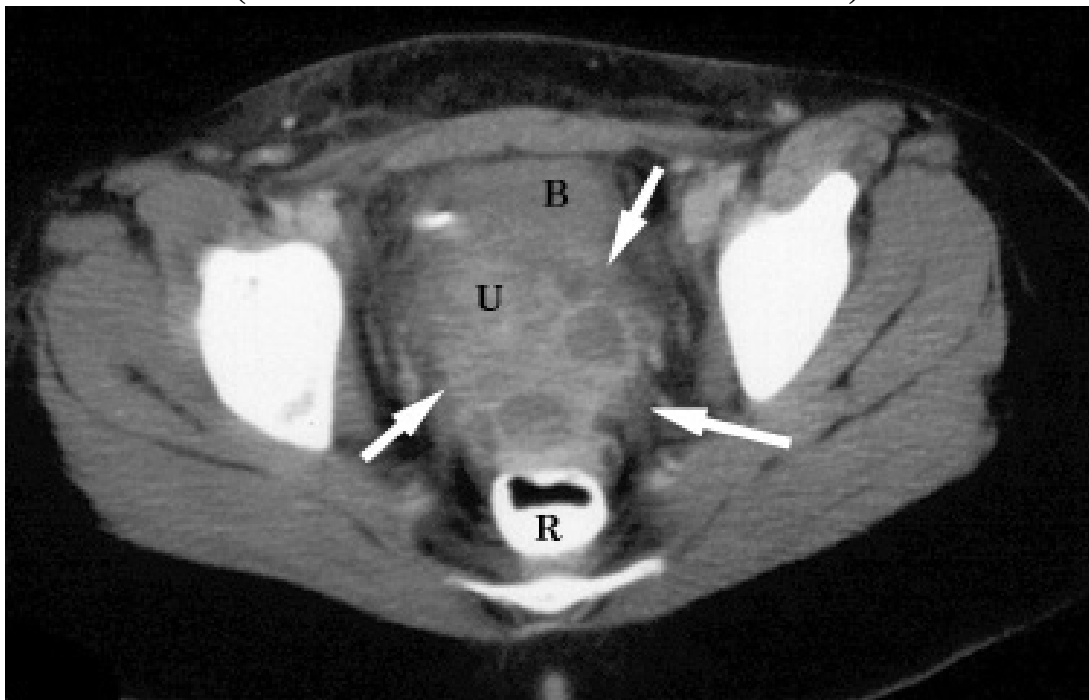


Table 2.SSI INCIDENCE IN VARIOUS TYPE OF SURGERY

Type of operation	Frequency	percentage	SSI incidence	SSI percentage
open appendicectomy	49	24.5	6	12.24
laparotomy&primary closure(gastric perforation)	6	3	2	33.33
laparotomy&primary closure(duodenal perforation)	12	6	4	33.33
laparotomy&primary closure(ileal perforation)	8	4	6	75
laparotomy(large bowel perforation)	3	1.5	2	66.66
laparotomy(intestinal obstruction)	5	2.5	1	20
laparotomy(blunt&penetrating injury)	11	5.5	4	36.36
laparotomy(others)	3	1.5	0	0
Anterior abdominal wall hernia	31	15.5	3	9.68
Resection&Anastomosis(benign small bowel disease)	5	2.5	2	40
Large bowel resection(malignant disease)	6	3	3	50
Large bowel resection(benign disease)	1	0.5	0	0
TV&PGJ	10	5	1	10
Gastrectomy or AGJ	13	6.5	3	23.08
THE	1	0.5	0	0
FJ	1	0.5	0	0
open cholecystectomy	5	2.5	1	20
open cholecystectomy&CBD exploration	4	2	1	25
choledochal cyst excision&hepaticojejunostomy	1	0.5	0	0
whipples procedure	1	0.5	0	0
pericystectomy liver	1	0.5	0	0
Retroperitoneal sarcoma excision	1	0.5	0	0
laparoscopic surgery	22	11	1	4.55

Table 3. SSI Distribution based on the age involved

Variable	Classification	SSI (+)		SSI (-)		Total		P.Value
		N	%	N	%	N	%	
Age	Age less than 25	3	6.82	41	93.18	44	100	0.037
	Age groups 25–65	34	23.13	113	76.87	147	100	
	Age groups above 65	3	33.33	6	66.67	9	100	

Chart 2. SSI Distribution based on the age involved

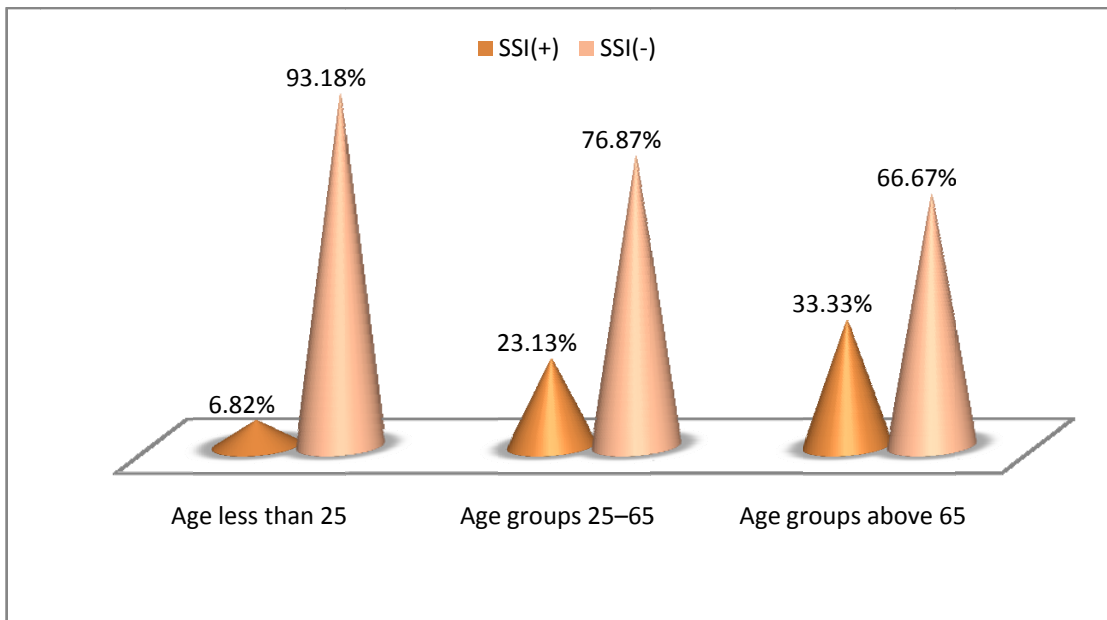


Table 4. SSI Distribution based on the sex involved

	Classification	SSI (+)		SSI (-)		Total		P.Value
		N	%	N	%	N	%	
sex	Male	26	19.70	106	80.30	132	100	0.8813
	Female	14	20.59	54	79.41	68	100	

