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FREQUENCY OF SURGICAL SITE INFECTIONS IN SURGICAL WARDS OF SERVICES HOSPITAL LAHORE

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Abstract:
Objective: Keeping in view the prevalence of Surgical Site Infections (SSIs) in our Health care facilities, this study was designed to: assess the frequency of SSIs and to compare the observed rates with international standards.
Design and Duration: It was a Cross-sectional study from May 2015 to June 2015.
Setting: Study was conducted in the four Surgical Wards of Services Hospital Lahore.
Subjects: All the patients undergoing clean and clean contaminated procedures during the time of research, in Surgical Wards of Services Hospital Lahore.
Methodology: Bio data of patients was collected, including ID information, type of surgery, ward of surgery and date of surgery. Patients were contacted on 8th day after surgery to assess whether SSIs had occurred or not.
Results: A total of 60 patients were included, of which 32 were clean and 28 were clean-contaminated type. Signs of SSI were observed in 9 out of 60 cases; 4 were Clean and 5 were clean contaminated category. The overall frequency of SSI at 8 day follow up was 15%. The incidence among clean surgical procedures was 12.5% and that of clean contaminated was 17.9%.
Conclusion: Frequency of SSIs in Surgical Wards of Services Hospital Lahore is much higher than International Standards.
Keywords: *Frequency, Surgical, Site Infections, Surgical Wards.*

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INTRODUCTION:

A Major Surgical Site Infection (SSI) is defined as a wound that either discharges significant quantities of pus spontaneously or needs a secondary procedure to drain it. The patient may have fever and systemic signs of illness. [1] Minor wound infections may discharge pus or infected serous fluid but should not be associated with excessive discomfort, systemic signs or delay in return home.

Complications are a part and parcel of Medical and Surgical procedures. With care and pre-cautions, they can be minimized, but even the best of Health-Care systems in the World fail to completely avoid them. For the purpose of this research, we will focus solely on one complication i.e. tissue infection at site of surgery. Tissue

Infection is diagnosed in two ways: Clinically (from signs and symptoms) and through lab investigations.

Clinically, serous discharge, erythema, purulent exudate and pain at site of procedure show infection of wound. It may manifest as an abscess, cellulitis or lymphangitis[1]. Systemically it presents with hyperthermia, tachycardia, increased WBC count in blood and reduction in function of one or more organ systems. [1] Diagnosis involves both clinical signs and symptoms and corroboration from lab reports received after culture.

Bacteria frequently involved in causing surgical sight infections are Streptococci, Staphylococci, Clostridia, E.coli, Klebsiella, Proteus, Pseudomonas and Bacteroides. Among Streptococci, most common agent is β hemolytic streptococci. Among Staphylococci, most common agent is Staphylococcus aureus, which is the major cause of exogenous suppuration in wounds. Infections caused by staphylococci usually suppurate and are localized. Strains resistant to antibiotics can cause epidemics and even more severe infections. The elderly are at increased risk of infections caused by Clostridium difficile. Most aerobic gram negative bacilli act in synergy with Bacteroides to cause SSIs after bowel operations (in particular appendicitis, peritonitis etc.).

Antimicrobials may be used to prevent or treat established SSIs. The use of antibiotics for the treatment of established surgical site infections ideally requires recognition and determination of the sensitivities of the causative organisms. It is unusual to treat SSIs with antibiotics unless there is evidence of spreading infections, bacteremia or systemic complications. The appropriate treatment of localized SSIs is interventional radiological drainage of pus or open drainage and debridement. There are two approaches to antibiotic treatment:

- A narrow-spectrum antibiotic may be used to treat a known sensitive infection; for example MRSA is usually sensitive to vancomycin but not to flucloxacillin.
- Combinations of broad-spectrum antibiotics can be used when the organisms are not known, or when it is suspected that several bacteria, acting in synergy may be responsible for the infection.

For example during and following emergency surgery requiring the opening of perforated or ischemic bowel, any of the gut organisms may be responsible for subsequent peritoneal or bacteremic infection. In this case, triple therapy combination of broad spectrum penicillins with an aminoglycoside and metronidazole may be used per- and post-operatively to support the patient's own body defenses.

