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CLINICAL STUDY AND MANAGEMENT OF POST OPERATIVE ABDOMINAL SURGICAL SITE INFECTIONS

Surgery

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ABSTRACT

BACKGROUND:- Surgical Site infections (SSIs) are one of the most commonly encountered complications after surgery. They cause pain and inconvenience to patients, result in prolonged hospital stay and may be potentially fatal. Surgical site infections and its management are costly to both patients and the health facilities. Though surgical site infection still causes considerable morbidity and high costs to the health care systems and is becoming increasingly important in medico-legal aspects.

MATERIAL AND METHODS;-Total of 150 patients of abdominal surgery from different surgical units were selected for the purpose of study from June 2015 to May 2017 in Department of general surgery, RIMS, Ranchi.

RESULTS:-The overall SSI rate is 16%. The incidence of infection is higher in elderly, in obese as well as is malnourished patients. Infection rate is also higher in anaemic patients. Compared to emergency operations, SSI rate is lower in elective operations. SSI rate is higher in surgeries of colorectal portion of GIT. Rate of SSI is directly proportional to the duration of the surgery. Compared to multifilament suture, use of monofilament suture causes less number of infections. Postoperative culture from discharge of infected wounds shows predominant growth of staphylococci and E.coli. Gram positive organism are mostly sensitive to cloxacillin ,ampicillin and amoxicillin while Gram negative organism are sensitive to gentamycin ,ciprofloxacin,amikacin. Established cases of SSI can be treated by proper debridement/ wound excision, dressing and judicious use of easily available antibiotics like ciprofloxacin, ampicillin, ceftriaxone, cefotaxime, cefepime, erythromycin, ceftazidine, piperacillin-Tazobactum, cloxacillin and gentamycin. Prophylactic antibiotics should be used according to the established guidelines to reduce the rate of SSI.

CONCLUSION:- Improvement in perioperative antibiotic spectra, dosing, and timing, in addition to focus on sterile technique is associated with a persistent decline in wound infection. Identification of risk factor for SSI to encourage the development of recommendations for prevention of SSI in order to achieve the setting goal to reduce the SSI.

KEYWORDS

Abdominal surgery, wound infection, Management

INTRODUCTION

The term surgical site infection refers to an infection that occurs at or near the surgical incision within 30 post operative days of the surgical procedure, or within one year if an implant is left in place (e.g. mesh, heart valve, etc). It involves the Incision site, deep space or organ accessed at the time of surgery. Rather than focusing solely on wound infections, these definitions extend to involve the broader spectrum of local postoperative infections. Thus, a pelvic abscess following colorectal surgery would be captured as an organ/space SSI, while a simple wound infection would be classified as a superficial SSI. Surgical site infection definitions can vary because they range from a relatively trivial wound discharge without complications to serious conditions that are fatal. Therefore, to encourage a uniform and standard approach among data collectors, the Center for Disease Control and Prevention (CDC) brought out definitions for surgical site infection.

By the CDC's criteria, SSIs are classified as:

A. SUPERFICIAL INCISIONAL SSI

Infection occurs within 30 days after operation, and involves only skin and subcutaneous tissue of the incision.

Patients has at least one of the following

1. Purulent discharge, with/without laboratory confirmation.
2. Organism isolated from an aseptically obtained culture of fluid or tissue from the superficial incision.
3. At least one of the following signs and symptoms of infection: Pain, tenderness, local swelling, redness, or heat and the Surgeon deliberately open superficial incision, unless incision is culture negative.
4. Diagnosis of superficial incisional SSI by the surgeon or attending physician.

B. DEEP INCISIONAL SSI

Infection occurs within 30 days of operation if no implant is left in place or within 1 year if implant is placed in situ.

Involves deep soft tissues (e.g. fascial and muscle layers) of incision.

Patients has at least one of the following

1. Purulent drainage from the deep incision but not from the organ/space component of the surgical site.
2. A deep incision spontaneously dehisces or is deliberately opened by a surgeon and is culture positive or not cultured and the patient has at least one of the following signs/symptoms
   - Fever of more than 38 degrees Celsius.
   - Localized pain.
3. An abscess or other evidence of infection involving the deep incision is found on direct Examination, during re-operation or by histopathological or radiological examination.
4. Diagnosis of deep incisional SSI by a surgeon or attending physician.

C. ORGAN/ SPACE SSI

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

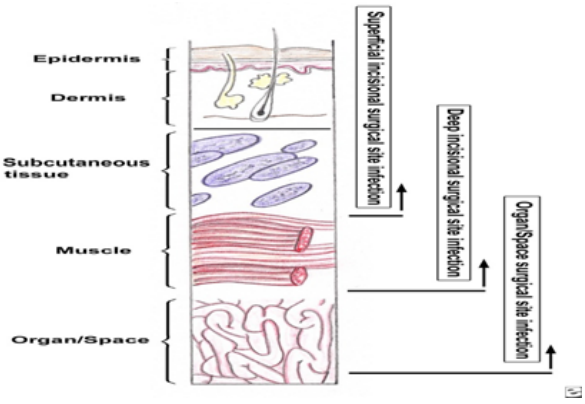
Infection involves any part of the body excluding skin incision, fascia or muscle layer which was opened or manipulated during the operative procedure .

Patients has at least one of the following

1. Purulent drainage from a drain placed through a stab wound into the organ/space.
2. Organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/space.
3. An abscess or evidence of infection on direct examination, during re-operation, or by histological or radiological examination.
4. Diagnosis of an organ/space SSI by a surgeon or attending physician.