Chart 3. SSI Distribution based on the sex involved

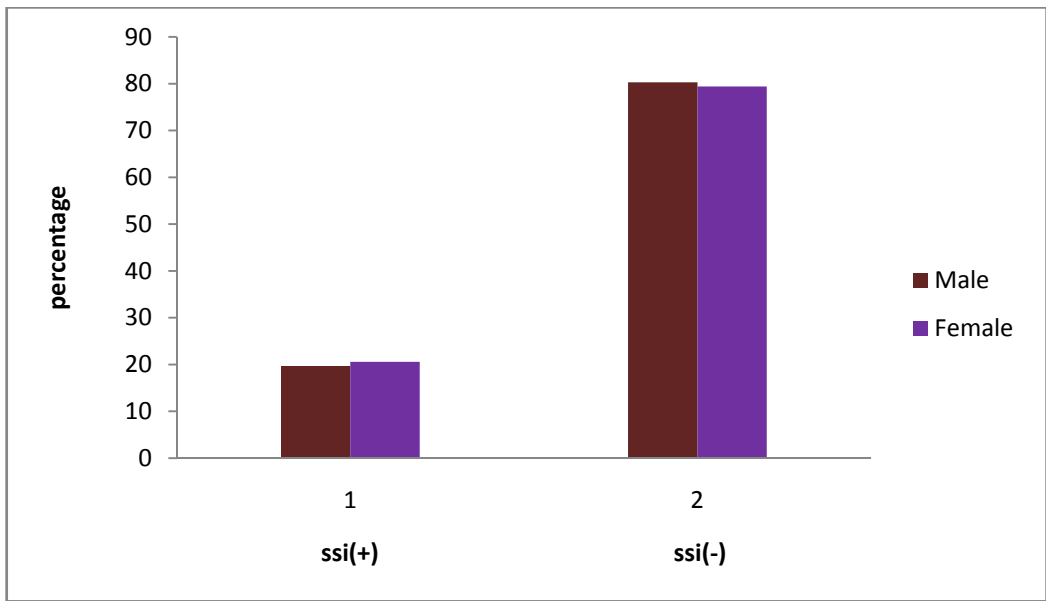


Table 5. SSI Distribution based on the type of wound

Type Of Wounds	Classification	SSI (+)		SSI (-)		Total		P.Value
		N	%	N	%	N	%	
Type Of Wounds	Clean wounds	4	12.5	28	87.5	32	100	0.0077
	Clean contaminated wounds	10	20.40	39	79.60	49	100	
	Contaminated wounds	17	16.83	84	83.17	101	100	
	Dirty – infected wounds	9	50	9	50	18	100	

Chart 4. SSI Distribution based on the type of wound

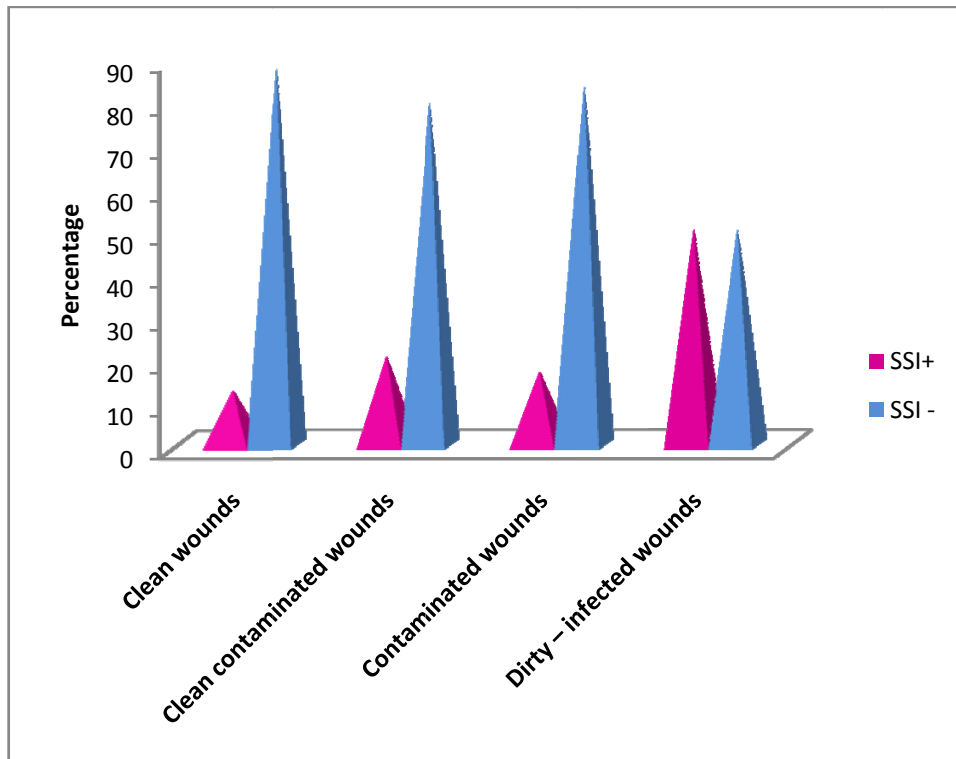


Table 6. SSI Distribution based on the electiveness of operation

Type of Operation	Classification	SSI (+)		SSI (-)		Total		P.Value
		N	%	N	%	N	%	
Operation	Urgent	25	28.09	64	71.91	89	100	0.010
	elective	15	13.51	96	86.49	111	100	

Chart 5. SSI Distribution based on the type of operation

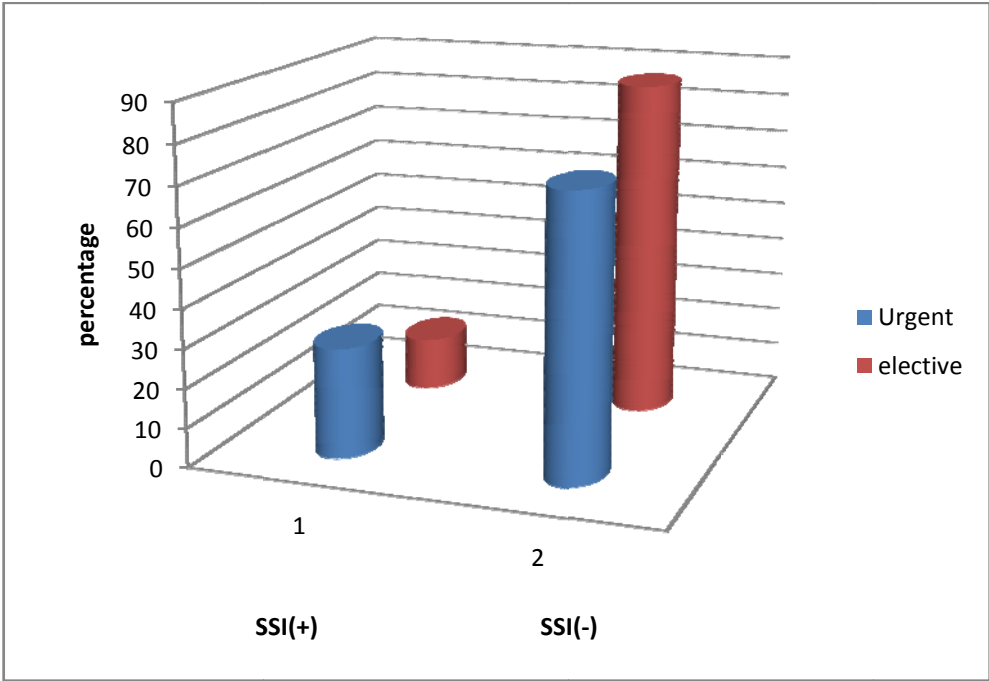


Table 7. SSI Distribution based on the operation duration

	Classification	SSI (+)		SSI (-)		Total		P.Value
		N	%	N	%	N	%	
Operation Duration	Below 1.5 hours	1	2.33	42	97.67	43	100	0.002
	1.5 – 4 hours	28	21.37	103	78.63	131	100	
	Above 4 hours	11	42.31	15	57.69	26	100	