Global standard rates for SSI's are 1-2% for Clean and less than 10% for Clean Contaminated surgical procedures.[1] A study in Pakistan reported SSI's to be 7.2% and 19.4% in Clean and Clean Contaminated cases respectively. [2] Another reported it 4.88% for Clean and 8.39% for Clean Contaminated cases. [3]

Surgical Site Infections are indicators of hygienic conditions of a hospital or Healthcare facility. If conditions, including environment, surgical instruments, theatres, doctor's hands, packing etc. are adequately sterile, incidence of sepsis are decreased. On the other hand, unhygienic conditions will increase rates of sepsis and tissue infection, causing a significant rise in mortality and morbidity. By considering rates of tissue infection in surgical patients, we will be able to find out whether the condition of the hospital is conducive to infection or not. Such a study and its findings may motivate the authorities to provide better surgical conditions, leading to better recovery and a decrease in morbidity and mortality.

Literature Review:

As are the demands of this research, previous work done on the topic were reviewed be the researchers. Topics under focus were the differences between clean and clean contaminated cases, the frequency of SSIs in clean and clean contaminated cases in Pakistan, in other third-world countries and in developed countries; and the organisms most commonly isolated from contaminated surgical site wounds. The findings are discussed in the following paragraphs.

A research by Lauwers S, de Smet F and co. in Brussels reported that the new CDC-definitions for surveillance of surgical site infections (1992) took into account 3 classes of surgical site infections (SSI): superficial and deep incisional SSI, and organ/space SSI. The most important host-related risk factors for development of SSI were advanced age, morbid obesity, disease severity, an ASA score > 2, prolonged preoperative hospital stay, and infection at distal sites. Microbial contamination of the surgical site occurred mainly during the surgical intervention. Although exogenous contamination may be of concern, especially in clean operations, most surgical site infections were caused by microorganisms of the patient's own commensal flora. SSI rates varied according to the type and duration of the surgical procedure and the skill of the surgeon. Proper surgical technique was the most important factor in the prevention of SSI. In addition the researchers recommended that adequate protocols for antimicrobial prophylaxis with antibiotics should be followed.

A research by Saito T, Aoki Y and others in Takamatsu Hospital, Kagawa, Japan, in 2005, reported in Journal of Infection and Chemotherapy : Official Journal of the Japan Society of Chemotherapy reported that surveillance of surgical-site infection (SSI) was becoming more important given the current situation of increasing antibiotic resistance by microorganisms. It was difficult to carry out SSI surveillance at small-scale community hospitals because of small staff numbers. They examined whether SSI surveillance could be carried out with a system they devised. Furthermore, they investigated the SSI rate at their small-scale community hospital (179 beds) in a Japanese city (populations, 330 000). Between June and December 2003, operations were performed on 210 patients. Procedures were identified as clean (n = 85), clean-contaminated (n = 108), contaminated (n = 14), or dirty-infected (n = 3). A 7-month prospective survey of SSI was conducted. SSIs were classified according to the Centers for Disease Control and Prevention criteria and identified using bedside surveillance and post-discharge follow-up. SSI developed following 16 procedures (7.6%). All patients who developed SSI had received antibiotic prophylaxis. Among the 16 patients with SSI, operations were clean (n = 1), clean-contaminated (n = 8), contaminated (n = 5), or dirty-infected (n = 2). Enterobacteriaceae were the most frequently isolated microorganisms, followed by Pseudomonas aeruginosa. SSI surveillance is just as important at small community hospitals as it is at larger hospitals, and SSI surveillance is relatively simple to institute at small-scale community hospitals with the selective use of investigation items.

A research by Kasatpibal N, Jamulitrat S, Chongsuvivatwong V from Prince of Songkla University, Hat Yai, Songkhla, Thailand; reported in American Journal of Infection Control in 2005 stating that no previous multicenter data regarding the incidence of surgical site infection (SSI) were available in Thailand. The magnitude of the problem resulting from SSI at the national level could not be assessed. The purpose of this study was to estimate the incidence of SSI in 9 hospitals, together with patterns of surgical antibiotic prophylaxis, risk factors for SSI, and common causative pathogens. A prospective data collection among patients undergoing surgery in 9 hospitals in Thailand was conducted. The National Nosocomial Infection Surveillance (NNIS) system criteria and method were used for identifying and diagnosing SSI. The SSI rates were benchmarked with the NNIS report by means of indirect standardization and reported in terms of standardized infection ratio (SIR). Antibiotic prophylaxis was categorized into preoperative, intraoperative, and postoperative. Risk factors for SSI were evaluated using multiple logistic regression models.