Failure to use objective criteria to define SSI's has been shown to substantially affect reported SSI rates.

The three categories of SSI are illustrated as in Figure below



MICROBIOLOGY OF SSI

For most SSI, the pathogens originate from the endogenous flora (e.g., patient's skin, hollow viscera). However surgical personnel, the operating room environment, surgical instruments, and many other exogenous sources contribute to these serious infections. According to the available data and published articles, the distribution of pathogens isolated from SSI's has not changed markedly over the past 17years. Staphylococcus aureus, coagulase negative staphylococci, enterococcus spp. and E. Coli remain the most frequently isolated pathogens. An increasing proportion of SSI's are caused by antimicrobial resistant pathogens, such as methicillin- resistant S. aureus (MRSA)or by Candida albicans.

Quantitatively,$>10^5$ microorganisms/g of tissue is defined as surgical site contamination, significantly increasing the risk of SSI. On the other hand, a much smaller inoculum of contaminating microorganisms is required to produce infection when foreign material is present at the site. For example, only 100 staphylococci/g of tissue are needed to increase the risk of SSI when introduced on a silk suture.
Before the mid-19th Century, the majority of surgical patients developed SSI. The process began with fever, followed by purulent drainage from the incision as well as sepsis and death. The face of surgery changed radically when Joseph Lister, in the late 1860s, introduced the principles of antisepsis, decreasing patient suffering by reducing postoperative infectious morbidity substantially. Since then, advances in surgical techniques, including better haemostasis, conservation of an adequate blood supply, hypothermia prevention, atraumatic tissue handling, and infection control practices such as better operating room Ventilation, sterilization methods, and the use of antimicrobial prophylaxis, have continued to decrease SSI . However, SSI remain a substantial cause of morbidity and death, possibly because of the emergence of antibiotic-resistant micro-organisms, larger numbers of elderly surgical patients or those with a variety of chronic and immunocompromising conditions, and greater use of prosthetic implants and organ transplantation

SURGICAL WOUND CLASSIFICATION

Operations can be categorized by the cleanliness of the procedure. This system was developed by NCR cooperative research study and modified in 1982 by the CDC for use in surveillance Classification is as below:

CLASS I: CLEAN

An uninfected operative wound in which no inflammation is encountered and the respiratory, Alimentary, genital or uninfected urinary tract is not entered.

CLASS II: CLEAN-CONTAMINATED

An operative wound in which respiratory, alimentary, genital or urinary tracts are entered under controlled conditions and without unusual contamination .There should be no evidence of infection or major break in technique encountered.

CLASS III: CONTAMINATED

Open, fresh, accidental wounds, operations with major breaks in sterile technique or gross spillage from GIT, and incisions in which acute, non-purulent inflammation is encountered.

CLASS IV: DIRTY INFECTED

Purulent inflammation (e.g. abscess); pre-operative perforation of respiratory, gastrointestinal, billiary or genitourinary tract, penetrating trauma of more than 4 hours old. Among these categories, infection risk ranges from 2% for clean wounds to 30% to 40% for dirty wounds when the skin is closed primarily.

Four variables have independently been proved to contribute towards development of SSI's. These are

1. An abdominal operation
2. Wound class
3. An operation lasting more than 2 hours
4. An operation performed on a patient having more than three diagnoses

ANTIBIOTIC PROPHYLAXIS

The choice of parenteral prophylactic antibiotic agents and the timing and route of administration have become standardized on the basis of well-planned prospective clinical studies. It is generally recommended in elective clean surgical procedures using a foreign body and in clean-contaminated procedures that a single dose of cephalosporin can be administered intravenously just before incision. Additional doses are generally recommended only when the operation lasts longer than 2 to 3 hours.

Surgical Site infections (SSIs) are one of the most commonly encountered complications after surgery. They cause pain and inconvenience to patients, result in prolonged hospital stay and may be potentially fatal (Gibbons et al., 2012). Surgical site infections and its management are costly to both patients and the health facilities. Though surgical site infection still causes considerable morbidity and high costs to the health care systems and is becoming increasingly important in medico-legal aspects.

So the present study has been carried out to find the incidence of surgical site infection following abdominal surgery in RIMS, RANCHI, to study the various risk factors responsible for the same and to find out various ways to bring down morbidity and mortality by preventing the SSI.

MATERIAL AND METHODS

STUDY DESIGN- The present study on abdominal surgical site infections, was a prospective observational study.

STUDY POPULATION- A total of 150 patients of abdominal surgery from different surgical units were selected for the purpose of study.

STUDY DURATION- From June 2015 to May 2017.

PLACE OF STUDY- Department of general surgery, RIMS, RANCHI

INCLUSION CRITERIA-

1. Only those patients who have undergone abdominal surgeries in RIMS, Ranchi will be included.
2. Age of the patients should be more than 12 years.
3. Patients who stayed in hospital postoperatively for more than five days .

B. EXCLUSION CRITRIA

1. Patients with previous abdominal surgery.
2. Wound site previously infected.
3. Age less than 12 years.
4. Patients abdominal surgery done by laparoscopic method.
5. Patients who did not stay in hospital for more than five days.
6. Patients with co morbidities like diabetes, previous radiation exposure, history of steroid intake, immunosuppression, HIV etc.