Chart 6. SSI Distribution based on the operation duration

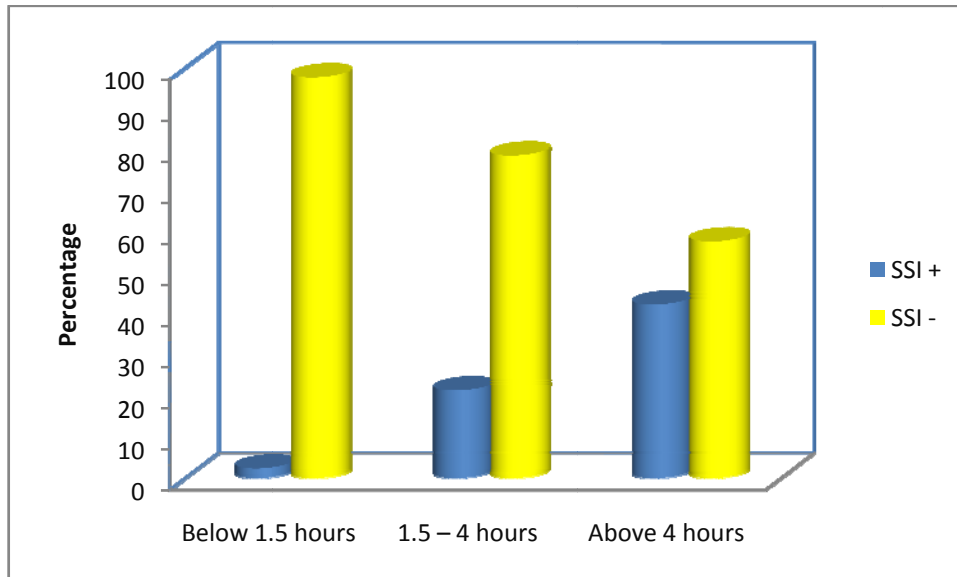


Table 8. SSI Distribution based on the preoperative bed stay

	Classification	SSI (+)		SSI (-)		Total		P.Value
		N	%	N	%	N	%	
Preoperative bed stay	Emergency	25	28.09	64	71.91	89	100	0.006
	1 – 15 days	4	5.56	68	94.44	72	100	
	More than 15 days	11	28.21	28	71.79	39	100	

Chart 7. SSI Distribution based on the preoperative bed stay

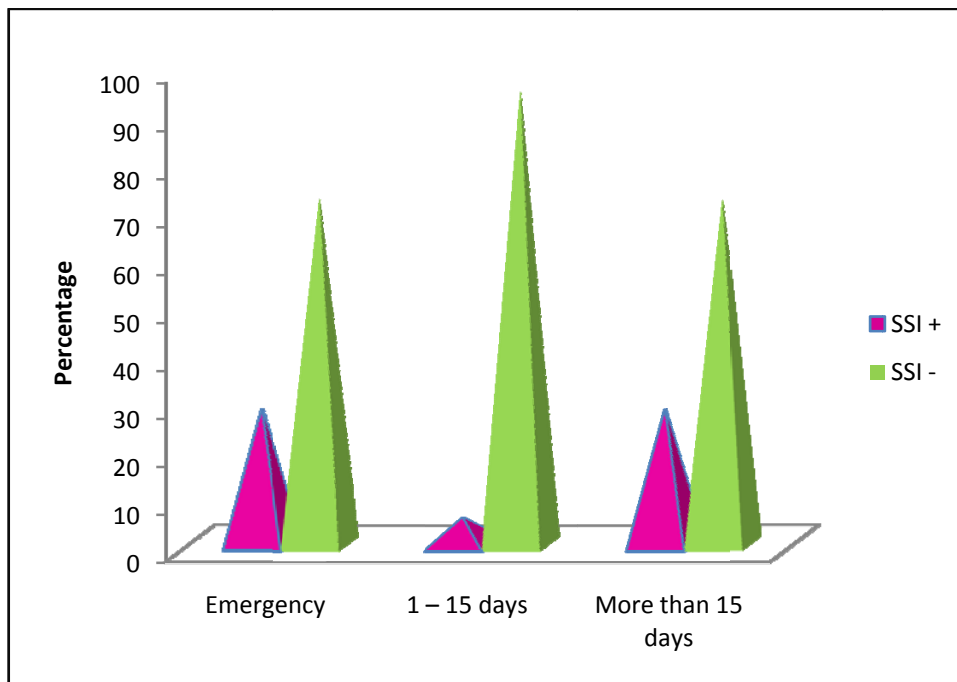


Table 9. SSI Distribution based on the shaving time

	Classification	SSI (+)		SSI (-)		Total		P.Value
		N	%	N	%	N	%	
Shaving Time	One hour before operation	14	17.72	65	82.28	79	100	0.5
	12 hours before operation	26	21.49	95	78.51	121	100	

Chart 8. SSI Distribution based on the shaving time

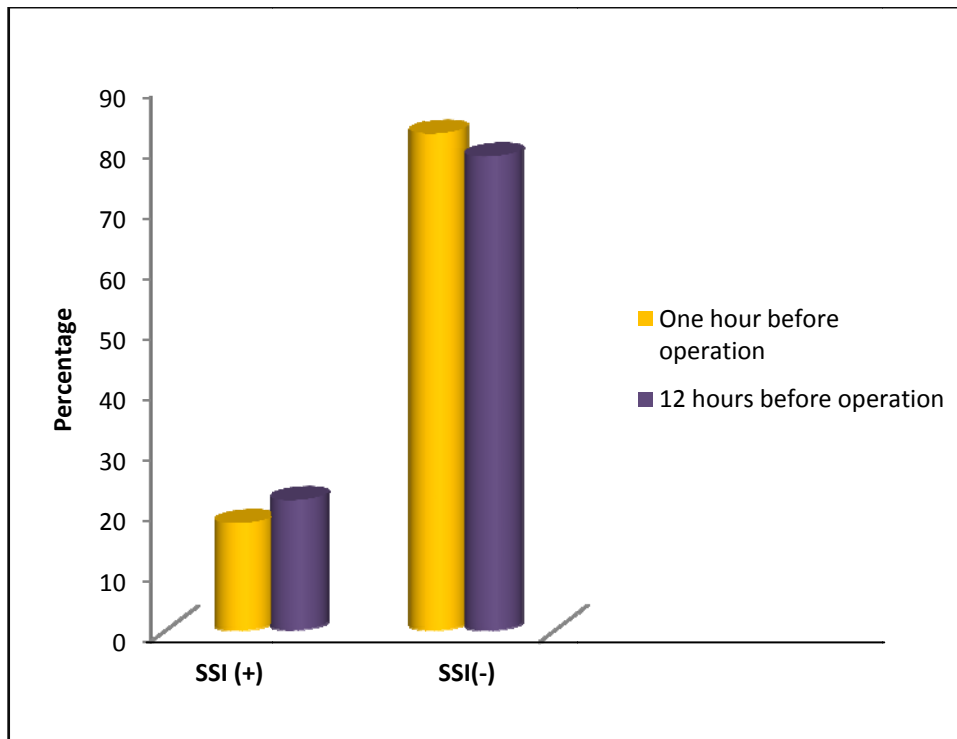


Table 10. SSI Distribution based on the Prophylactic antibiotic administration

Prophylactic antibiotic administration(elective cases only)	Classification	SSI (+)		SSI (-)		Total		P.Value
		N	%	N	%	N	%	
	Given	5	6.94	67	93.06	72	100	0.002
	Not given	10	25.64	29	74.36	39	100	

