A STUDY ON ANALYSIS OF SURGICAL SITE INFECTION USING QUALITY TOOLS AT A TERTIARY CARE TEACHING HOSPITAL

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ABSTRACT

Introduction: The hospitals as well as the patient are negatively affected by surgical site infections (SSI), which are the third most frequently reported nosocomial infection. Hence it is necessary to carry out continuous surveillance for monitoring of the occurrence of surgical site infection. Surgical site infections (SSIs) can be prevented and are a significant financial burden in addition to increasing morbidity and death. Strong surveillance systems for these healthcare-associated illnesses are required because surgical site infection (SSI) rates are a good indicator of the standard of surgical and postoperative treatment.

Objectives:

1. To assess the incidence of surgical site infections.

2. To analyse the surgical site infections with the application of quality tools.

3. To the study impact of quality improvement initiatives on SSI rates

Methodology: Retrospective study was conducted for the period of 1 year data (January-December 2019) in the surgical wards.

Results: The retrospective study which included 27,122 surgeries during the study period, revealed rate of SSI as 89 surgeries at Department of surgery. This study also showed that incidence rate of surgical site infection more in the age group of 15 – 40.

Conclusion: SSI rate was investigated and quality improvement initiatives were implemented to reduce the SSI

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INTRODUCTION

Surgical site infection (SSIs), previously called as wound infections, stays one of the most common adverse events that occur with hospitalized surgical patients or after outpatient's surgical operation in spite of many advances in preventive techniques. Surgical site infections are high source of morbidity and mortality and represents the second most common motive of health-care-urinary tract infections. Despite excellent development in surgical techniques, antimicrobial prophylaxis, environmental upgrades in operating rooms, and suggestions, surgical site infections (SSI) stay one of the most common causes of the health care related infections (HAIs). Surgical site infection (SSI) is defined as any infection occurring within 30 days after surgery or within 12 months of surgical implantation of prosthesis or foreign body. Evidence – based wound care plays a significant role in reducing the surgical site infections. Depending on the type of surgery 2-10% of patient develops SSIs, with risk being highest for cardiac and intra-abdominal surgeries. SSI is the most common post-operative complication, and that can have a significant impact on the patient and on hospital, with reported increasing length of stay, hospital cost and mortality. Length of stay can increase

by 4-10 days compared to patients without complication after surgery.

The surgical site infections are answerable for a bigger financial burden to healthcare systems in brought postoperative health facility period and expenditure. Patients with an SSI have a 2-10 instances higher chance of mortality as compared with operative patients without a surgical site contamination. It is tricky to disregard burden posted by using surgical site infections on sufferer's safety in phrases of ache, struggling, not on time wound restoration, extended use of antibiotics, antibiotic resistance, revision surgical procedure, multiplied duration of length of stay, mortality, morbidity and extra fitness care costs.

Surgical site infections are particularly caused by the access of microorganism at some point of surgical intervention. During the surgical processes' microorganisms can penetrate the body through various ways such as contaminated environment, which specially includes operating room and non-sterile techniques like unsanitary hands and non-sterile objects. At the same time if the patient body is not sterile, that is also act as door for the entry of microorganism. Most surgical site infections originate at the time of surgical operation.

The common organisms motive infections in surgical procedure are Staphylococcus Aureus, Streptococcus Milleri, Enterococcus Faecium, Escherichia Coli, Candida Albicans and Pseudomonas Aeruginosa. The risk of infection can be identified by way of many influencing elements consisting of the number of tissues devitalised during surgical treatment, co morbidities factors consisting of whether the patient is overweight, diabetes, smoking and technical problems which includes heavy bleeding.

Most surgical site infections are can be preventable through supplying the fundamental and advanced nursing method of wound care. To provide effective infection prevention care, fitness care professionals need to stay updated with knowledge and skills to offer the best practice.

OBJECTIVE OF THE STUDY

- To assess the incidence of Surgical Site Infections in the hospital
- To analyse the surgical site infections with the application of quality tools.
- To suggest measures to prevent surgical site infections

RESEARCH METHODOLOGY

Study area: The data collected from the surgical wards and ICU of a tertiary care teaching hospital.

Study Period: Retrospective study was conducted for the period of 1 year data (January-December 2019) in the surgical wards.

Inclusion criteria: All major surgeries carried out during the study period.

Exclusion criteria: All minor surgeries carried out during the study period.