From July 1, 2003, to February 29, 2004, the study included 8764 patients with 8854 major operations and identified 127 SSIs, yielding an SSI rate of 1.4 infections/100 operations and a corresponding SIR of 0.6 (95% CI: 0.5-0.8). Of these, 35 SSIs (27.6%) were detected post-discharge. The 3 most common operative procedures were cesarean section, appendectomy, and hysterectomy. The 3 most common pathogens isolated were Escherichia coli, Staphylococcus aureus, and Pseudomonas aeruginosa, which accounted for 15.3%, 8.5%, and 6.8% of infections, respectively. The 3 most common antibiotics used for prophylaxis were ampicillin/amoxicillin, cefazolin, and gentamicin. The proportion of types of antibiotic prophylaxis administered were 51.6% preoperative, 24.3% intra-operative and 24.1% postoperative. Factors significantly associated with SSI were high degree of wound contamination, prolonged preoperative hospital stay, emergency operation, and prolonged duration of operation.

A research by Roumbelaki M and co researchers from University of Crete, Crete, Greece; reported by American Journal of Infection Control in 2008. In this first attempt to implement a standardized surveillance system of surgical site infections (SSI) in a Greek hospital, our objective was to identify areas for improvement by comparing main epidemiologic and microbiologic features of SSI with international data. The National Nosocomial Infections Surveillance (NNIS) system protocols were employed to prospectively collect data for patients in 8 surgical wards who underwent surgery during a 9-month period. SSI rates were benchmarked with international data using standardized infection ratios. Risk factors were evaluated by multivariate logistic regression. A total of 129 SSI was identified in 2420 operations (5.3%), of which 47.3% developed after discharge. SSI rates were higher for 2 of 20 operation categories compared with Spanish and Italian data and for 12 of 20 categories compared with NNIS data. Gram-positive microorganisms accounted for 52.1% of SSI isolates, and Enterococci were predominant. Alarming resistance patterns for Enterococcus faecium and Acinetobacter baumannii were recorded. Potentially modifiable risk factors for SSI included multiple procedures, extended duration of operation, and antibiotic prophylaxis. SSI was associated with prolongation of postoperative stay but not with mortality.

Arias CA, Quintero G, Vanegas BE, Rico CL, Patiño JF from University Hospital, Calle 116 No 9-02, Bogotá, DC, Colombia, reports published in World Journal of Surgery in 2003 reported that a protocol for surveillance of surgical site infections (SSIs) was established in a tertiary care center in 1991 in Bogota, Colombia and followed for 10 years. Wounds were classified according to the Centers for Disease Control guidelines. The National Nosocomial Infection Surveillance and Study of the Efficacy of Nosocomial Infection Control scores for risk factors were included from June 1999. A total of 33027 surgical procedures were followed by the surveillance team. The overall infection rate was 2.6%. Most surgical procedures (70.6%) were classified as clean; 25.3%, 3.8%, and 0.26% were classified as clean/contaminated, contaminated, and dirty, respectively. Infection rates according to wound classification were 1.28%, 3.9%, 15.4%, and 38.4% for clean, clean/contaminated, contaminated, and dirty procedures, respectively. Escherichia coli and coagulase-negative staphylococci were the most frequently isolated microorganisms from SSI: 23.9% and 22.8% of isolates, respectively. A program of surveillance of SSIs was successfully implemented in a country with limited resources and the infection rate was maintained within international standards.