The materials required for the present study were as follows-

I. Materials for culture and sensitivity test:

1. Culture tube with swab stick for collection of samples
2. The culture media for the culture of microorganism:
3. Drugs for the sensitivity tests:

II. Materials for wound management.

1. Surgical instruments
2. Dressing materials
3. Antiseptics, like savlon, spirit, Beta dine etc. for local application

RESEARCH METHODOLOGY

A total of 150 consecutive patients undergoing abdominal surgery

were included in this study. All patients were explained about the study and a written consent was taken from them for their participation in this study. All observations like development of SSI , bacterial culture and sensitivity and management of SSI were recorded in a data collection sheet.all the questionnaires were coded and the collected data entered into the computer using spss for analysis .descriptive statistics analyzed were mean, median and mode. Association between SSI and operative characteristics were calculated using univariate logistic analysis. Results were presented in forms of tables, graphs and diagrams.

Postoperatively, the wounds were observed three to seven days after surgery for the development of SSI. Patients were assessed for systemic (fever, chills) and local (pain, redness, warmth ,swelling, discharge) signs of infections. Deep/ organ SSI was determined either through ultrasonography , clinical signs of intra abdominal sepsis or at reoperation .we examined the patient on bedside on third, fifth and seventh day of post-operative period.

If SSI was present, the type of SSI, according to the CDC criteria, date of onset, and the micro-organisms cultured were reported. The treatment given, readmission and reoperation were also documented.

The degree of infection was graded as follows:

None - Operative wound 100% dry, clean and no signs of inflammation around the stitches or wound margins.

Mild - Presence of the signs of inflammation (partially) with or without serum discharge but no pus on applying pressure.

Moderate - Definite signs of inflammation around the wound margins of stitches with thin purulent discharge, not much in amount on applying pressure or spontaneously.

Severe - Presence of frank profuse pus discharging with or without gaping of skin margins or complete wound dehiscence. In cases of serous discharge the infection was defined after bacteriological examination i.e. smear and culture examination.In all cases where any discharge was present culture and sensitivity tests were done.

Method of bacteriological study

In cases where discharge was copious, it was sucked with a sterilized glass syringe and was transformed into a hard glass test tube (5" x 1/2" size) and the top of the tube was plugged with cotton wool, both the test tube and cotton wool were pre-sterilized.

In cases where the discharge was in small quantities, it was collected on a swab stick prepared from thin wooden sticks 6 1/2" long with a cotton wool pledget wrapped round one end. The swab stick was placed in a hard glass test tube and its top was plugged with cotton wool, the swab stick, the test tube and cotton wool all pre-sterilized. In these cases one more swab was taken for smear examination. The test tubes were labelled with patients name, registration number, bed number and date of collection. Then the test tube was taken to the Department of Microbiology for studies.

CULTURE PROCEDURE

Primary culture - The collected samples were inoculated on culture media before drying. Results were interpreted after 24 and 48 hours as follows: -

The interpretation of results was done as follows: -

(a) Sterile - When the blood agar plate showed no growth of microorganism after 24 hours.
(b) Scanty - When the culture plate showed less than 25 colonies after 48 hours.
(c) Luxurious - When the culture plate showed more than 25 colonies after 48 hours.

Subculture - If more than one strain of bacterial culture was found, each strain were cultured separately (pure culture isolation)

SMEAR EXAMINATION - Smear were prepared from different cultures and stained by Gram's staining. Microscopic examination of the stained smear was done under oil immersion lens.

ANTIBIOTIC SENSITIVITY TEST - It was done by Disc diffusion method.

MANAGEMENT OF INFECTED WOUNDS-

It is done by following methods-

i. Surgical drainage and debridement and dressing
ii. Secondary suture after control of infection
iii. Removing of predisposing factors of wound infection
iv. Suitable systemic antibiotics

RESULTS

SEX DISTRIBUTION

A total of 150 patients of abdominal surgery were included into this study. Out of these 114 (76%) operations were performed on male and 36 (24%) on female patients, as illustrated below (Table- 1).

Table 1: Sex Distribution of Patients Undergoing Abdominal Surgery

SEX	FREQUENCY	PERCENTAGE
Male	114	76%
Female	36	24%
Total	150	100%

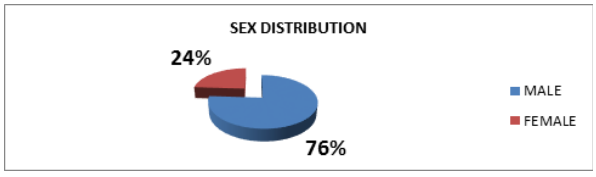


Figure1.Percentage sex distribution in patients undergoing abdominal surgery

AGE DISTRIBUTION

Table 2- Age Distribution In Patients Undergoing Abdominal Surgery

Age group	Male	Female	Total
12-20	24	8	32
20-40	40	12	52
40-60	43	13	56
60-80	7	3	10

Out of 150 patients in the study group age distributions are as follows. In 12-20 years age group 32 patients were there 24 male and 8 female; in 20-40 years age group 52 patients were there, 40 male and 12 female; in 40-60 years age group 56 patients were there, 43 male and 13 female and in 60-80 years age group 10 patients were there, 7 males 3 female.

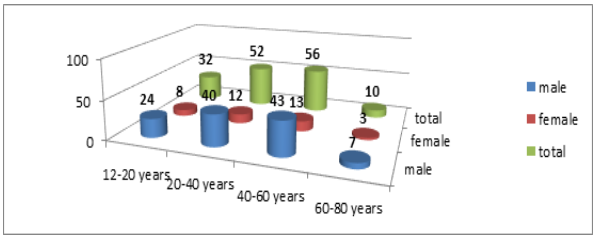


Figure 2.Age Distribution of Cases

EMERGENCY VS ELECTIVE PROCEDURES

Table 3: Incidence of Emergency Vs Elective Surgery

Type of operation	Frequency	Percentage
Emergency	91	60.6%
Elective	59	39.3%
Total	150	100%

Out of 150 cases; 91(60.6%) were emergency surgical operations and 59(39.3%) were elective procedures.