Chart 9. SSI Distribution based on the Prophylactic antibiotic administration

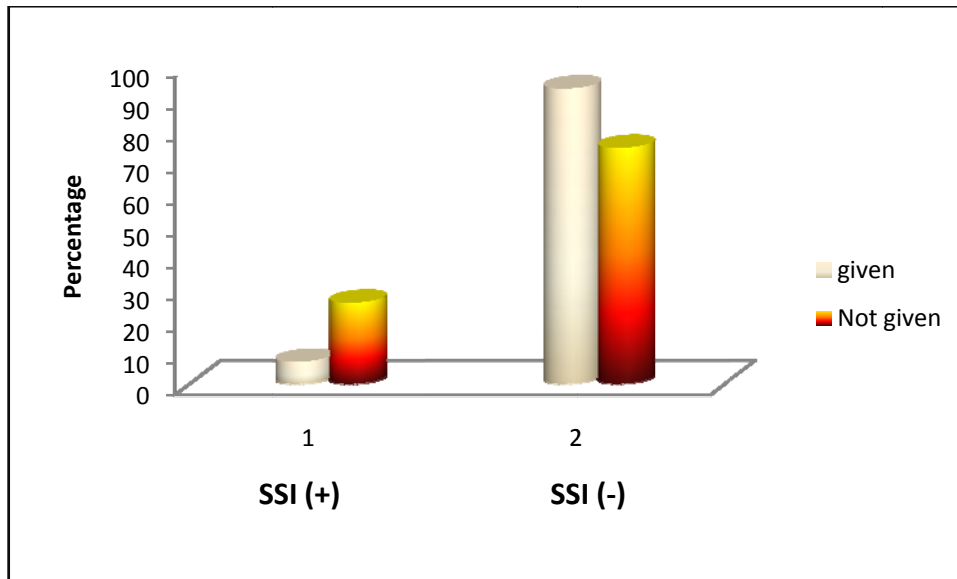
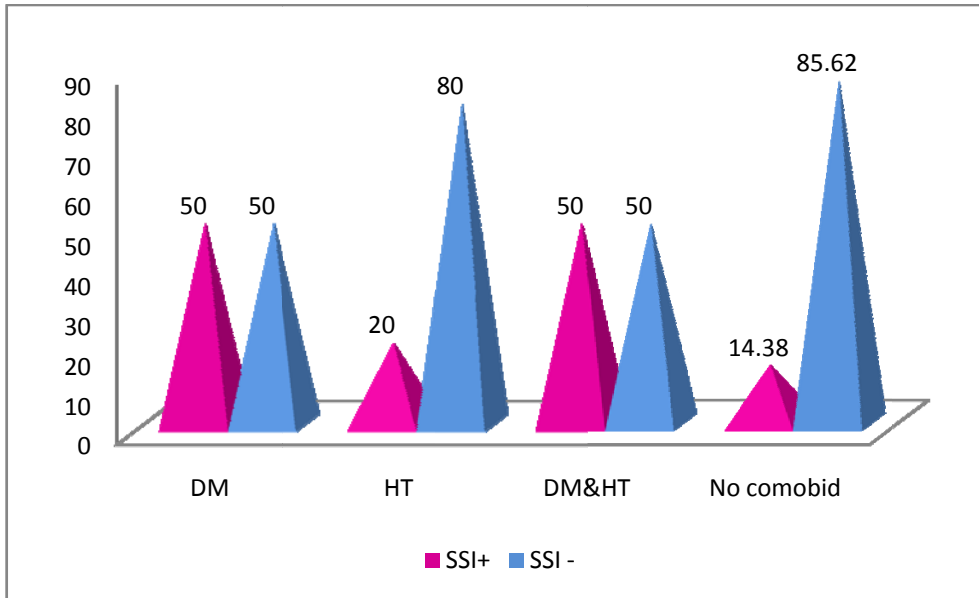


Table 11. SSI Distribution based on the Co morbid condition

Co morbid condition	Classification	SSI (+)		SSI (-)		Total		P.Val
		N	%	N	%	N	%	
Co morbid condition	DM	10	50	10	50	20	100	0.0001
	HT	2	20	8	80	10	100	
	DM&HT	5	50	5	50	10	100	
	No comorbid	23	14.38	137	85.62	160	100	

Chart 10: SSI Distribution based on the Co morbid condition



DISCUSSION

For the 200 patients in this study, SSI reported was 20% which is well above the 14-16% reported in other studies (1).

SSI And Type Of Operation

Particularly high SSI observed in colon cancer surgery about 50% compared with other studies, which was lower incidence (58.3%) (1). Next high incidence observed in cases of small bowel surgery 40% compared with previous study 20% (1), followed in stomach cancer surgery 23.08% compared with other studies 20% (4) 39-7% (1), Which was comparable to other studies. Lower incidence observed in the cases of laparoscopic surgery 4.55% compared with previous study incidence 0 to 4%.

In the cases of emergency surgery high incidence observed in ileal perforation closure surgery about 75% compared with other studies 60%(1) followed by large bowel perforation closure surgery about 66.66% compared with previous study 66.7%(1).

SSI And Age

Increases age is correlate with SSI because of increase age associated with condition like immunological deficiency and diabetes. SSI incidence age less than 25 about 6.82%, middle age group (25 to 65) about 23.13% and age above 65 incidence about 33.33%. The present findings support this argument (P value – 0.037). This finding correlated with current literature and previous studies.(1,5)

SSI and Sex

In my study SSI is not correlated with sex even though difference between this group 1% . This finding correlated with other studies and literature (5,1).

SSI and Type of wound

According to the type of wound SSI observed in clean cases 12.5% (previous study 4.6% (1)), clean contaminated 20.4% (previous study 4.2%), contaminated wound 16.83% (previous study 31.3%), dirty wound 50% (previous study 8.9%). This findings shows increase bacterial load more prone for SSI. This finding also correlated with current literature and previous studies (1,5).

SSI and Electiveness of surgery

According to the type of operation elective surgery had 13.51% (14.9% (1)). Emergency had 28.09% (18.1%(1)). So emergency surgery had higher incidence of SSI. This finding also correlated with current literature and previous studies (1,5).

SSI and Duration of surgery

Duration of surgery more than 4 hours SSI incidence about 42.31%, below 1.5 hours incidence about 2.33%. So prolonged duration of surgery had higher incidence of SSI. This finding supported by current literature and previous studies (1,10).

SSI and Pre operative stay

The literature shows the correlation between SSI and pre operative bed stay (4,5) was supported by this study pre operative stay more than 15 days had higher incidence of SSI.

SSI and timing of shaving

In my study timing of shaving does not correlated SSI, less than 1 hour shows 17.72%, more than 12 hours shows 21.49%. Even though observed difference between this 2 groups about 4% but P values is not

significant. This finding against current literature and previous studies(1,4).Because of other confounding factor.

SSI and Prophylactic antibiotic administration

In my study prophylactic antibiotic administration cases SSI incidence about 6.94%, those without antibiotic cases SSI incidence about 25.64% . This finding supported by current literature and previous studies (1,10).

SSI and comorbid conditions

Diabetic patients had higher incidence of SSI about 50% but hypertensive patients had 20%. So only DM risk factor for SSI not HT.

Other such factors quoted in the literature as the conditions of the operating theater, personal hygiene, immunological disorders, smoking, techniques of surgery, BMI, the surgeon's expertise, duration of surgical scrub, preoperative skin preparation, poor hemostasis, failure to obliterate dead space, tissue trauma, and inadequate sterilization of instruments, which were not included in this study might be considered as confounding factors.

CONCLUSION

Considering the relatively higher rate of SSI in this study 20%, 14 -16% in the other studies (1,4) especially in such cases as colon cancers and small bowel resection surgery, where the rate is considerably higher, I should reconsider the whole operation procedure. In general, We should try our best to reduce the average operation duration to less than 4 hours and the average pre operative bed stay to less than 15 days, to treat the comorbid condition preoperatively. Finally, when the administration of prophylactic antibiotics is required.