A study by Weiss CA 3rd' Statz CL and others in Fairview-University Medical Center, Minneapolis revealed that Our SSI rates were 2.6% for class I wounds, 3.6% for class II wounds, and 10.5% for class III/IV wounds; 53.9% of SSIs were identified after hospital discharge. Coagulase-negative staphylococcus and group D enterococcus were the 2 most frequent isolates before and after antibiotic restriction policies were implemented. Candida albicans isolates decreased from 7.9% (1993-1995) to 6.5% (1996-1998; P=.46). Methicillin-resistant Staphylococcus aureus (1.8% of isolates) and vancomycin-resistant enterococcus (2.4% of isolates) organisms were first identified between 1996 and 1998. Antibiotic restriction policies did not alter the microbial spectrum of SSIs during the observation period.

Deverick J Anderson, Daniel J Sexton and others fromDepartment of Medicine, Duke University, Durham, North Carolina, United States reported that SSI data were collected prospectively at 26 community hospitals in the southeastern United States. Two analyses were performed: (1) a study of the overall prevalence rates of SSI and the prevalence rates of SSI due to specific pathogens in 2005 at all participating hospitals and (2) a prospective study of consecutive surgical procedures at 9 of the 26 community hospitals from 2000 through 2005. In 2005, a total of 1,010 SSIs occurred after 89,302 procedures (prevalence rate, 1.13 infections per 100 procedures). Methicillin-resistant S. aureus (MRSA) was the pathogen most commonly recovered (from 175 SSIs). Trend data from 2000 through 2005 demonstrated that the prevalence rate of MRSA SSI almost doubled during this period, increasing from 0.12 infections per 100 procedures (95% confidence interval [CI], 0.12-0.13) to 0.23 infections per 100 procedures (95% CI, 0.22-0.24) (P<.0001). In adjusted analysis, MRSA SSI was significantly more prevalent at the end of the study period than at the beginning (prevalence rate ratio, 1.48 [95% CI, 1.36-1.61]; P<.0001).

MRSA was the pathogen that most commonly caused SSI in their network of community hospitals during 2005. They found that the prevalence of MRSA SSI had increased significantly over the past 6 years.

Kenneth Sands, Gordon Vineyard and Richard Platt of Beth Israel Hospital, 330 Brookline Ave., Boston, reported that although surgical site infections (SSIs) occurring after hospital discharge caused substantial morbidity, their epidemiology was not well understood, and methods for routine post-discharge surveillance had not been validated. In-patient and out-patient surveillance followed 5572 non-obstetric procedures among members of a health maintenance organization with extensive automated records. One hundred thirty-two SSIs were documented, of which 84% occurred after hospital discharge and 63% were managed outside the surgical facility. Postdischarge SSIs led to an average of 4.6 additional ambulatory encounters. Patient and surgeon questionnaires had a sensitivity of 28% and 15%, respectively. These data suggest that most SSIs occured after discharge and were not detectable by conventional surveillance. Nonetheless, they caused substantial resource utilization.

A research by Masood Ahmed, Shams Nadeem Alam and co-researchers from Dow University of

Health Sciences & Civil Hospital, Karachi reported that out of 100 patients (52 males and 42 females) in the study, 69 belonged to the clean group and 31 to the clean contaminated group surgery group. The overall incidence of SSIs in the study was found to be 11%; 5 (7.2%) in the clean surgical group and 6 (19.4%) cases in the clean contaminated group developed infections. Patients in age group 51-60 or older were infected more than those in the younger age groups. The incidence of wound infection was more in male patients (11.2%) as compared to female patients (10.4%). This study was conducted in Pakistan and the results were comparable with international limits for SSI frequencies.