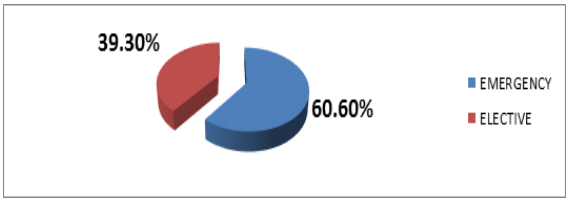


Figure 3.Incidence of emergency vs elective surgery

SURGERY PERFORMED

Table 4: Showing Frequency of Different Surgery Performed S

Name of surgery performed	Number of cases	Percentage
Appendectomy	43	28.66%
Biliary (Cholecystectomy)	39	26.00%
Peptic perforation	31	20.66%
Small intestinal surgery	11	7.33%
Colorectal Resection	9	6.00%
Gastrectomy	7	4.66%
Others	10	6.66%

The most commonly performed procedure was appendectomy accounting for 43 (28.6 %) cases out of total 150. Other surgeries performed were biliary tree surgery in 39 (26%) cases, peptic perforation repair in 31(20.6%) cases, small bowel surgery in 11(7.3%) cases, and colorectal surgery in 9 (6%) cases and gastrectomy in 7 (4.6%) cases. Rest of the other surgeries accounted for 10(6.6%) cases.

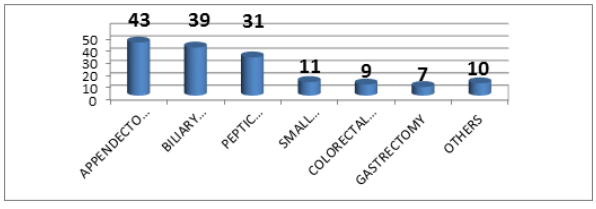


Figure 4. Frequency of different surgeries performed

DURATION OF PROCEDURE

The operation time was defined as the time from the skin incision to that of wound closure.

In this study surgeries performed were grouped according to time consumed. Time taken to complete 78 surgeries was <1hour, in 42 surgeries time consumed was 1-2 hours, in 26 surgeries time consumed was 2-3 hours and in 4 surgeries >4 hours were consumed.

Table 5- Duration of Procedure

Duration in Hours	<1	1-2	2-3	>3
Number	78	42	26	4
Percentage	52	28	17.33	2.66

The overall mean duration of surgery was 1.9 hours. Infected wounds had a mean duration of 2.5 hours (median 2 hours, range 1 – 7 hours) while non-infected wounds had duration of 1.1 hours (median 2 hours, range 0.5 – 3 hours). The difference was statistically significant .

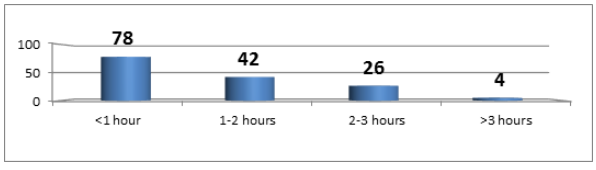


Figure 5. Duration of Surgery

DESCRIPTION OF SSI

Table 6: Incidence of SSI

No of cases	No of cases who developed SSI	Percentage
150	24	16

In our study, SSI was present in 24 out of 150 cases of abdominal surgery performed, the percentage being 16 percent.

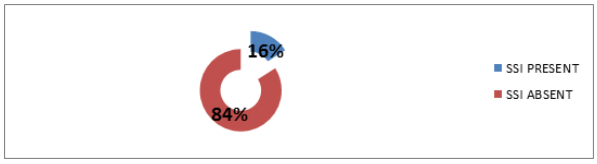


Figure 6. Incidence of SSI

AGE DISTRIBUTION OF SSI

In this study 32 patients were present in 12-20 years age group out of which 2(6.2%) developed SSI; 52 patients were in 20-40 years age group out of which 5 (9.6%) developed SSI; 56 patients were in 40-60 years age group out of which 13(23.2%) developed SSI and 10 patients belonged to 60-80 years age group out of which 4 (40%) developed SSI.

Table 7: SSI in Different Age Groups

AGE GROUP	TOTAL PATIENT	PATIENT WITH SSI
12-20	32	2(6.2%)
20-40	52	5(9.6%)
40-60	56	13(23.2%)
60-80	10	4(40%)

The above table shows that maximum percentage of SSI belongs to the age group 60-80 and the incidence was minimum between 12-20 years of age.

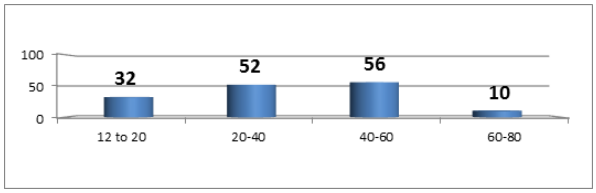


Figure 8. SSI in different age groups

SEX DISTRIBUTION OF SSI

Table 8: Incidence of SSI In Male And Female Patients

	TOTAL PATIENTS	SSI PRESENT
MALE	114	18(15.7 %%)
FEMALE	36	6(16.6%)

In this study, out of 36 female patients, 6 patients (16.6 %%) developed SSI and out of 114 male patients, 18 patients (15.7%) developed SSI. Although SSI in females is slightly higher in our study but the difference is statistically not significant.