ABBREVIATIONS

CDC - Center For Disease Control

SSI - Surgical site infection

Table and chart abbreviations

N - No of cases

SSI + - Presence of surgical site infection

SSI - - Absence of surgical site infection

DM - Diabetes mellitus

HT - Hypertension

Master chart abbreviations

M - Male

F - Female

CL - Clean

CON - Contaminated

CC - Clean and contaminated

D - Dirty

BIBLIOGRAPHY

1. Abdominal surgical site infections: incidence and risk factors at an Iranian teaching hospital **Seyd Mansour Razavi¹, Mohammad Ibrahimpoor², Ahmad Sabouri Kashani³ and Ali Jafarian⁴** *BMC Surgery* 2005, **5**:2doi:10.1186/1471-2482-5-2
2. Troillet N, Petignant C, Matter M, Eisenring MC, Mosimann F, Francioli P: **Surgical site infection surveillance: an effective preventive measure.** *Rev Med Suisse Romande* 2001, **121**(2):125-8. PubMed Abstract
3. Burkitt Jf: **Identification of the sources of staphylococci contaminating the surgical wound during operation.** *Ann Surg* 1963, **158**:898-904. PubMed Abstract
4. Schwartz SI, Comshires G, Spencer FC, Dally GN, Fischer J, Galloway AC: *Principles of surgery.* 7th edition. NY: McGraw-Hill companies; 1999:83.

5. Habte-Gabr E, Gedebau M, Kronvall G: **Hospital-acquired infections among surgical patients in TikurAnbessa Hospital, Addis Ababa, Ethiopia.** *Am J Infect Control* 1988, 7-13. PubMed Abstract

6. Lecuona M, Torres Lana A, Delgado-Rodriguez M, Llorc J, Sierra A: **Risk factors for surgical site infections diagnosed after hospital discharge.** *J Hosp Infect* 1988, **39**(1):71-4. Publisher Full Text

7. Nystrom PO, Jonstam A, Hojer H, Ling L: **Incision infection after colorectal surgery in obese patients.***Actachirscand* 1987, **153**(3):225-7. PubMed Abstract

8. Nichols RL: **Preventing surgical site infections: A Surgeon's Perspective.***Emerg Infect Dis* 2001, **7**(2):220-4. PubMed Abstract

9. Majidpoor A, Jabarzadeh S: **Hospital acquired infections, how to control.** In *Emerging, Re-emerging infectious diseases and Employee Health. Volume 1.* Edited by Hatami. Tehran: Ministry of health and medical education, Center for disease management; 2004:263-321.

10. Gante JE: *Manual of Antibiotics and Infectious Disease Treatment and Prevention*. 9th edition. L.W.W; 2002:630-730.
11. Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR: **Guidelines for Prevention of surgical site infection 1999.***Infect Control HospEpidemiol* 1999, **20**(4):250-78. PubMed Abstract
12. Gilbert N, David ,Moellering , Robert C, Sande , Merle A: *The Sanford Guide to antimicrobial Therapy*. Cambridge: Cambridge University Press. INC; 1998.
13. Skarzynska J, Cieniala A, Madry R, Barucha P, Kwasniak M, Wojewoda T, Sroga J: **Hospital infection in general surgery wards.***PrzegIEpidemiol* 2000, **54**(3-4):299-304. PubMed Abstract
14. Alvarado CJ. 2000. The Science of Hand Hygiene: A Self-Study Monograph. University of Wisconsin Medical School and Sci-Health Communications. March.
15. Cruse PJE and R Foord. 1980. The epidemiology of wound infection: A 10year prospective study of 62,939 wounds. *SurgClin North Am* 60(1): 27-40

16. Fry DE. 2003. Surgical site infection: Pathogenesis and prevention. Medscape (February 19). Available at: www://medscape.com/viewprogram/2220_pnt.
17. Horan TC et al. 1992. CDC definitions of nosocomial surgical site infections, 1992: A modification of CDC definitions of surgical wound infections. *Infect Control Hosp Epidemiol* 13(10): 606–608.
18. James RC and CJ MacLeod. 1961. Induction of staphylococcal infections in mice with small inocula introduced on sutures. *Br J Exp Pathol* 42:266–272.
19. Lowry PW et al. 1991. A cluster of legionella sternal-wound infections due to postoperative topical exposure to contaminated tap water. *N Engl J Med* 324(2): 109–113.
20. The Medical Letter. 2001. Antimicrobial prophylaxis in surgery. *The Medical Letter* 43: 1116–1117.
21. SHEA, APIC, CDC and SIS. 1990. Consensus paper on the surveillance of surgical wound infections. *Infect Control Hosp Epidemiol* 18(5): 599–605.

22. Classen DC, Evans RS, Pestotnik SL, Horn DH, Menlove RL, Burke JP. The timing of prophylactic administration of antibiotics and the risk of surgical wound infection. *New Engl J Med* 1992; 326:281-286.
23. Howard JM, Barker WF, Culbertson WR et al Postoperative wound infections: the influence of ultraviolet irradiation of the operative room and of various other factors. *Ann Surg* 1964;160Suppl:1-192.
24. Knight R, Charbonneau P, Ratzer E, Zeren F, Haun W, Clark J. Prophylactic antibiotics are not indicated in clean general surgery cases. *Am J Surg.* 2001 ;182:682-6.
25. Gyssens IC. Preventing Postoperative infections: current treatment recommendations. *Drugs.* 1999;57:175-85.
26. Weed HG Antimicrobial prophylaxis in the surgical patient. *Med Clin North Am* 2003;87:59-75
27. Khan SA, Rao PGM, Rao A, Rodrigues G. Survey and evaluation of antibiotic prophylaxis usage in surgery wards of tertiary level

institution before and after implementation of clinical guidelines.

IndianJSurg2006;68:150-15

28. Barie PS, Eachempati SR. Surgical site infections. SurgClin N Am 2005;85:1115-1135.

29. Coskun H, Erisen L, Basut O. Factors affecting wound infection rates in head and neck surgery. Otolaryngolgy Head Neck surg 2000;123:328-333.

30. Andersen BR, Kallehave FL, Andersen HK. Antibiotics versus placebo for prevention of postoperative infection after appendicectomy. Cochrane Database Syst Rev. 2005 Jul20;(3):CD001439.

31. Melcher GA, Ruedi TP. Duration of antibiotic treatment in surgical infections of the abdomen .Blunt abdominal trauma. Eur J Surg Suppl. 1996; (576):59-60.

32. Kanazawa H, Nagino M, Kamiya S, Komatsu S, Mayumi T, Takagi K et al. Synbiotics reduce postoperative infectious complications: a

randomized controlled trial in biliary cancer patients undergoing hepatectomy. *Langenbecks Arch Surg* 2005; 390: 104-113.

33. Schein M, Wittmann DH, Lorenz W. Duration of antibiotic treatment in surgical infections of the abdomen. Forum statement: a plea for selective and controlled postoperative antibiotic administration. *Eur J Surg Suppl.* 1996;(576)

PROFORMA

Name

Age/Sex:

IP No.:

Height / Weight

Diagnosis

Past Medical History especially :

Diabetic Yes / No

Malignancy : Yes / No

Hypertension Yes/No

Previous Surgeries if any:

History of Allergy :

Drug history - Long-term medications, especially corticosteroids.