Method of data collection: The data were collected from the documents and records of the patient who underwent major surgeries at the study hospital.

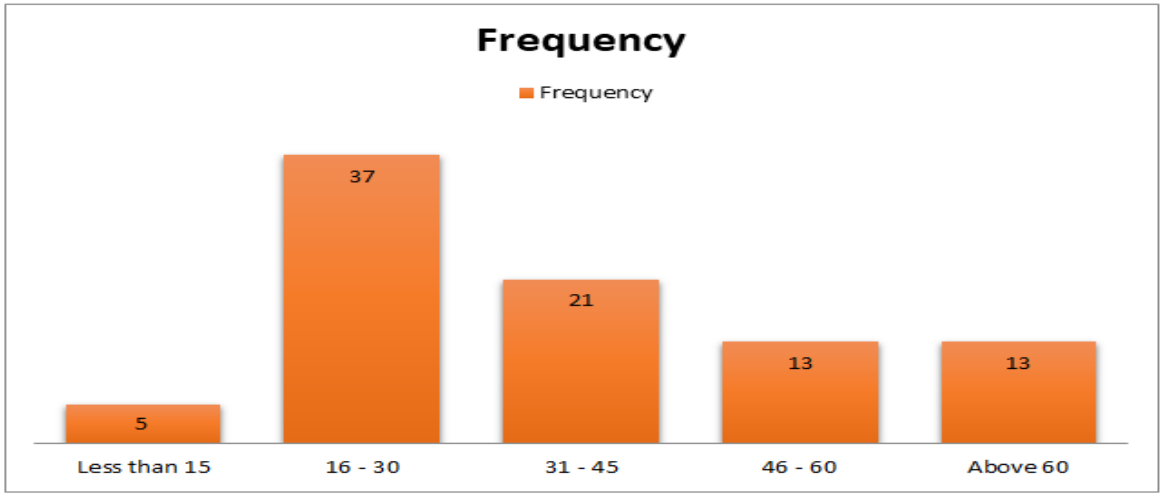
RESULTS

Table 1: SSI rate based on Gender distribution

GENDER	SSI RATE	PERCENTAGE
Male	46	51
Female	43	48
Total	89	100

Table 2 : Frequency of SSIs in different age groups

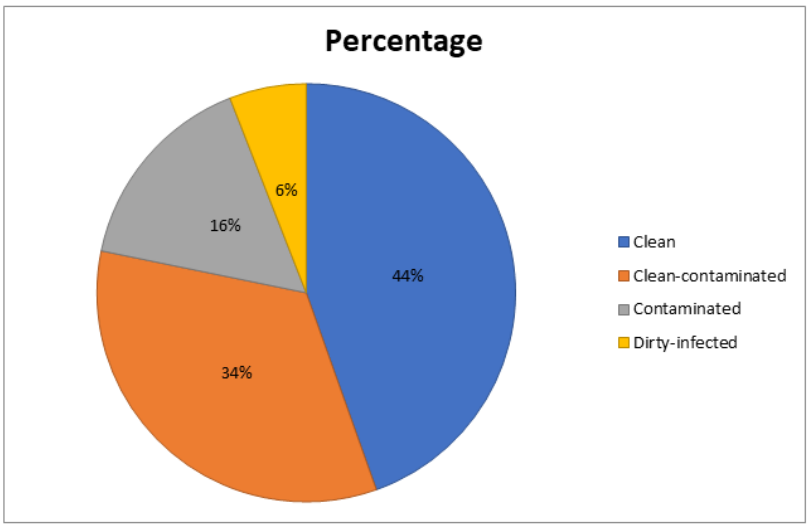
Age groups(In years)	Frequency	Percentage
Less than 15	5	5.6
16 - 30	37	41.5
31 - 45	21	23.5
46 - 60	13	14.6
Above 60	13	14.6
Total	89	100



The above table and graph depict that the SSI was highest incidence was in the age group of 16 to 30 (23.5%) and least in the age group of less than 15 years (5.6%)

