

## Superficial Surgical Site Infection in Hand Surgery: A Cross-sectional Study in a Hand Surgery Unit

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### ABSTRACT

#### Introduction

Superficial surgical site infection (SSI) in hand surgery is generally considered to be less common. Infection of surgical site can lead to poor outcomes. Burden of surgical site infection in hand surgery has not been studied in our part of the world. We sought to determine the prevalence rate superficial surgical site infection in patients undergoing hand surgery.

#### Methods

We used standard definition of CDC National Healthcare Surveillance Network (NHSN) criteria to evaluate 112 consecutive adults undergoing various hand surgery procedures outcome at the end of the second week for superficial SSI. The study was conducted over a period of six month (November 2022 to May 2023).

#### Results

The prevalence of superficial surgical site infection was 6.25%. Among those affected 0.02% cases were diagnosed based on signs and symptoms criteria. In 0.03% patient the wound discharge yielded *Staphylococcus aureus*. The most common cause requiring hand surgery were workplace injuries, household injuries, and injuries due to road traffic accounting for 45.54%, 26.79%, and 18.75%, respectively. Crushing type of injury which was the most common of all mechanisms of injury.

#### Conclusion

The prevalence rates of hand procedures are low but not negligible. This under-evaluated condition must be more extensively evaluated in a multicenter study involving larger population.

#### Keywords

*Hand surgery; surgical site infection*

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## INTRODUCTION

Healthcare providers worldwide are faced with the challenge of healthcare-associated infections. Surgical site infection (SSI) is a predominant health care-associated infection.<sup>1,2</sup> The world wide incidence of SSI is estimated to be 2.5%.<sup>3</sup> It has a major bearing on the outcome of surgery. As a result of SSI there is significant morbidity and consumption of healthcare resource and result in deterioration of quality of life.<sup>4</sup>

Superficial surgical site infection, a subset of SSI, involves only skin and subcutaneous tissue of the incision site and can occur within 30 days of the operation if no implant is placed or within 90 days if the implant is placed.<sup>5</sup>

Postoperative infection has been considered relatively rare in hand surgery as this anatomical location has been supposed to have a superior defense against infection in comparison to other areas as in orthopedics, plastic and general surgery.<sup>6</sup> This is however not backed by robust data. Studies assessing SSI in hand and wrist trauma, the estimate risk range from 3% to 10%, reflecting a similar risk to all operative procedures.<sup>7</sup>

Exact rates of infection in hand surgery are difficult to determine because of lack of uniform definition of infection, supposed low rates of infection in hand surgery, challenges associated with wound surveillance in outpatient surgery. Moreover, studies have failed to distinguish this subset of SSI from deep infection, and there is a lack of literature reporting this event.

The study was carried out to assess the prevalence of superficial SSIs in hand surgery unit using a standard definition. A better understanding of the prevalence might be useful in allocating of resources and implementing preventive strategies.

## METHODS

This was a cross-sectional study undertaken at a hand surgery unit of plastic and reconstructive surgery department of a referral hospital. Consecutive patients aged 16 years or above, who underwent procedures for hand and upper extremities (elective and emergency) were included. We excluded patients with an active infection at the operative site and those with repeat surgery at the same anatomical site. Structured data collection tools captured the data on age, sex, affected side, injury type (clean lacerations, crush injuries or surgical incisions) and site of injury (workplace, household, road traffic accidents or miscellaneous).

All the patients received preoperative antibiotics followed by five days of oral antibiotic prophylaxis as per hospital protocol. In cases with the discharging wound, the discharge was subjected to culture, and antibiotic was prescribed as per antibiogram

Table 1. Criteria for defining superficial surgical site infection

Criteria
Superficial surgical site infection involves skin or subcutaneous tissue of the incision and at least one of the following:
<ul style="list-style-type: none"> <li>• Purulent drainage, with or without laboratory confirmation, from the superficial incision</li> <li>• Organisms isolated from an aseptically obtained culture from the superficial incision</li> <li>• At least one of the following signs or symptoms: pain, localized swelling, erythema, or heat and superficial incision, is deliberately opened by surgeon, unless incision is culture negative.</li> <li>• Diagnosis of superficial incisional SSI by surgeon</li> </ul>

along with analgesics for a minimum of one week. The diagnosis of superficial surgical SSI was made at end of second week when patients presented for suture removal or follow-up. Study participants were assessed for SSI using CDC's National Healthcare Surveillance Network (NHSN) criteria. (Table 1) Data collection started on November 2022 and was completed in May 2023. Data were entered and analyzed in Microsoft Excel. Numerical variables were summarized using Mean or Median and Inter-Quartile Range (IQR) and frequencies as appropriate. The prevalence of SSI was reported as a proportion of the number of patients with SSI among the study participants included in the study.