Date of Admission :

Date of Surgery:

Details of surgery:

Duration of Surgery:

Time of shaving before surgery :

Type of wound

Antibiotic given

Allergic reaction to test dose:

Time of administration

Any additional dose given :

MASTER CHART - ELECTIVE CASES

S.No	Name	IP No	Age	Sex	Diagnosis	Operation	Type of wound	Duration of surgery(hrs)	Pre op stay(days)	Shaving time before surgery(hrs)	propylactic antibiotic administration	comorbid condition	SSI
1	pandi	41469	23	m	chr appendicitis	open appendicectomy	con	1.2	5	10	yes	_	_
2	abuthahir	56310	20	m	chr appendicitis	open appendicectomy	con	1.5	5	9	yes	_	_
3	kannan	63428	22	m	chr appendicitis	open appendicectomy	con	1.5	7	8	yes	_	_
4	shanmugapriya	75313	21	f	chr appendicitis	open appendicectomy	con	1.5	7	8	yes	_	_
5	nadraj	760210	13	m	acute appendicitis	open appendicectomy	con	2	5	10	yes	_	_
6	karthick	100890	19	m	chr appendicitis	open appendicectomy	con	1.5	9	10	yes	_	_
7	arumugam	45088	25	m	chr appendicitis	open appendicectomy	con	2.6	1	10	yes	_	_
8	abimanyan	71776	23	m	chr appendicitis	open appendicectomy	con	1.2	5	10	yes	_	_
9	kalavathy	44253	30	f	umbilical hernia	mesh repair	cl	2	7	10	Yes	_	_
10	sudhamani	48285	32	f	incisional hernia	mesh repair	cl	1.5	8	9	no	_	_
11	jemmema	48394	33	f	incisional hernia	mesh repair	cl	1.5	10	10	yes	_	_
12	saroja	52278	50	f	incisional hernia	mesh repair	cl	2	16	10	no	HT	_
13	arumugam	58437	44	f	incisional hernia	mesh repair	cl	2.3	11	10	no	_	_
14	thilagam	62736	40	f	incisional hernia	mesh repair	cl	2.5	12	10	yes	_	_
15	ayyadurai	61697	70	m	para umbilical hernia	mesh repair	cl	1.5	5	9	yes	DM	_

16	thiruvalar selvi	65188	37	m	incisional hernia	mesh repair	cl	2.4	20	10	no	_	_
17	manoharan	63489	52	m	incisional hernia	mesh repair	cl	4.2	7	10	yes	HT	_
18	tamil selvi	63571	35	f	epigastric hernia	mesh repair	cl	1.4	8	10	no	_	_
19	alagan	7263	70	m	epigastric hernia	anatomical repair	cl	2.2	10	10	yes	D&H	_
20	vasanthi	89201	50	f	incisional hernia	mesh repair	cl	2.5	18	10	no	_	yes
21	indiragandhi	89217	38	f	para umbilical hernia	mesh repair	cl	2.4	11	10	yes	_	_
22	bose	50099	55	m	incisional hernia	mesh repair	cl	1.5	9	9	no	_	_
23	mandhayan	58314	65	m	umbilical hernia	mesh repair	cl	2.5	7	10	yes	DM	_
24	kannan	58099	42	m	umbilical hernia	mesh repair	cl	1	7	10	no	_	_
25	ramuja	63120	45	f	para umbilical hernia	mesh repair	cl	1.5	5	10	yes	Dm&HT	_
26	sasikala	68352	33	f	incisional hernia	mesh repair	cl	3	8	10	yes	_	_
27	karrupiah	74515	43	m	epigastric hernia	mesh repair	cl	2	21	1	yes	_	_
28	meenatchi	86746	45	f	incisional hernia	mesh repair	cl	4.3	16	10	no	_	yes
29	kalimuthu	84385	47	m	incisional hernia	mesh repair	cl	3	10	10	no	HT	_
30	vijayalakshmi	78481	55	f	para umbilical hernia	mesh repair	cl	2	7	10	no	_	yes
31	lakshmi	9146	60	f	port site hernia	mesh repair	cl	2.5	8	10	no	_	_
32	rajammal	14089	60	f	incisional hernia	mesh repair	cl	2.4	7	10	yes	D&H	_
33	valarmathi	24896	40	f	incisional hernia	mesh repair	cl	2.5	8	10	no	_	_
34	mookayee	23288	60	f	incisional hernia	mesh repair	cl	3	18	11	yes	DM	_
35	vijayalakshmi	27409	40	f	incisional hernia	mesh repair	cl	2.4	10	10	no	_	_
36	malar kani	30655	46	f	para umbilical hernia	mesh repair	cl	2.5	8	1	yes	_	_
37	kalai priya	35588	26	f	incisional hernia	mesh repair	cl	2.2	8	8	yes	_	_
38	rajammal	38056	47	f	incisional hernia	mesh repair	cl	2.5	9	10	no	_	_
39	muthu irulandi	41244	50	m	incisional hernia	mesh repair	cl	2.4	7	10	no	HT	_
40	pandi	50309	40	m	ileo cecal TB	resection&anastomosis	c.c	4.5	10	10	yes	D&H	yes
41	kali kuruchi	58326	55	m	ileo cecal TB	resection&anastomosis	c.c	3	12	10	yes	_	_
42	andisamy	56436	60	m	ileo cecal TB	resection&anastomosis	c.c	3	18	10	no	HT	yes

43	rajammal	10988	40	f	mesentric mass	resection&anastomosis	c.c	3	20	10	no	_	_
44	palaniammal	52286	60	f	ca rectum	APR	c.c	4.5	20	9	yes	DM	yes
45	chinnathai	60068	55	f	ca rectum	APR	c.c	5	16	9	yes	_	_
46	kannan	45841	45	m	ileo cecal intusseption	R hemicolectomy	c.c	3.5	18	8	yes	_	_
47	rajan	9140	63	m	ca rectum	Hartmans procedure	c.c	3	18	10	yes	HT	yes
48	muthu	32683	52	m	ca decending colon	L hemicolectomy	c.c	3.3	17	9	yes	_	_
49	manivasagan	30024	54	m	ileo cecal TB	resection&anastomosis	c.c	3	16	9	yes	_	_
50	perumal	39766	35	m	ca ascending colon	R hemicolectomy	c.c	5	16	9	yes	_	_
51	saravanan	1745	36	m	ca rectum	APR	c.c	5	20	10	yes	DM	yes
52	samayan	60062	58	m	ca stomach	palliative AGJ	c.c	4.3	17	1	yes	_	_
53	muthiah	75861	67	m	GOO&DU	TV & PGJ	c.c	3	10	8	yes	HT	_
54	ubendran	80941	63	m	ca stomach	sub total gastrectomy	c.c	4.3	16	8	yes	_	_
55	marimuthu	89152	45	m	GOO&DU	TV & PGJ	c.c	3	9	1	no	_	_
56	madasamy	96425	46	m	ca stomach	palliative AGJ	c.c	3	20	1	yes	_	_
57	paraman	208899	75	m	GOO&DU	TV & PGJ	c.c	3.3	10	8	yes	DM	_
58	solaiappan	45027	64	m	GOO&DU	TV & PGJ	c.c	3	9	8	no	_	_
59	paulsamy	58909	45	m	GOO&DU	TV & PGJ	c.c	4.3	16	10	no	DM	yes
60	kannan	68328	65	m	GOO&DU	TV & PGJ	c.c	3	10	8	no	_	_
61	sakkari	68328	30	m	ca stomach	sub total gastrectomy	c.c	4.3	17	1	yes	_	_
62	jothi	87413	37	m	GOO&DU	TV & PGJ	c.c	4.3	17	8	yes	_	_
63	aayi pillai	87518	50	f	ca stomach	palliative AGJ	c.c	3	12	9	no	DM	yes
64	thomas	1475	55	m	ca stomach	sub total gastrectomy	c.c	4.3	10	1	yes	_	_
65	anburaj	7513	55	m	ca stomach	palliative AGJ	c.c	3	16	8	yes	_	_
66	kamaraj	16378	45	m	ca stomach	palliative AGJ	c.c	3	9	8	yes	_	_
67	karrupa thevar	18670	68	m	ca stomach	palliative AGJ	c.c	4.5	20	1	yes	DM	_
68	malaisamy	21296	49	m	GOO&DU	TV & PGJ	c.c	3	9	8	yes	_	_
69	palani samy	31250	42	m	GOO&DU	TV & PGJ	c.c	3.3	10	9	yes	D&H	_