Table 3: Classification of surgical wound

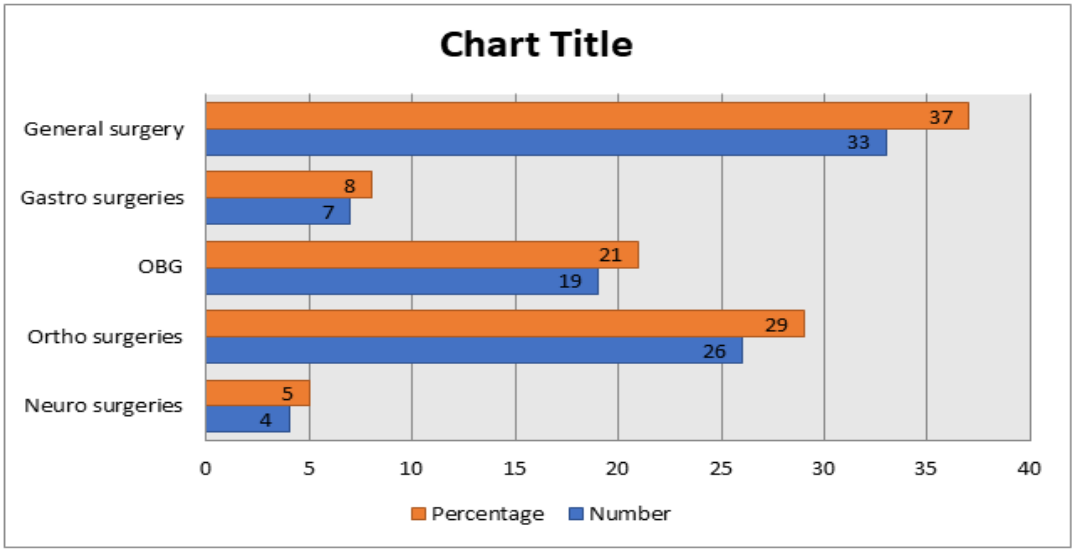
Wound type	**Number**	**Percentage**
Clean	40	45
Clean-contaminated	30	34
Contaminated	14	16
Dirty-infected	5	6
Total	89	100



The above table and graph depict that the SSI was highest incidence was in the Clean wound type which was 45 % and least in the dirty infected which was 6 %

Table 4: Distribution of patient based on the departments where surgery was carried out

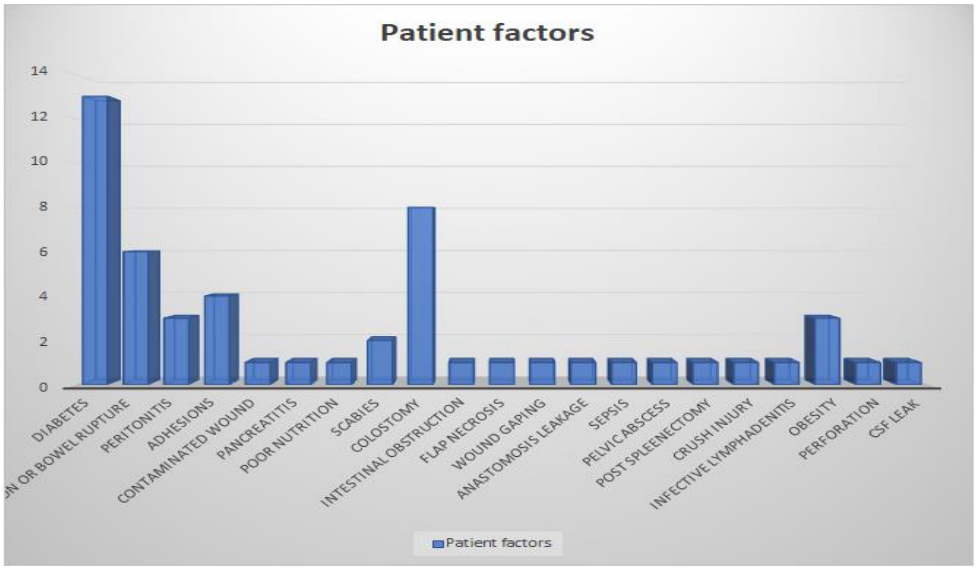
SURGERY	Number	Percentage
Neuro surgeries	04	5
Ortho surgeries	26	29
OBG	19	21
Gastro surgeries	07	8
General surgery	33	37
Total	89	100



The above table and graph depict that the SSI was highest number of cases was in the general surgery department which was 33 cases and least number of cases was in the neurosurgery department which was 4 cases

Table 5: Co morbidities (Patient Factors)