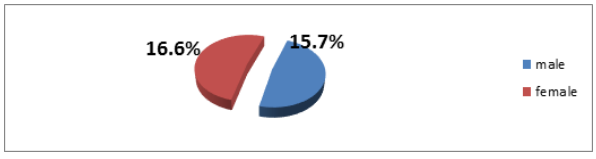


Figure 8. incidence of SSI in male and female patients

SSI IN EMERGENCY VS ELECTIVE SURGERY

Table 9: Incidence of SSI in Emergency Vs Elective Surgery

	TOTAL PATIENTS	SSI PRESENT
EMERGENCY	91	18(19.7%)
ELECTIVE	59	6(10.16%)

In the present study SSI in elective surgery was 10.16%, while in emergency surgeries SSI rate was 19.78%.

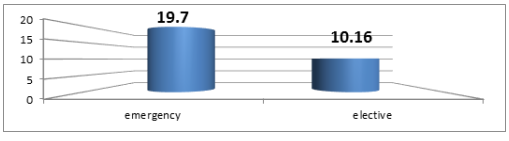


Figure 9. Incidence of SSI in emergency vs elective surgeries in percentage

SSI IN RELATION TO QUALITY OF SUTURE MATERIAL

Table 10: Rate of SSI Associated With Monofilament Vs Multifilament Suture

Quality of suture material	No of cases	No of cases having SSI	Percentage
Multifilament	90	16	17.77
Monofilament	60	8	13.33

It is obvious from the above table that high incidence of infection (17.77%) was found where multifilament suture material were used as opposed to only(13.33%) infection when monofilament suture material was used.

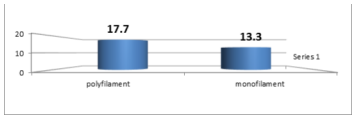


Figure 10. Rate of SSI associated with monofilament vs polyfilament suture used

INCIDENCE OF DIFFERENT TYPES OF SSI

Table 11: incidence of different types of SSI

SSI Type	No of patients	Percentage
superficial	12	50
Deep	9	37.5
Organ space	3	12.5
Total	24	100

Out of total 24 cases of SSI, 12 (50%) were superficial SSI, 9 (37.5%) were deep SSI and only 3 (12.5%) were organ space SSI.

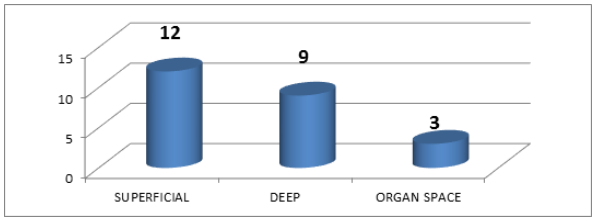


Figure 12. Incidence of different types of SSI

SURGICAL SITE INFECTION BY WOUND CLASS

Table 12: incidence of SSI in different wound classes

Class of wound	SSI present	Percentage
Clean	2	8.3
Clean contaminated	3	12.5
Contaminated	7	29.1
Dirty	12	50
Total	24	100

In present study, the incidence of SSI in clean wound was 8.3%, clean contaminated wound 12.5%, contaminated wound 29.16%, and in dirty wound 50%.

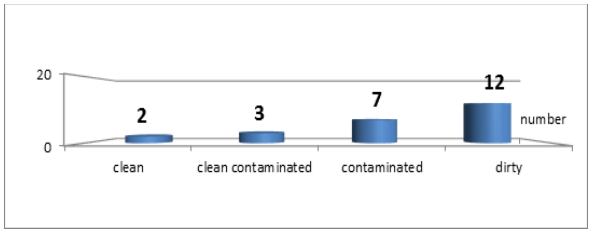


Figure 12. Incidence of SSI in different wound classes

SSI IN RELATION TO STATE OF NUTRITION (BASED ON BODY WEIGHT).

Table 13: incidence of SSI based on state of nutrition

STATE OF NUTRITION	NO. OF CASES	ASSOCIATED WITH SSI	PERCENTAGE
GOOD HEALTH	40	3	7.5%
AVERAGE HEALTH	36	4	11.1%
POOR HEALTH	38	8	21.05%
OBESE	36	9	25%

In this study, weight of patients measured and health status was determined by comparing with ideal body weight chart. In patients with good health, 3 out of 40(7.5%) cases developed SSI; in patients with average health, 4 out of 36 (11.1%) developed SSI; in patients with poor health 8 out of 38(21.05%) cases developed SSI and in obese patients 9 out of 36 (25%) cases developed SSI

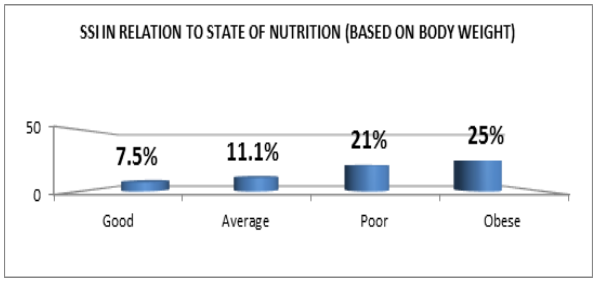


Figure 13. Incidence of SSI based on state of nutrition

SSI IN RELATION TO PREOPERATIVE HEMOGLOBIN LEVEL

Table14: Incidence of SSI Based on Preoperative Hb% Level

HB% LEVEL	NO. OF CASES	ASSOCIATED WITH SSI	PERCENTAGE
<10 GM%	86	16	18.6%
>10 GM%	64	8	12.5%

In the present study postoperative wound infection was 18.6% when the haemoglobin level was less than 10 gm% and 12.5% when the haemoglobin level was more than 10 gm% preoperatively.

