

## A Prospective Study of Surgical Wound Infection in a New Government Medical College Hospital

Dr.K.K.Singh<sup>1</sup>, Dr.Sanjay Kumar<sup>2\*</sup>

<sup>1</sup> Associate Professor, Department of Surgery, Medinirai Medical College, Medininagar, Palamu, Jharkhand.

<sup>2\*</sup> Assistant Professor, Department of Surgery, Medinirai Medical College, Medininagar, Palamu, Jharkhand.

Corresponding Author: Dr.Sanjay Kumar

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### Abstract

**Introduction:** A surgical site infection (SSI) is an infection that occurs after surgery in the wound created by an invasive surgical procedure and in the part of the body where the surgery took place. This can sometimes be superficial infection involving only the skin, but at times it can be more serious and can involve organs and implant material. SSIs are the third most important cause of Hospital-acquired infections & they account for a quarter of all nosocomial infections. These infections are mainly associated with considerable morbidity. It has been reported that over one-third of postoperative deaths are related to it.

**Materials and Methods:** This is a prospective study, carried out on 225 patients operated in the Surgery department of Medinirai Medical College Hospital, Palamu, Jharkhand India over a period of eighteen-months. The parameters included in this study were, 1.) age of the patient, 2.) presence/absence of Diabetes, 3.) anemia, 4.) preoperative hospital stay, 5.) details of the timing of antimicrobial prophylaxis, 6.) surgical wound infection, 7.) type of surgery (emergency and elective surgery), 8.) duration of surgery, and 9.) the type of wound classes.

**Results:** Out of 225 patients observed, 32 patients developed surgical site infections (14.22%). Out of 32 infected cases, 27 cases were culture-positive (84.38%, 27/32), while 5 cases were culture negative (15.62%, 5/32).

**Conclusion:** Surgical site infection is one of the important complications of Surgeries. SSI rate is increasing due to poor hygienic conditions, and lack of proper antibiotics selection. Other conditions that may be considered as risk factors for the development of SSI are the presence of anemia, diabetes, obesity, increased preoperative stay in hospital, improper timing of antibiotics administration, etc. SSI is responsible for increased cost to healthcare.

**Key Words:** surgical site infections, elective surgery, anemia, Diabetes, obesity.

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### I. Introduction

A surgical site infection is an infection that occurs after surgery in the wound created by an invasive surgical procedure and in the part of the body where the surgery took place. This can sometimes be superficial infection involving only the skin, but at times it can be more serious and can involve organs and implant material. SSIs are the third most important cause of Hospital-acquired infections & they account for a quarter of all nosocomial infections. These infections are associated with considerable morbidity. It has been reported that over one-third of postoperative deaths are related to it.<sup>1</sup>

SSIs can range from a relatively trivial wound discharge with no complications to a life-threatening condition.<sup>2</sup> SSI is responsible for increasing the cost of healthcare to the patient as well as the health care provider. It can double the length of stay in the Hospital and thereby increase the costs of health care, which can be related to re-operation, extra nursing care and interventions, and drug treatment costs. The frequency of these infections varies from patient to patient and hospital to hospital. This study is conducted in a newly established Government Medical College Hospital in a rural region of Jharkhand.

There are numerous patient-related (endogenous) and process/procedural related (exogenous) risk factors that can affect a patient's exposure to developing a SSI. Some of these factors, such as age and gender cannot be changed.<sup>3</sup>

However, a number of other elements may be for considerations, such as Diabetes, smoking, proper use of antibiotics and Intra-operative techniques and having tissue respect in order to reduce the chances of developing SSI after surgery. Despite improved understanding of the pathophysiology and improved methods of prevention and prophylaxis, surgical site infection remains the common cause of postoperative morbidity and mortality.<sup>4</sup>

It is therefore imperative to implement adequate measures and following strict guideline for prevention of surgical site infection issued by different health bodies, from time to time in order to reduce these incidences and to prevent them. It is necessary to identify the epidemiology of these infections.<sup>5</sup> So the present study was conducted with the objective to know the causes of incidence of surgical site infections, its association with various risk factors, frequencies of various pathogens causing SSIs, and their antibiotic profile at our hospital.

## II. Materials And Methods

This was the prospective study carried out in the Department of Surgery, Medinirai Medical College, Medininagar, Palamu, Jharkhand, India, during eighteen-month period (August 2019 to January 2021). 225 patients admitted at our hospital, who underwent various surgical procedures, were included in this study.

The patients with age above 14 years and more, and those who did not have previous infections at surgical sites were included in the study. Other aspects that were accounted and considered were as follows:

All diagnosed Wound infection after surgery having any one of the following:

- a. serous or non-purulent discharge from the wound,
- b. pus discharge from the wound.
- c. serous or non-purulent discharge from the wound with signs of inflammation (edema, redness, warmth, increased local temperature, fever > 38°C, tenderness).

Swabs were obtained from wounds and were processed without delay using standard microbiological methods. Wound class was considered as clean, clean-contaminated, contaminated, and dirty as per National Research Council classification criteria. This classification is based on the extent of intraoperative contamination. The data collected includes the age of patient, Diabetes, preoperative hospital stay, details of the timing of antimicrobial prophylaxis, surgical wound infection, type of surgery (emergency and elective surgery), duration of surgery, the wound classes, and Hemoglobin percentage apart from the demographic profile of the patient. Timing of administration of prophylactic antimicrobial was considered early operative if it was given more than 2 hours before incision, preoperative if it was given less than 2 hours before incision, peri-operative if it was during surgery, and postoperative if it was given after the completion of surgery. Collected data were analyzed accordingly.