Factors	Numbers
Diabetes	13
Colon or bowel rupture	**6**
Peritonitis	**3**
Adhesions	**4**
Contaminated wound	**1**
Pancreatitis	**1**
Poor nutrition	**1**
Scabies	**2**
Colostomy	**8**
Intestinal obstruction	**1**
Flap necrosis	**1**
Wound gaping	**1**
Anastomosis leakage	**1**
Sepsis	**1**
Pelvic abscess	**1**
Post Splenectomy	**1**
Crush injury	**1**
Infective lymphadenitis	**1**
Obesity	**3**
Perforation	**1**
CSF Leak	**1**



The above table and graph depict that the incidence of SSI was highest in the patient with the comorbidity of diabetes

Table 6: Microorganisms found in the surgical site causing the infections

ORGANISM	NUMBERS
Methicillin – resistant staphylococcus	12
Klebsiella Pneumoniae	16
Escherichia Coli	17
Coagulase negative Staphylococcus	06
Acinetobacter Baumannii	09
Staphylococcus Epidermidis	05
Pseudomonas Aeruginosa	04
Enterobacter Cloacae	02
Candida Tropicalis	01
Staphylococcus Haemolytic	05
Citrobacter Amalonaticus	01
Enterobacter Aergenes	03
Enterococcus Facium	01
Staphylococcus Hominis	04

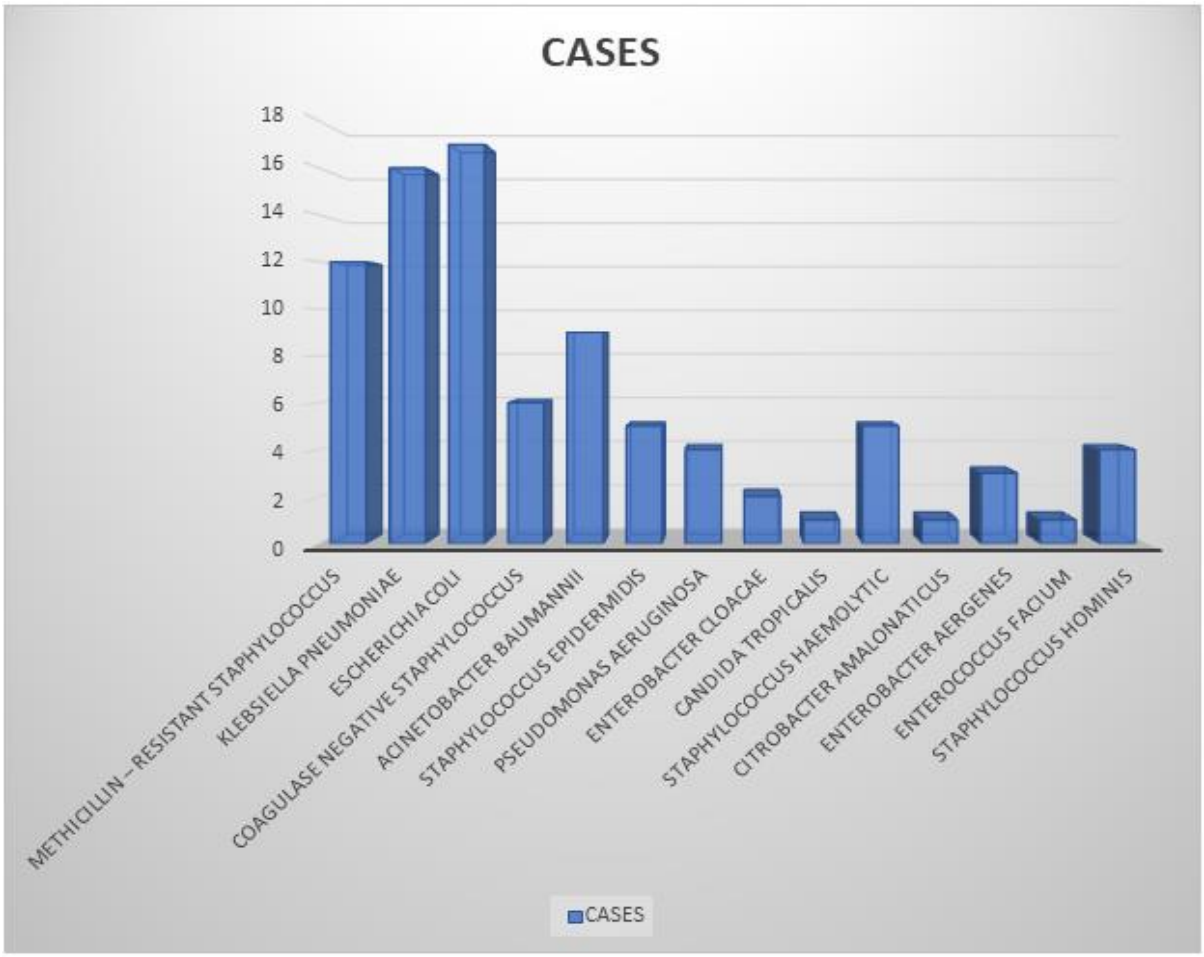


Table 7: Rate of surgical site infection (Jan 2019– Dec 2019)