A look at regional studies conducted on the topic revealed a research from Rajivgandhi Institute of Medical Sciences (RIMS), Srikakulam-532 001, Andhra Pradesh, India. This study was designed to evaluate the frequency, clinical presentation, common risk factors and the different organisms which were involved in cases of clean and clean-contaminated, contaminated and dirty surgeries. Out of the 428 patients (232 males and 196 females) in the study, 286 belonged to the clean surgery group, 97 belonged to the clean-contaminated surgery group, 27 belonged to the contaminated surgery group and 18 belonged to the dirty surgery group. The overall incidence of surgical site infections (SSI) in this study was 9.81%; 17 (5.94%) cases in the clean surgical group, 9(9.28%) cases in the clean-contaminated group, 6(22.22%) cases in the contaminated group and 10(55.56) cases in the dirty group developed infections. The patients in the age group of 51-60 years were infected more than those in the younger age groups. The incidence of the wound infections was more in the male patients (11.63%) as compared to that in the female patients (7.65%). Obesity was also a main cause of the SSIs, as was evident from the fact that the patients with more than 60kg/m2 of weight were infected more (26.7%) as compared to those with 30-40kg/m2 of weight (6.45%). Anaemia, prolonged surgeries, operations which were done by junior surgeons and operations which were late in the list were also associated with more surgical site infections. The usual time of presentation of the SSIs was within three weeks following the surgeries and most of the patients presented with wound abscesses and cellulitis, while nine patients had wound dehiscence. The common organisms which were involved in the SSIs were Staphylococcus aureus, Escherichia.coli and Streptococcus pyogenes. The researchers noted that meticulous surgical techniques, the duration of the operation, proper sterilization, the judicious use of antibiotics, hygienic operation theatres and ward environments, the control of malnutrition and obesity and the treatment of infective foci and diseases like diabetes helped in controlling the morbidity of the surgical wound infections.

A study from Peru by Hernandez K, Ramos E, Seas C, Henostroza G, Gotuzzo E reported adult patients undergoing abdominal surgery who consented were enrolled and observed until 30 days after surgery. Patients who had undergone surgery at another hospital or who died or were transferred to another hospital within 24 hours after surgery were excluded. Four hundred sixty-eight patients were enrolled. Their mean age was 37.2 years. One hundred twenty-five patients developed SSIs, 18% of which were identified after discharge. The overall incidence rate (IR) was 26.7%. The IR was 13.9% for clean, 15.9% for clean-contaminated, 13.5% for contaminated procedures, and 47.2% for dirty interventions. The IR was 3.6% for NNIS System risk index 0 and 60% for index 3. Risk factors for SSI on logistic regression analysis were dirty or infected wound (RR, 3.8; CI95, 1.7-8.4), drain use longer than 9 days (RR, 6.0; CI95, 2.5-12.5), and length of surgery greater than the 75th percentile (RR, 2.1; CI95, 1.0-4.4). Patients with SSI had a longer hospital stay than did non-infected patients (14.0 vs 6.1 days; $p < .001$).

Literature review revealed that SSIs are a major problem in developing countries and their etiology is multi-factorial. Stating a single cause or a single organism most commonly responsible is difficult, as it varies with place and time.

Objectives:

The objectives of this study were:

- To find out the frequency of patients of surgical procedures developing tissue infection within 8 days of Surgery in Surgical Wards of Services Hospital Lahore.
- To notify the Health Authorities of the current status of SSIs and make recommendations to improve the existing status.

METHODOLOGY:

Study design:

It is a Cross- Sectional study.

Study setting:

The 4 Surgical wards of Services Hospital Lahore.

Study Duration:

30 days, from 1 May 2015 to 30th May 2015.

Sample Size:

All patients in Surgical Wards fulfilling the inclusion criteria in the given time. The final sample size was 60 patients.

Sampling technique:

Temporal sampling was used. All patients in surgical wards from 11-5-2015 to 17-5-2015 (1 week) fulfilling the inclusion criteria were taken as sample.

Inclusion Criteria:
All patients of Clean and Clean-contaminated elective surgical procedures within the specified time span of research.

Exclusion Criteria:
A. Patients with already infected wounds before surgery
B. Patients not coming to a follow up appointment.
C. Patients with compromised Immune system.
D. Contaminated and Dirty surgeries.

Data Analysis Plan:
Data was analyzed by computer software SPSS ver.20

Operational Definitions:
Surgical Site Infection:
A Major Surgical Site Infection (SSI) is defined as a wound that either discharges significant quantities of pus spontaneously or needs a secondary procedure to drain it. The patient may have fever and systemic signs of illness.

Clean Surgical Wounds:
The wound is judged to be clean when the operative procedure does not enter into a normally colonized viscus or lumen of the body.

Clean-Contaminated Wounds
A clean-contaminated surgical site is seen when the operative procedure enters into a colonized viscus or cavity of the body, but under elective and controlled circumstances. The most common contaminants are endogenous bacteria from within the patient.