70	panchavarnam	36291	45	f	ca stomach	sub total gastrectomy	c.c	3.3	16	8	no	_	yes
71	poonkodi	34696	48	f	ca stomach	palliative AGJ	c.c	3	20	1	yes	HT	_
72	muniyammal	3813	32	f	ca stomach	palliative AGJ	c.c	3	9	8	yes	_	_
73	raju	68403	30	m	GOO&DU	TV & PGJ	c.c	3	10	8	no	_	_
74	murugesan	61376	35	m	ca stomach	sub total gastrectomy	c.c	3	10	1	no	_	yes
75	gnanambal	61309	50	f	ca oesophagus	THE	c.c	5	16	1	yes	_	_
76	nagaraj	43261	75	m	ca oesophagus	FJ	c.c	2	10	8	no	_	_
77	vishalatchi	52299	55	f	calculous cholecystitis	open cholecystectomy	c.c	3	10	8	yes	D&H	_
78	pandi	93017	52	m	acal cholecystitis	open cholecystectomy	c.c	3	9	8	yes	HT	_
79	paramasivam	100380	45	m	acal cholecystitis	open cholecystectomy	c.c	3	10	8	yes	_	_
80	pandiammal	45089	42	f	calculous cholecystitis	open cholecystectomy	c.c	3	9	8	yes	DM	_
81	poonkothai	54023	40	f	choledochal cyst	excision&hepaticojejunostomy	c.c	4	18	1	no	_	_
82	malligai	65149	43	f	peri ampullary ca	whipples procedure	c.c	5	20	8	yes	_	_
83	dharamani	74281	60	m	CBD calculous	cholecystectomy&CBD exploration	c.c	4	18	8	yes	_	_
84	marriammal	90502	50	f	hyadid cyst liver	pericystectomy	c.c	3	10	8	no	HT	_
85	parameswari	6257	37	f	chronic cal cholecystitis	open cholecystectomy	c.c	4.3	20	5	no	DM	yes
86	varamani	6349	40	f	CBD calculous	cholecystectomy&CBD exploration	c.c	4.3	20	8	yes	DM	yes
87	pappathi	12339	38	f	choledochoduodenal fistula	chol&Choledochoduodenostomy	c.c	4.3	20	8	yes	_	_
88	chidambaram	23272	62	m	CBD calculous	cholecystectomy&CBD exploration	c.c	4	20	1	yes	DM	_
89	seeniammal	32151	60	f	acu appendicitis	lap appendicectomy	con	4	16	8	yes	_	_
90	ajmal khan	75928	43	m	acu appendicitis	lap appendicectomy	con	4	18	8	yes	_	_
91	samsudeen	58899	62	m	retroperitoneal sarcoma	excision	c.c	4.3	20	8	no	_	_
92	rajalahmi	5241	18	f	chr appendicitis	lap appendicectomy	con	1.3	7	1	yes	_	_
93	suresh	63486	15	m	acu appendicitis	lap appendicectomy	con	1.3	7	7	yes	_	_
94	alageswari	63467	37	f	acu appendicitis	lap appendicectomy	con	2	16	1	no	DM	yes
95	menaka priya	70334	15	f	chr cal cholecystitis	lap cholecystectomy	con	3	16	1	yes	_	_

96	laxmi raja	70282	21	m	acu appendicitis	lap appendicectomy	con	2	9	1	no	_	_
97	kalai selvi	70265	14	f	acu appendicitis	lap appendicectomy	con	1.3	7	4	no	_	_
98	ajay	98589	13	m	acu appendicitis	lap appendicectomy	con	2	8	7	yes	_	_
99	princi	94422	24	f	acu appendicitis	lap appendicectomy	con	1.3	7	7	no	_	_
100	madurai sami	93367	27	m	acu appendicitis	lap appendicectomy	con	2	9	1	no	_	_
101	pandiaraj	99367	19	m	acu appendicitis	lap appendicectomy	con	1.3	7	6	yes	_	_
102	subeema	100353	18	f	acu appendicitis	lap appendicectomy	con	1.3	8	7	no	_	_
103	selvam	45098	23	m	chr appendicitis	lap appendicectomy	con	2	7	1	yes	_	_
104	vengateswari	48110	45	f	acu appendicitis	lap appendicectomy	con	2	9	1	yes	DM	_
105	veeramani	50551	26	m	acu appendicitis	lap appendicectomy	con	1.3	7	6	no	_	_
106	muniyammal	54017	36	f	acu appendicitis	lap appendicectomy	con	1.3	8	1	no	_	_
107	vijaya	63107	30	f	acu appendicitis	lap appendicectomy	con	1.3	6	8	yes	_	_
108	bommi	73251	22	f	chr appendicitis	lap appendicectomy	con	2	5	1	no	_	_
109	selvaraj	9125	18	m	chr appendicitis	lap appendicectomy	con	1.3	7	7	yes	_	_
110	selvaganesan	10080	39	m	cal cholecystitis	lap cholecystectomy	con	3	7	1	no	DM	_
111	yoga lakshmi	33150	24	f	cal cholecystitis	lap cholecystectomy	con	3	7	8	yes	_	_
MASTER CHART - EMERGENCY CASES													
112	Arumugam	74950	45	m	duodenal peforation	laparotomy&primary closure	con	3	_	1	yes	_	_
113	ponniah	79700	60	m	duodenal peforation	laparotomy&primary closure	D	4.3	_	1	yes	DM	yes
114	sivakumar	86101	30	m	duodenal peforation	laparotomy&primary closure	con	2.5	_	1	yes	_	_
115	ashok	89032	15	m	duodenal peforation	laparotomy&primary closure	con	3	_	1	yes	_	yes
116	sakhivel pandi	88924	42	m	duodenal peforation	laparotomy&primary closure	con	2.5	_	1	yes	_	_
117	sundaraj	4597	45	m	duodenal peforation	laparotomy&primary closure	con	3.5	_	1	yes	D&H	yes
118	alagarsamy	20383	50	m	duodenal peforation	laparotomy&primary closure	D	4.5	_	1	yes	_	_
119	ragavan	26618	38	m	duodenal peforation	laparotomy&primary closure	con	3	_	1	yes	_	yes
120	murugan	30127	37	m	duodenal peforation	laparotomy&primary closure	con	3	_	1	yes	_	_
121	palanisami	41410	60	m	duodenal peforation	laparotomy&primary closure	con	2.5	_	1	yes	_	_

122	balu	51232	27	m	duodenal perforation	laparotomy&primary closure	con	3	_	1	yes	_	_
123	sivakumar	51235	22	m	duodenal perforation	laparotomy&primary closure	con	2.5	_	1	yes	_	_
124	muthusamy	66849	63	m	gastric perforation	laparotomy&primary closure	con	3	_	1	yes	D&H	yes
125	innasi	70117	56	m	gastric perforation	laparotomy&primary closure	con	3.3	_	1	yes	_	_
126	pootchi	74718	55	m	gastric perforation	laparotomy&primary closure	D	3	_	1	yes	_	yes
127	muthu selvan	76577	27	m	gastric perforation	laparotomy&primary closure	con	3	_	1	yes	_	_
128	subranani	14121	60	m	gastric perforation	laparotomy&primary closure	con	3.3	_	1	yes	_	_
129	ramu	54341	40	m	gastric perforation	laparotomy&primary closure	con	3	_	1	yes	_	_
130	manikandan	68466	35	m	ileal perforation	laparotomy&primary closure	D	3	_	3	yes	_	_
131	chinnayan	79671	42	m	ileal perforation	laparotomy&primary closure	D	3	_	3	yes	_	Yes
132	mahamani	86242	45	m	sigmoidcolon perforation	laparotomy&primary closure	D	3	_	3	yes	_	_
133	sekar	90518	40	m	sigmoidcolon perforation	hartmans procedure	D	4.5	_	1	yes	DM	yes
134	ramar	1411	45	m	cecal perforation	laparotomy&primary closure	D	3.3	_	3	yes	DM	yes
135	chinnadurai	3063	35	m	ileal perforation	laparotomy&primary closure	D	3.3	_	3	yes	_	_
136	anand	4658	38	m	ileal perforation	laparotomy&primary closure	D	3.3	_	1	no	_	_
137	subramani	6364	40	m	strangulated incisional hernia	resection&anastomosis	D	3	_	1	yes	_	_
138	muthu kumar	34819	17	m	ileal perforation	laparotomy&primary closure	con	3	_	3	yes	_	yes
139	tharani	34793	87	m	ileal perforation	laparotomy&primary closure	con	3	_	2	yes	_	yes
140	shanmugavalli	36302	51	f	ileal perforation	laparotomy&primary closure	con	3	_	3	yes	_	yes
141	pitchaiammal	38139	55	f	ileal perforation	laparotomy&primary closure	con	3	_	3	yes	D&H	yes
142	anitha	39823	38	f	intestinal obstruction	adhesiolysis	con	3	_	1	yes	_	_
143	aasai pandi	49554	19	m	intestinal obstruction	adhesiolysis	con	3.3	_	3	yes	_	_
144	vellaipandi	78213	28	m	enteric fever	laparotomy	con	3.3	_	1	yes	_	_
145	chinnakaruppan	7491	60	m	SMA occlusion	resection&anastomosis	D	4.3	_	1	yes	_	yes
146	nallathambi	79637	70	m	obstructed umbilical hernia	resection&anastomosis	con	3.3	_	1	yes	_	yes
147	gopalan	669293	35	m	acute pancreatitis	laparotomy	con	3	_	3	yes	_	_
148	chandran	23272	34	m	intestinal obstruction	adhesiolysis	con	3	_	1	yes	_	_