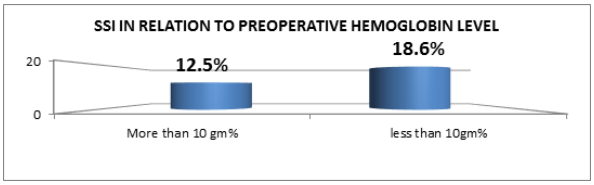


Figure 14. Incidence of SSI based on preoperative Hb% level

SSI IN RELATION TO LENGTH OF INCISION

Table 15: Incidence Of SSI In Relation To The Length Of The Incision

LENGTH OF INCISION (IN CMS)	No of cases	No of cases developing SSI	Percentage
UPTO 4	12	NIL	0
4-8	29	2	6.8
8-12	43	6	13.9
>12	66	16	24.24

In this study 12 surgeries were done where length of incision was <4 cms and SSI didn't develope in this group; in cases with length of incision between 4-8 cm SSI developed in 2 out of 29 (6.8%) case; in cases with length of incision between 8-12 cm SSI developed in 6 out of 43(13.9%) case and in surgeries with incision length >12 cm SSI developerd in 16 out 66 (24.24%)

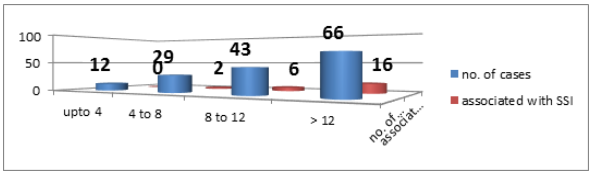


Figure 15. Incidence of SSI in relation to the length of the incision

SSI IN RELATION TO DIFFERENT SURGERIES PERFORMED

Table 16: SSI Associated With Different Surgery

NAME OF SURGERY	NO. OF SURGERY	ASSOCIATED CASES OF SSI	PERCENTAGE SSI
APPENDECTOMY	43	2	4.6%
CHOLECYSTECTOMY AND/OR CHOLEDOCHOLITHOTOMY (BILLIARY)	39	4	10.2%
PEPTIC PERFORATION	31	6	19.3%
SMALL INTESTINAL SURGERY	11	3	27.2%
COLORECTAL SURGERY/APR	9	4	44.4
GASTRECTOMY	7	2	28.5%
OTHER SURGERIES	10	3	30%

In this study, 2 out of 43 cases of appendectomy(4.6%) developed SSI, 4 out of 39 cases of billiary surgeries(10.2%) developed SSI, 6 out of 31 cases of peptic perforation(19.3%) developed SSI, 3 out of 11 cases of small intestinal surgeries(27.2%) developed SSI, 2out of 7 cases of gastrectomy (28.5%) developed SSI, 3 out of other 10 cases(30%) developed SSI, and 4 out of 9 cases of colorectal surgeries(44.4%) developed SSI.

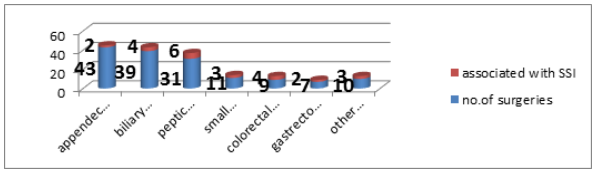


Figure 16. SSI associated with different surgeries

DURATION OF HOSPITAL STAY

This was derived from the day of operation to the day of discharge from the ward. Some patients had prolonged hospital stay either due to financial constrains or otherwise. The excess days in these patients were not included into the study. The overall mean duration of hospital stay following abdominal surgery was 11 days. The mean days of hospital stay in Patients with SSI was 13.6 days while in patients without SSI had a hospital stay of 5.7 days. The duration of hospital stay longer in patients who suffered from SSI.

SSI IN RELATION TO PROPHYLACTIC ANTIBIOTIC USE

In this study prophylactic antibiotic coverage was given in all (100%) cases as directioned/ advised in CDC guidelines. Despite the recommended coverage, SSI developed in 16% of the cases.

IDENTIFIED PATHOGENS

Table 17: Different Micro-Organisms Isolated From Infected Lesion

Micro-organism isolated	Total no. of cases	Percentage
Staph. aureus	16	66.66%
E. Coli	4	16.66%
P. Pyocynae	1	4.16%
Staph Albus	1	4.16%
Klebsiella	2	8.33%

Positive cultures were obtained from all 24 swabs taken from clinically infected wounds. In the present study staph aureus infection was found highest (16 cases, 66.66%) whereas that of E.coli was the second most infecting organism 4 cases, (16.66%). Other less common pathogens are staph albus (4.16%), klebsiella (8.33%) and P.pyocynae (4.16%).

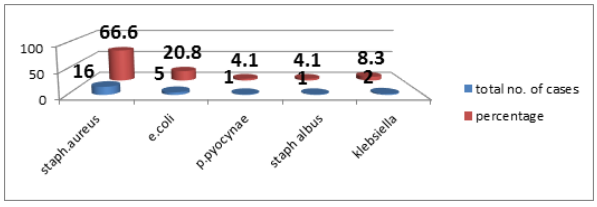


Figure17. differen micro-organisms isolated from infected region

CULTURE AND SENSITIVITY OF DIFFERENT PATHOGENS

In our study Staph, aureus was sensitive to ampicillin, ampicillin + salbactum, piperacillin-tazobactum, amoxyciilin, cloxacillin. E. coli was sensitive to ceftriaxone, gentamicin, amikacin, piperacillin-tazobactum.