RESULTS:

Number of cases in Sample:

Table 1: Type and Number of Cases taken as Sample in the Study.

	Type of Procedure	Number of cases (%)
Clean contaminated	Cholecystectomy	19 (68%)
	Appendectomy	5 (18%)
	Open abdominal procedures	3 (11%)
	Esophagectomy	1 (3%)
	Total	**28**
Clean	Hernioplasty	20 (62.5%)
	Mastectomy	2 (6%)
	Circumcision	2 (6%)
	Orchiectomy	3 (9%)
	Thyroidectomy	2 (6%)
	Pancreatectomy	1 (3%)
	Heller's myotomy	1 (3%)
	Removal of aneurysms	1 (3%)
	Total	**32**
Grand Total		**60**

Of the total cases coming in during the sampling week, a total of 65 were in clean and clean contaminated category. During follow up, 5 patients fell in the exclusion criteria due to not showing at the follow up. So, the final sample size was 60 patients, of which 32 were clean and 28 were clean contaminated type.

Fever:

Table 2: Number of subjects showing Fever post-op (Day 8).

Fever in Patients on Day 8	
Type of procedure	**Number of cases showing fever (%)**
Clean	5 (15.6%)
Clean Contaminated	8 (28.6%)
Total	13 (21.7%)

Of the total sample size of 60 patients 13 were positive for fever on day 8 showing a percentage of 21.7% (Table 2, fig. 1). Of these, 5 were in clean (15.6%) and 8 were clean contaminated type (28.6%).

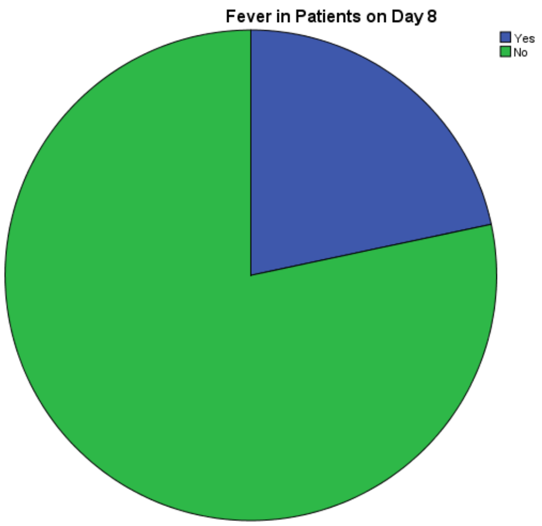

Figure 1: Percentage of patients developing fever on Day 8.

Discharge from Surgical Site:

Table 3: Number of patients developing Discharge from Surgical Site on Day 8.

Discharge from Surgical Site on Day 8	
Type of Procedure	**Number of cases (%)**
Clean	4 (12.5%)
Clean Contaminated	5 (17.9%)
Total	**9 (15%)**

A total of 9 patients developed discharge from surgical site, showing a percentage of 15%. (Table 3, fig. 2). Of these, 4 were clean (12.5%) and 5 were clean contaminated (17.9%).

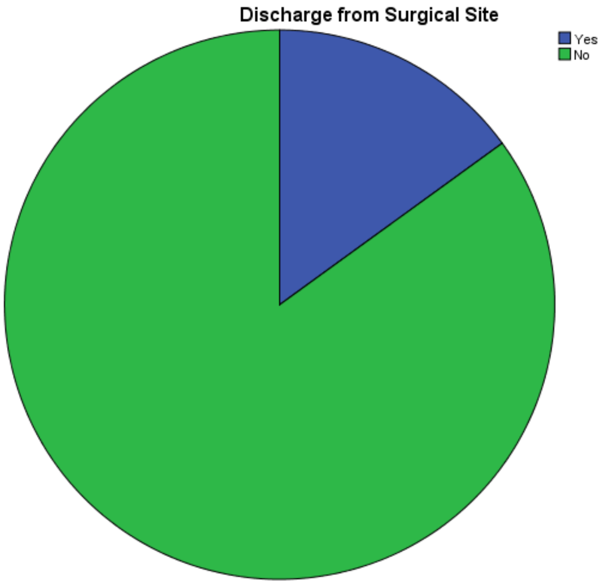

Figure 2: % of patients developing purulent discharge from surgical site up to Day 8.