149	muthu raman	65147	43	m	bluntinjury-DU peforation	laparatomy &primary closure	con	5	_	5	yes	_	_
150	nagappan	76541	67	m	penetrating injurygastric perforation	laparotomy &primary closure	D	3	_	1	yes	_	yes
151	murugan	84503	36	m	stab injury abdomen	laparotomy	con	3.3	_	1	yes	_	_
152	pitchai mani	92096	36	m	pene injury gastric perforation	laparotomy&primary closure	con	3	_	5	yes	_	_
153	selvaraj	14011	30	m	bluntinjury ilealperforation	laparotomy&primary closure	con	3.3	_	1	yes	_	_
154	dinesh	14032	16	m	pancreatic injury	pacreaticojejunostomy	con	5	_	5	yes	_	yes
155	muniyathevar	28189	55	m	liver lacreation	laparotomy	con	3.3	_	1	yes	_	_
156	selvam	38055	45	m	bluntinjury ilealgangrene	resection&anastomosis	con	3.3	_	5	yes	_	yes
157	pandi	41490	52	m	stab- injury	laparotomy	con	3.3	_	4	yes	_	yes
158	pandiammal	44633	27	f	stab-IVC injury	primary repair	con	3.3	_	1	yes	_	_
159	pitchai mani	49517	35	m	blunt-gastric perforation	laparotomy&primary closure	con	2	_	1	yes	_	_
160	sathesh kumar	65231	21	m	acute appendicitis	open appendicectomy	con	2	_	5	yes	_	_
161	meharaj	65070	40	m	acute appendicitis	open appendicectomy	con	1.3	_	1	yes	_	_
162	marnadu	66923	35	m	acute appendicitis	open appendicectomy	con	2	_	1	yes	_	_
163	samsudeen	70078	30	m	acute appendicitis	open appendicectomy	con	1.2	_	1	yes	_	_
164	nagarajan	70151	23	m	acute appendicitis	open appendicectomy	con	1.2	_	1	yes	_	_
165	lakashmi	69962	31	f	acute appendicitis	open appendicectomy	con	2.3	_	4	yes	DM	yes
166	kalimuthu	73360	35	m	appendicular perforation	open appendicectomy	con	2	_	1	yes	_	yes
167	thangaraj	74843	20	m	acute appendicitis	open appendicectomy	con	1.2	_	4	yes	_	_
168	karrupu	74810	30	m	acute appendicitis	open appendicectomy	con	2	_	1	yes	_	_
169	sasikumar	74900	32	m	acute appendicitis	open appendicectomy	con	1.3	_	4	yes	_	_
170	gopikrishnan	74844	23	m	acute appendicitis	open appendicectomy	con	2	_	1	yes	_	_
171	sathesh kumar	65231	21	m	acute appendicitis	open appendicectomy	con	2.1	_	4	yes	_	_
172	kanagalakshmi	76644	31	f	acute appendicitis	open appendicectomy	con	1.2	_	1	yes	_	_
173	velumani	76551	27	m	acute appendicitis	open appendicectomy	con	2	_	3	yes	_	yes
174	sangaih	78248	15	f	acute appendicitis	open appendicectomy	con	1.3	_	1	yes	_	_
175	muneeswaran	81085	15	m	acute appendicitis	open appendicectomy	con	2	_	1	yes	_	_

176	nagoorammal	74066	33	f	appendicular perforation	open appendicectomy	D	2.3	_	1	yes	_	_
177	vaishnavi	15614	18	f	acute appendicitis	open appendicectomy	con	2	_	1	yes	_	_
178	jhonsirani	15718	21	f	acute appendicitis	open appendicectomy	con	1	_	4	yes	_	_
179	muthulakshmi	1424	15	f	acute appendicitis	open appendicectomy	con	1	_	1	yes	_	_
180	marudhan	3664	19	m	acute appendicitis	open appendicectomy	con	1.3	_	1	yes	_	_
181	prabhu	26476	20	m	acute appendicitis	open appendicectomy	con	1	_	3	yes	_	_
182	karupayee	6187	50	f	appendicular perforation	open appendicectomy	D	1	_	1	yes	_	_
183	balamurugan	20360	31	m	acute appendicitis	open appendicectomy	con	1	_	1	yes	_	_
184	sivapandi	23383	39	m	acute appendicitis	open appendicectomy	con	1.2	_	1	yes	_	_
185	satyalakshmi	23300	17	f	acute appendicitis	open appendicectomy	con	1.3	_	1	yes	_	_
186	jaya sree	26461	22	f	acute appendicitis	open appendicectomy	con	1.3	_	1	yes	_	_
187	uday kumar	30118	40	m	appendicular perforation	open appendicectomy	D	2	_	3	yes	D&H	yes
188	ramkumar	30151	24	m	acute appendicitis	open appendicectomy	con	2	_	3	yes	_	_
189	kathiresan	31589	29	m	acute appendicitis	open appendicectomy	con	2	_	4	yes	_	_
190	ganesan	34816	48	m	acute appendicitis	open appendicectomy	con	2	_	4	yes	_	_
191	joesph	36284	55	m	acute appendicitis	open appendicectomy	con	2	_	4	yes	_	_
192	malarkodi	36429	40	f	appendicular abscess	open appendicectomy	D	2.3	_	5	yes	DM	yes
193	jayanthi	36352	26	f	acute appendicitis	open appendicectomy	con	2.3	_	1	yes	_	_
194	muthuraj	39790	35	f	acute appendicitis	open appendicectomy	con	1.1	_	1	yes	_	yes
195	gayathri	39711	18	f	acute appendicitis	open appendicectomy	con	2	_	1	yes	_	_
196	vignesh pandian	43092	15	m	acute appendicitis	open appendicectomy	con	1	_	3	yes	_	_
197	villukaran	43030	61	m	acute appendicitis	open appendicectomy	con	1	_	1	yes	_	_
198	murugan	46303	42	m	appendicular perforation	open appendicectomy	D	2	_	1	yes	_	_
199	pandiammal	49684	35	f	acute appendicitis	open appendicectomy	con	1	_	5	yes	_	_
200	jayamani	51222	21	m	acute appendicitis	open appendicectomy	con	2	_	3	yes	_	_