MANAGEMENT OF SSI

TYPE OF MANAGEMENT	TOTAL NO. OF CASES	PERCENTAGE
EVACUATION OF DISCHARGE BY PRESSURE+ DRESSING	10	41.6%
SURGICAL DRAINAGE AND DEBRIDEMENT +DRESSING	12	50%
SURGICAL DRAINAGE, DEBRIDEMENT, DRESSING AND SECONDARY SUTURING	2	16.6%

Out of 24 cases of SSI, 10(41.6%) cases healed after evacuation of discharge by pressure followed by regular dressing for 5-10 days. 12(50%) cases needed surgical drainage, debridement and regular dressing for 5-10 days, in 2(16.6%) cases secondary suturing was required after debridement and dressing for 5-10 days.

DISCUSSION

Improvement in perioperative antibiotic spectra, dosing, and timing, in addition to focus on sterile technique, is associated with a persistent decline in wound infection.

The approach used in this study was designed to evaluate the magnitude of SSI at RIMS, RANCHI following abdominal surgery.

INCIDENCE OF SSI FOLLOWING ABDOMINAL SURGERY

In the present study a total of 150 cases of abdominal surgery were observed. Among them 24 cases (16%) developed postoperatively SSI. In my series 16% SSI occurred, and this is consistent with the finding of Clarke (13.6%), The public Health Laboratory Services(14%), Ketcham et al (14%).In study done by by National Research Council SSI was low(7.4%).

In the present study incidence of SSI, is somewhat higher (16%).This may be due to large number of emergency operations .This kind of wide variation in SSI may also be due to non-uniform implementation of antiseptic and aseptic techniques.

RELATIONSHIP OF INCIDENCE OF SSI WITH AGE OF THE PATIENTS

In this study it was observed that the incidence of SSI, varied in relation to different age groups. It was 6.2% in patients of 12-20 years age group, 9.6%% in 20-40 years age group, 23.2% in 40-60 years age group and 40% in 60-80 years group.

It is obvious that infection rate was higher in those above 40 years age.

Similar results were reported by various other workers like Eleman (1952), William et al (1959), Lindwell (1961), Committee on wound infection (1964) and Subramaniam et al (1973). This is due to poor antibody production with advancement of age as noted by Baumgartner (1934). Committee on wound infection in USA (1964) attributed this rise in SSI is due to decline of cellular and humoral factors.

INCIDENCE OF SSI IN RELATION TO DIFFERENT SEXES

In this study, out of 36 female patients, 6 patients (16.6 %%) developed SSI and out of 114 male patients, 18 patients (15.7%) developed SSI. Although SSI in females is slightly higher in our study but the difference is statistically not significant. These results are consistent with the findings of Cohen et al (1964).

RELATION OF SSI AND PREOPERATIVE HAEMOGLOBIN (HB %) LEVEL

In the present study postoperative wound infection was 18.6% when the haemoglobin level was less than 10 gm% and 12.5% when the haemoglobin level was more than 10 gm% preoperatively.
Similar finding has been reported by Subramaniam et al (1973); and Crystal & chang (1975) Low haemoglobin means low oxygen transportation and this lowers the oxygen saturation at the wound site causing interference with intracellular killing of bacteria by affecting the production of hydrogen peroxide and reduction of NADPH (Hunt et al, 1975). It also interferes with hydroxylation of proline which is an essential step in collagen formation and wound healing.

RELATION OF SSI WITH RELATION TO EMERGENCY VS ELECTIVE SURGERY

In the present study SSI in elective surgery was 10.16%, while in emergency surgeries SSI rate was 19.78%.

The findings of Dineen (1961), Committee on wound infection (1964), Kippax and Thomas (1966), Crystal and Chang (1975) and B.M.L. Kapur and colleagues (1985) also support the present findings.

RELATION OF SURGICAL SITE INFECTION AND LENGTH OF INCISION

In the present study no infection was seen in <4cm long incision, 6.8% infection was seen in 4 to 8 cm long incision, 13.9% infection was seen in 8 to 12 cm long incision and >12 cm long incision had 24.24% infection postoperatively.

It is obvious that longer the incision, higher the postoperative wound infection.

Similar finding has been reported by William et al (1960) and Lidwell (1961). On the other hand Stewart and Douglas (1962) could not find out any relationship between length of incision and postoperative wound infection

RELATION OF SSI IN RELATION TO DIFFERENT NATURE OF WOUND

In present study, the incidence of SSI in clean wound was 8.3%, clean contaminated wound 12.5%, contaminated wound 29.16%, and in dirty wound 50%.

Similarly in study by Adhoc Committee on Wound Infection (1964) concluded that overall incidence of infection in clean wound 7.4%, clean contaminated wounds 10.8%, contaminated wound 16.3% and dirty wounds 28.6%. According to the committee, degree of contamination of the incision at the operating time seemed to be directly related to the incidence of infection.

Altemeier et al (1968) reported 10.8% infection rate in contaminated cases. They reported that significant contamination occurred from the skin if it was diseases or inadequately prepared preoperatively.

In the study of Leewenthal (1962), 14% infection was seen in clean surgical wounds and 68% in frankly contaminated wounds.

In the present study, the relatively much higher infection in dirty cases may be attributable to inadequately prepared patient and microbial contamination of wound at operation and emergency operation.