Results Verdict:

Table 4: Number and % of subjects with Confirmed post-op SSIs.

Status of SSIs on Day 8			
Type of Procedure	**Total cases in Sample**	**Cases showing No SSIs**	**Cases of Clinically Evident SSIs (%)**
Clean	32	28	4 (12.5%)
Clean Contaminated	28	23	5 (17.9%)
Total	**60**	**51**	**9 (15%)**

Signs of SSI were observed in 9 out of 60 cases. 4 were Clean and 5 were clean contaminated category (Table 4, fig. 3).
The overall frequency of SSI at 8 day follow up was 15%. The incidence among clean surgical procedures was 12.5% and that of clean contaminated was 15%.
(Fig. 4).

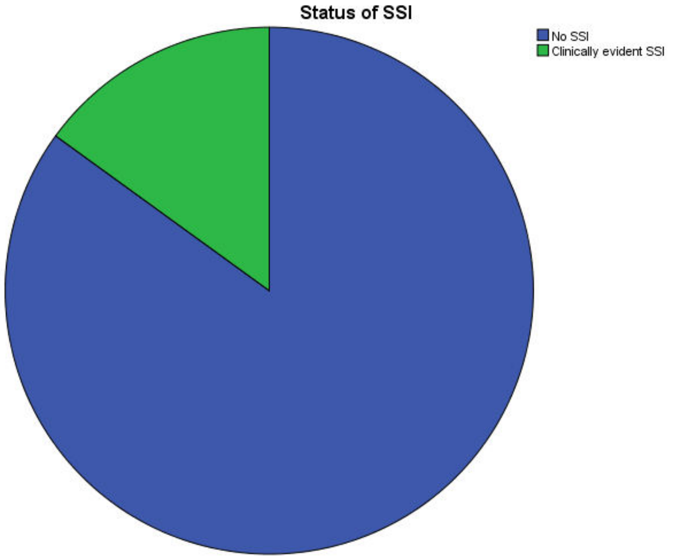

Figure 3: Total % of subjects developing SSIs Post-op.

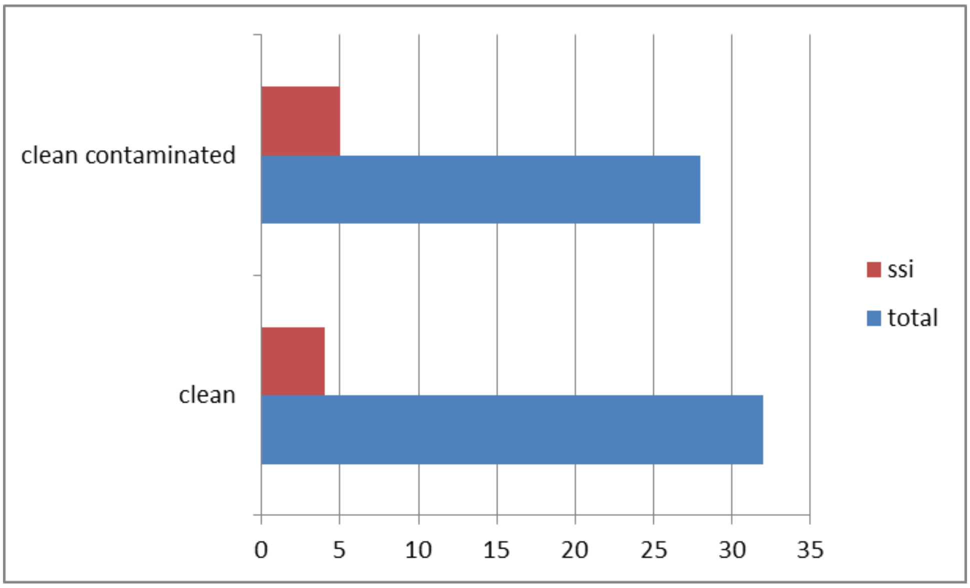

Figure 4: A Summary of results of the study.