## RESULTS

We included a total of 112 patients in the study; the median age was 30 (IQR 23 – 40) years and most of the patients were male (106, 94.64%). A

Table 2. Characteristics of the injuries

Characteristics	Frequency	Percentage
Injured side		
Right hand	59	49.7%
Left hand	52	46.8%
Both hands	1	0.9%
Site of injury		
Work Place	51	45.5%
Household	30	26.8%
Road traffic injury	21	18.8%
Others	10	8.9%
Mechanism of injury		
Clean/Sharp injury	27	24.1%
Crush injury	67	59.8%
Non-open injury	18	16.1%

majority (109, 97.32%) of the study participants had right-hand dominance and more than half of them had injuries on the right side (Table 2).

Superficial SSI was detected in 7 (6.25%) patients; organisms were isolated from five patients and two patients we diagnosed based on the symptoms and signs. *Staphylococcus aureus* was the most common organism isolated.

## DISCUSSION

Our study found that the prevalence of superficial surgical site infection was 6.25% and *Staphylococcus aureus* was the predominant organism isolated.

In a similar study by AJ Platt et al. overall prevalence of surgical site infection was 10%. This study noted increased postoperative infection in emergency procedures not receiving antibiotics. There was also an independently significant postoperative infection in dirty wounds. And regarding the organism *S. aureus* was the most common isolate.<sup>8</sup>

In a more recent study by Davies et al. which studied the effect of time to surgery for open hand injuries and the risk of surgical site infection, it was 4%. In the study, *Staphylococcus aureus* was the most common isolate. The time from injury to surgery and preoperative antibiotics did not change the risk of infection.<sup>9</sup>

Both studies have not individually differentiated between the superficial and deep surgical site infection. But the infection rate is 10% and below in both the study and ours. The organism that has been isolated most commonly in all these three studies are the same. These studies are done at different periods but a major paradigm shift has been regarding the idea of use of antibiotic prophylaxis. Our study which is a prevalence study and has not taken into account this factor.

Menendez et al. studied rate of SSI in ambulatory hand surgery cases where infection occurred in 0.17% procedures at 14 days and 0.33% cases at 30 days. This study selected cases done on ambulatory basis and select type of surgery of hand. This study demonstrates a very low infection rate in ambulatory surgery of the hand compared to above study and our finding.<sup>4</sup> In another study conducted by Kambiz H et al over for two years, reported infection rates of 1% observed this low infection rate was reasoned to be due seniority of the surgeon, operative technique and short duration of the operation.<sup>10</sup> Both of these studies highlight low rate of surgical site infection in ambulatory hand surgery. This low rate can be because SSI in patients undergoing outpatient surgery are not typically detected by existing hospital infection surveillance and can go unaccounted for as many of go unreported. Our study shows that infection

rates are similar in many similar studies. Our study included both the ambulatory and inpatients moreover single observer made the diagnosis. This might have led to elimination of interobserver difference in diagnosing the condition. This helps to bust the myth that surgical site infection is less common as this area is supposed to be more immune to infection. The surgical site infection was similar to overall prevalence rate of hospital care-associated infection which was 7.6% and increased significantly with age.<sup>11</sup>

A single centre study including a small population limits our study. More extensive study including multiple centre needs to be carried out to evaluate further this condition and various other facets of this condition. But this study certainly paves the way for similar study in this field.

## CONCLUSION

Prevalence of superficial surgical site infection in hand surgery was 6.25%. *Staphylococcus aureus* was the most common organism isolated. This data on prevalence can provide basis for better distribution of resources and implementation of preventive strategies as surgical site infection can lead to prolonged morbidity and causes added pressure on already restrained health care resources.

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## CONFLICT OF INTEREST

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