Relation Of Ssi In Different Surgical Procedures

From this observation, 2 out of 43 cases of appendectomy(4.6%) developed SSI, 4 out of 39 cases of billiary surgeries(10.2%) developed SSI, 6 out of 31 cases of peptic perforation(19.3%) developed SSI, 3 out of 11 cases of small intestinal surgeries(27.2%) developed SSI, 2out of 7 cases of gastrectomy (28.5%) developed SSI, 3 out of other 10 cases(30%) developed SSI, and 4 out of 9 cases of colorectal surgeries(44.4%) developed SSI.

Highest incidence of infection was also observed in operations done on colon (Maitland, 1905).

Hnatko et al (1963) reported postoperative wound infection in gastrectomies (8.9%), nephrectomies (7.7%), cholecystectomy and exploration of common bile duct (4%). Contamination from opened abdominal viscera and emergency operations were thought to be responsible.

In the present study the higher incidence of infection in ileal and colorectal surgeries may be due to frank contamination of operative field, prolonged operating time, necessity for longer incision and patient's poor personal hygiene.

RELATION OF SSI WITH DURATION OF OPERATION

The overall mean duration of surgery was 1.9 hours. Infected wounds had a mean duration of 2.5 hours (median 2 hours, range 1 – 7 hours) while non-infected wounds had duration of 1.1 hours (median 2 hours, range 0.5 – 3 hours). From observations, it is evident that long duration of surgery is associated with higher rate of SSI. Simiar result has been reported by Public Health Laboratory Services (1960), committee on wound infection (1964),cohen et al (1964),and Subramanian et al (1973). Committee on wound infection (1964) reported that the rise in postoperative wound infection might be due to the following factors: -

1. Greater number of contaminated wound in longer operative procedure group.
2. The increase in bacterial contamination of the wound with increasing time of exposure of the wound by all the three routes of infection, i.e. air borne, exogenous contact and endogenous spread.
3. Combined effect of longer exposure, more tissue trauma and increased amount of suture materials.

POSTOPERATIVE BACTERIAL FLORA IDENTIFIED AT THE TIME OF CLINICAL WOUND INFECTION

A total of 24 cases developed clinical wound infection out of 150 cases and swabs were taken for culture and sensitivity test . Positive cultures were obtained from all 24 swabs taken from clinically infected wounds. In the present study staph aureus infection was found highest (16 cases, 66.66%) whereas that of E.coli was the second most infecting organism 4 cases, (16.66%). Other less common pathogens are staph albus (4.16%), klebsiella (8.33%) and P.pyocynae (4.16%).

Similarly McDonald and Blowers (1960) reported Staph aureus to be present as causative organism 60% in postoperative wounds.

Meleny(1933) noted that Staph constitute more than one half of the infecting organism in the surgical wounds.

Baker, Altemeier et al (1964) reported in their study of wound infection in 5 different hospitals that Staph, aureus was present in 31.3% while E. coli, B. proteus and Pseudomonas occurred in 22.3%, 13.3% and 13.1% cases respectively.

According to Kippax and Thomas (1965) Staphylococcus aureus and coliforms are the most common organisms of the septic wounds giving a positive culture .

Similarly in the present study it was observed that Staphylococci and E. coli were the most frequent infecting organisms.

CULTURE SENSITIVITY OF ORGANISMS RECOVERED FROM INFECTED POSTOPERATIVE WOUNDS

In the present study ampicillin, gentamicin, chloramphenicol, Oxacillin, cefotaxime, cefexime, ceftazidine, amikacin, ampicillin+ sulbactum, piperacillin+ tazobactum, cirpofloxacin, norfloxacin were used for antibiotic sensitivity.

In the present study it was observed that most of the organisms were sensitive to gentamicin especially the gram negative organisms. They were also sensitive to amikacin, ciprofloxacin and ceftriaxone.

Gram positive organisms were sensitive to, cloxacillin, ampicillin, ampicillin+ sulbactum, erythromycin, ciprofloxacin etc. 70-80 percent of Staphylococci were resistsnt to penicillin, streptomycin, tetracycline, chloramphenicol in the study of Gupta et al (1965).

On observation it is better to opt for combination therapy such as ampicillm+ cloxacillin and gentamicin or ampicillin+ sulbactum+metronidazole or piperacillin+tazobactum for postoperative wound infection.

CONCLUSION

This study deals with surgical site infection (SSI) in 150 cases of abdominal surgeries performed in RIMS, Ranchi over a period of 2 years. Following conclusion can be made from this study.

1. The overall SSI rate is 16%. The incidence of infection is higher in elderly, in obese as well as is malnourished patients. Infection rate is also higher in anaemic patients.
2. Compared to emergency operations, SSI rate is lower in elective operations.
3. SSI rate is higher in surgeries of colorectal portion of GIT.
4. Rate of SSI is directly proportional to the duration of the surgery.
5. Compared to multifilament suture, use of monofilament suture causes less number of infections.
6. Postoperative culture from discharge of infected wounds shows predominant growth of staphylococci and E.coli.
7. Gram positive organism are mostly sensitive to cloxacillin ,ampicillin and amoxicillin while Gram negative organism are sensitive to gentamycin ,ciprofloxacin,amikacin.
8. Established cases of SSI can be treated by proper debridement/ wound excision, dressing and judicious use of easily available antibiotics like ciprofloxacin, ampicillin, ceftriaxone, cefotaxime, cefepime, erythromycin, ceftazidine, piperacillin-Tazobactum, cloxacillin and gentamycin .
9. Prophylactic antibiotics should be used according to the established guidelines to reduce the rate of SSI.

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