## III. Results

Out of 225 patients observed, 32 patients developed surgical site infections (14.22%). Out of 32 infected cases, 27 cases were culture-positive (84.38%, 27/32), while 5 cases were culture negative (15.62%, 5/32).

**Table 1: Showing SSI rate according to a preoperative hospital stay in days**

Pre-op. Hospital stay	No. of patients	Infected patients	SSI Rate
0-1	94	05	5.31%
2-5	88	14	15.9%
6-10	31	08	25.8%
>10	12	05	41.66%

**Table 2: Showing SSI rate according to the wound class**

Wound Class	Total patients	Infections	SSI Rate
Clean	190	24	12.63%
Clean Contaminated	27	5	18.51%
Contaminated	6	2	33.33%
Dirty	2	1	50%

**Age and Sex:** Out of a total of 173 male patients, 24(13.87%) developed SSIs, whilst 7 (13.46%) out of 52 female patients got SSIs. Thus, it could be inferred that males were more prone to post-operative wound infections. Age of more than 50 years was found to be a risk factor for Post-operative wound infections.

**Quetelet Index (BMI):** Most of the patients had a Quetelet Index of between 20-30 kg/m<sup>2</sup>. Obesity was more common in females, and a Quetelet index of more than 40 was identified as a risk factor for Postoperative wound infections.

**Causative Organism:** The pathogens isolated were Staphylococcus aureus (12/32, 37.5%), Escherichia coli (8/32, 25%), Klebsiella sp. (3/32, 9.38%), Coagulase negative Staphylococci (3/32, 9.4%), Pseudomonas aeruginosa (2/32, 6.25%), Proteus mirabilis (1/32, 3.1%) and others (3/32, 9.4%).

**Emergency vs. Elective Surgery:** In patients with emergency surgery, the infection rate was 16.48%, while in patients operated electively, the rate was 13.39%.

**Preoperative Hospital stays:** In an elective surgery, the rate of infection increased with an increase in a preoperative hospital stay. The infection rate in patients having preoperative hospital stay 0-1 day was 5.31% (5/94), in patients with preoperative hospital stay 2-5 days was 15.9% (14/88), and in patients with a

preoperative hospital stay, 6-10 days was 25.8% (8/31). For more than 10 days pre-op. hospital stay it came out to be 41.66% (5/12cases)

**Wound class:** For surgical site infections with their rate according to wound class refer [Table 2]. The infection rate is 12% in clean wounds, whereas it was almost 50% in dirty wounds. It was our observation that, there was a clear correlation between the wound infection rate and the contamination of the wound.

**Diabetes:** In the present study, out of 23 patients with Diabetes Mellitus, 6 patients had SSI. The rate of SSI was 26% (6/23) in patients with Diabetes Mellitus compared to the rate of SSI in patients without Diabetes mellitus, which was 12.87% (26/202).

**Anemia:** It was observed that patients having hemoglobin level below ten gm% accounted for 7.5% (17/225). The wound infection rate was 23.53% (4/17) in these patients compared to 13.46% (28/208) in normal individuals.

#### IV. Discussion

The present study was carried out in 225 patients who underwent various surgeries at our hospital. The etiology of surgical site infections is dependent on the location of the surgery, the bacterial load in the tissue or blood peri-operatively, and the integrity of host defenses.<sup>6</sup>

The overall infection rate varies from surgeon to surgeon, Hospital to Hospital, one procedure to another, and even from one patient to another patient. In our study, the overall surgical wound infection rate was 14.22%. Many studies from India at different places have shown the SSI rate to vary from 6.09% to 38.7%.<sup>7</sup>

The infection rate in Indian hospitals is much higher than that in other countries; for instance, in the USA, it is 2.8%, and it is 2-5% in European countries. The higher infection rate in Indian hospitals may be due to the poor set up of our hospitals and also due to the lack of attention towards the basic infection control measures.<sup>8</sup>

In our study, we found that SSIs are more common in patients above 50 years of age. Nursing et al. and Patel Sachin et al. also recorded the similar trends. This could be due to multiple factors like a low healing rate, malnutrition, mal-absorption, increased catabolic processes, and low immunity.<sup>9</sup>

Obesity is a well-established risk factor for surgical site wound infections. Patients should be advised to reduce weight before all planned surgeries. In our study, a Quetelet index of more than 40kg/m<sup>2</sup> was associated with a higher rate of postoperative wound infections in accordance study by Narasinga Rao Bandaru et al.<sup>10</sup>

We found staphylococcus aureus (37.5%) as the most commonly identified organism from wounds similar to Shittu et al., but Patel Sachin et al. found Escherichia coli as the most offending pathogen.

The infection rate in our study was more with emergency surgery when compared to elective surgery, same as that reported by Patel Sachin et al. and Satyanarayana V. e al. The high rates of infection in emergency surgeries may be because of insufficient preoperative preparation, the underlying conditions which predisposed to the emergency surgery and the more frequency of contaminated or dirty wounds in emergency surgeries. Emergency surgeries were usually performed by junior doctors, more often with complications & had dirtier cases.<sup>11</sup>

#### V. Conclusion

Surgical site infection is one of the important complications of Surgeries. SSI rate is increasing due to poor personal hygienic conditions of the patients, as well as lack of proper sanitation in the hospitals. The rate of SSI is strongly influenced by the operation theatre quality. Lack of proper antibiotics selection may be another cause of SSI. Other factors that may be considered as risk factors for the development of SSI are the presence of anemia, Diabetes, obesity, increased preoperative stay in Hospital, proper timing of antibiotics administration, etc. Tissue respect during surgery and correct surgical techniques go long way in prevention of SSI.

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