Months	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
NO OF SSI	7	3	4	1	7	10	11	7	7	9	13	10
No of Surgeries	1160	1252	1567	1365	1589	1345	5026	4814	4658	1422	1366	1558
QI(Percentage)	0.60	0.24	0.26	0.07	0.44	0.74	0.21	0.14	0.15	0.63	0.95	0.64
BENCHMARK	1.20%											

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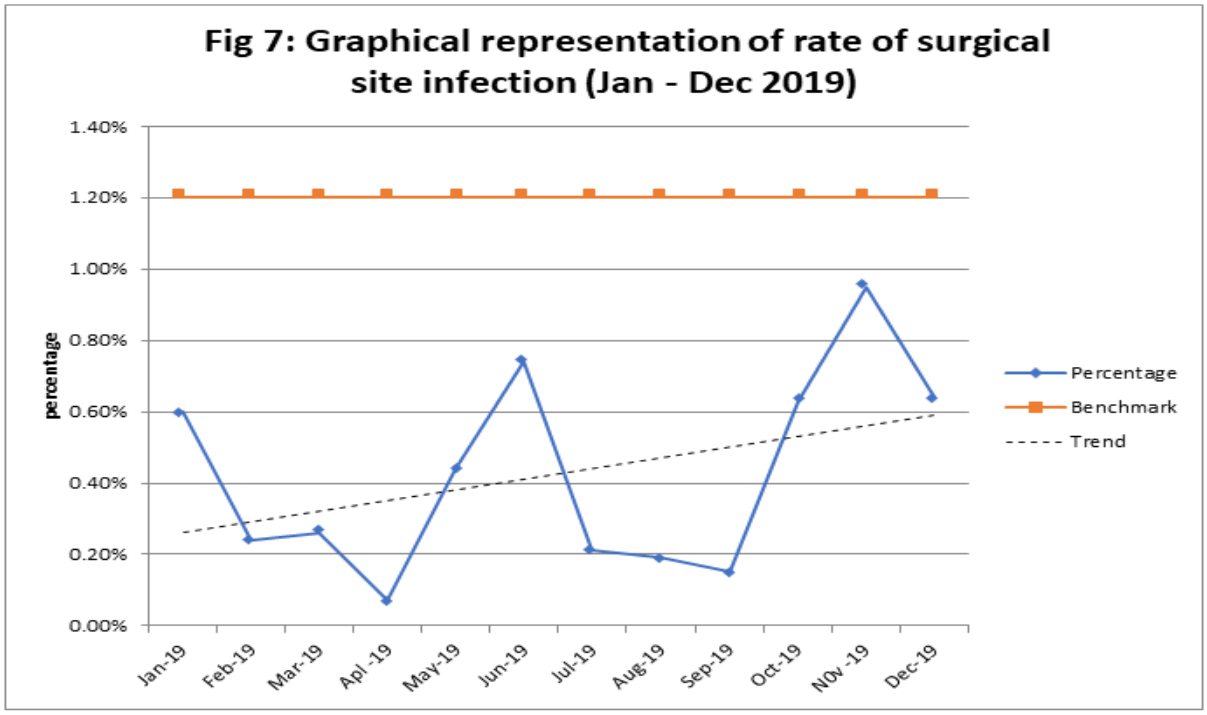