DISCUSSION:

This research found the SSIs to be much higher than international standards. The standard rates for clean procedures are 1-2% [1] and for clean contaminated, less than 10% [1]. This fact is augmented by researches conducted on this topic in developed countries. A study in USA found 4.8% in clean and 8.39% in clean contaminated cases. [4] Another found it to be 1.28% and 2.39% for clean and clean contaminated respectively [5]. Unlike the case in this research, these rates are comparable with international standards.

Interestingly, SSIs are higher, and therefore closer to results of this research in developing countries. A study by Hernandez from Peru in 2005 described rates of 13.9% and 15.9% amongst clean and clean-contaminated cases respectively [6].

As in all other problems plaguing developing countries like Pakistan, these high rates are probably due to lack of awareness of factors responsible for SSIs, both on part of the patient and the medical staff. Therefore, adequate information counselling must be available to the patient, especially focusing on post discharge care of the wound, knowing the factors responsible for causing SSIs and identifying signs of SSIs early to report to a health care professional. Similarly, the doctors, surgeons and supporting medical staff must be trained to know and avoid all factors leading to SSIs. They must also be able to identify clinical signs and symptoms, and must know the protocols for management of SSIs.

Malnutrition due to poverty may be a cause, but is difficult to establish a direct relation as the nutritional status is almost never available, and it is beyond the scope of this research to find out the nutritional status of the subjects involved. Lack of proper post-op wound care may be a significant cause, one that has been established in other countries. A study in Boston discovered that 84% of the SSIs were post-discharge. [7] All of the subjects of this research developed SSI post discharge, a fact that could indicate that negligence occurred more on part of the patient than the medical staff.

This research was unable to identify the organisms most commonly responsible for SSIs as Culture report was not available for even a single patient. That is understandable, considering that on 8th day, signs of SSI barely become visible, after which culture is sent. Then it usually takes a week or so for the report to come from the lab. Due to the limited time frame of data collection, the researchers couldn't receive any data from the labs regarding the identification of organism responsible and/or its antibiotic sensitivity. However, international studies have found that Streptococci and E. coli are the most common pathogens involved. [1]

Interestingly, the age and experience of the surgeon is also considered a factor in SSIs. It is considered that SSIs have an inverse co relation, i.e. the greater the age/experience of the surgeon, the lesser the chances of developing SSIs. Such a relation was difficult to establish in this setting, but it is the researcher's observation that most operations are performed by younger medical officers and PG trainees, which could be a factor for the elevated rates of SSIs.

Patients with bleeding disorders, diabetes or compromised immune systems are at a significantly higher risk of developing SSIs due to delayed wound healing. In this research, the factor was considered and such patients were placed in exclusion criteria to avoid the perversion of results by falsely elevating the rates. So, this factor is not responsible for the elevated rates.

In the end, it must be said that whatever the factors or cause of elevated SSIs be, it is a thing not to be taken lightly. Significant increase in morbidity and mortality is associated with SSIs. This leads to an increased strain on the resources available to the patient. Loss of time and wealth, and the social stigma of prolonged illness are just some of the things to be considered. Especially in a developing country like Pakistan, where resources are scarce and the hospital facilities are already over-burdened, special care must be given to address all issues involving the increase in SSIs. A comprehensive plan of action involving the patient, surgeon and the support staff must be adopted immediately to decrease this rate.

In this research, the final SSIs seen were 15% total, with 12.5% for clean and 17.9% for clean contaminated cases on 8th day of follow up. Identifying the reason of such high rates or the factors responsible for them, in detail, is beyond the scope of this research; however, the researchers recommend that the issues be identified and resolved quickly.

CONCLUSION AND RECOMMENDATIONS:

A collective effort focusing on eradicating all factors responsible for increased SSIs should be made. Hospital management should act to identify and correct the factors responsible for the high rates of SSIs. Doctors, patients and supporting staff should be made aware of the factors responsible for SSIs and the complications, including loss in time and wealth, due to SSIs. Patients should be counseled properly to identify the signs and symptoms of SSIs and to report any suspicion to the hospital immediately.

Future researchers should focus on identifying the cause of the high rates of SSIs and identifying the organisms most commonly involved.

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