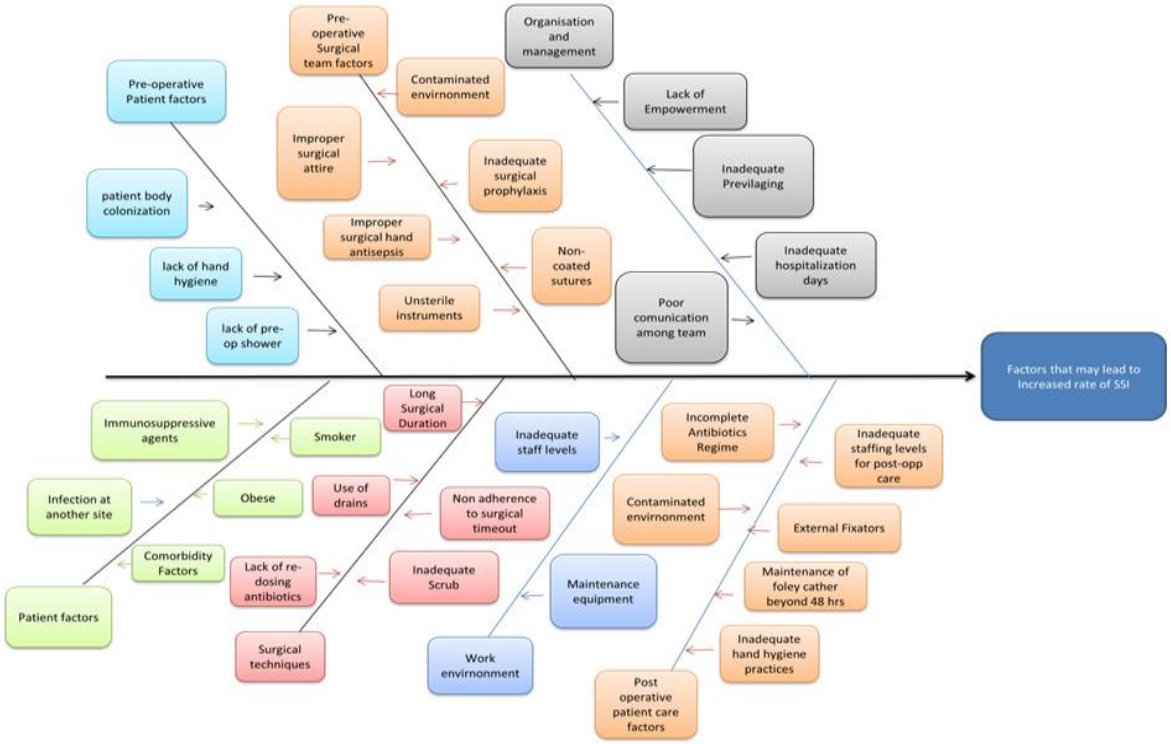
This graph explains the quality improvements in the field of surgical site safety from the period January to December 2019.

Ishikawa diagram for incidence of Surgical Site Infection

A cause-and-effect diagram is a quality tool, often called a "fishbone" or "Ishikawa" diagram, can help to identify possible causes of a problem (here surgical site infection) and in sorting ideas into useful categories. A fishbone diagram is a visual way to look at cause and effect.

Ishikawa diagram helped to identify the causes in the pre-operative factors, pre-operative team factors, patient factors, surgeon technique, work environment factors, organization and management factors and post –operative factors. That helped to improve measures in those respective areas to improve the factors and reduces surgical site infection

Fig 1: Ishikawa diagram for incidence of Surgical Site Infection



DISCUSSION

The current study considered 27,122 patients underwent surgeries. Among 27,122, 89 patients developed surgical site infections. Earlier study shows that out of 250 patients, 48 patients developed surgical site infections. [14]

Among 89 patients, 25 patients underwent emergency surgery and 64 patients underwent elective surgery. In this study increased surgical site infection was observed with elective surgery. Earlier study shows that out of 250 patients, 118 patients were emergency surgeries and 132 patients were elective surgery.[14]

Among 89 patients, 46 patients were males and females 43 got infected, the present study incidence of surgical site infection was slightly more among males compared to females. Earlier study shows that out of 48 patients 22 were males and 26 were females.[14]

Among 89 patients, 5 patients were less than 15 age, 37 patients were between the 16 – 30 age, 21 patients were between 31 – 45 age and 13 were between 46 – 60 and 13 patients were above 60. So, this current study incidence of surgical site infection was high in the age between 15 – 30. Earlier study shows that age of patients with SSIs was high between 56 - 70.[14]

Among 89 patients, 4 patients were neuro surgeries, 26 were ortho surgeries, 19 were OBG, 7 were gastro surgery and 33 were general surgery. This study revealed that general surgery has higher surgical site incidence. Earlier study shows that patients with SSIs was high in abdominal surgeries. [14]

CDC classified the wound into four categories clean, clean contaminated, contaminated and dirty-infected. This present study showed 40 patients were clean wound, 30 patients were clean – contaminated, 14 were contaminated and 5 were dirty – infected. Earlier study shows that 7 patients were clean wound, 14 patients were clean – contaminated, 10 patients were contaminated wound, 17 patients were Dirty – infected.[14]

The study incidence of surgical site infection was more with the diabetic patients and more risk factors are present which are associated with the surgical site infections and also because of poor patient hygienic, external fixator, antibiotic prophylaxis is not given for the emergency surgery, and unhygienic dressing that all the factors lead to surgical site infections. Earlier study revealed that major factors that influencing the SSI were diabetes, obesity, pre – operative antibiotic usage, duration of surgery,

emergency surgeries and levels of haemoglobin and albumin levels.[14]

Escherichia coli was found to be most common pathogen associated with surgical site infection followed by Klebsiella species and methicillin resistant staphylococcus Aureus. Earlier study shows that most common pathogens were Klebsiella SSP followed by E – Coli and Proteus SSP, Acinetobacter, S. Aureus and Coagulase – negative staphylococci.[14]

And also, in this study quality tools are implemented (Ishikawa diagram) in order to identify the causes of increased surgical site infections. Ishikawa diagram can help in brainstorming to identify possible causes of the problem and in sorting ideas into useful categories. A fishbone diagram is visual way to look at the cause and effect. It is the more structured approach than some other tool available for brainstorming causes of a problem. In this study identified the many causes using fishbone diagram in the pre-operative factors, pre-operative team factor, patient factors, surgeon technique, work environmental factors, organization and management factors and post-operative factors. Earlier study identified the gaps in pre – operative care, intra – operative care, post-operative care, Aseptic Technique, OT Environment, OT Instruments Sterilisation.[11]

SUMMARY

The retrospective study was conducted at a tertiary care teaching hospital. This study was conducted to identify the surgical site incidence, root causes and organisms associated with surgical site infections.

The study included 27,122 patients underwent surgery, the incidence of surgical site infections revealed that 89 patients were infected. Among 89, 64 patients went for elective surgery and 25 patients for emergency surgery. And in that male were 46 patients and female were 43 patients.

This study showed that incidence rate of surgical site infection more in the age group between 15 – 40.

Major Factors associated with surgical site infections are diabetes, obesity, external fixator, poor patient hygiene, duration of surgery, unhygienic dressing for wound.

This study included all major surgeries like ortho surgeries, neuro surgeries, OBG, Gastro surgeries, and General surgeries. It revealed General surgery has higher incidence rate.

The micro – organism isolated from surgical site infections were E. coli followed by Klebsiella species and Methicillin resistant staphylococcus Aureus.

Fishbone diagram was implemented to analysis the causes of surgical site infections factors. It helps to identify the causes in pre – operative factors, pre – operative team factors, patient factors, surgeon factors, work environment factors, organizational and management factors and care delivery problems.

CONCLUSION

Surgical site infections are most common post – operative complication. The study conducted to analysis the incidence of surgical site infections and also to analysis the quality tools on surgical site infections. The current study made clear that Surgical site infection rate was high. Surgical site infection was found more in between the age group of 15 – 40 and also affect slightly more among males and compared to females. Factors influencing surgical site infection were diabetes, patient poor hygiene, external fixator and unhygienic dressing. E. coli was observed in most of surgical site infection followed by Klebsiella species and methicillin resistant staphylococcus Aureus. Therefore, controlling the influence factors and proper surveillance towards the patient care will reduces the surgical site infections and improves the overall quality.

RECOMMENDATIONS BASED ON THE STUDY

- Patients should be advised for proper pre – operative shower of patients with antiseptic soap.
- Periodic dressing changes for the first 24 – 48 hours after surgery.
- Following of proper Antibiotic Prophylaxis regime pre- and post-surgery.
- Usage of hair clippers to clean the surgical area instead of shaving.
- Adequate maintenance of operation theatre environment for surgery.
- Strict adherence of the full surgical team to hand scrub techniques before surgery.
- Substituting staplers with suture material for better and clean skin closure.

- Regular and routine training and infection control program need to be carried out for sensitizing the practices in the operation theatre.
- Standard operation protocol should be maintained for all procedures done across various department of the hospital.
- Sensitise patient towards the maintenance of hygiene pre- and post-surgery.

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