

# Infection Rates Amongst Patients Undergoing Treatment of Long Bone Fractures at a Tertiary Care Centre: A Comparative Study

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## ABSTRACT

**Background:** Prevention of sepsis of wound is the chief and prime objective in the management of fractures. Ideal treatment sequence of open fractures include tetanus prophylaxis, immobilization, antibiotic prophylaxis, wound debridement with fixation of fracture. Most of the infections usually develop during first month after surgery; a vast majority develop during first seven days. The aim of present study is to establish the incidence of infection in fractures treated by open reduction. **Methods:** The present comparative study was conducted in the Department of Orthopaedics, Mata Gujri Memorial Medical College, Kishanganj, Bihar (India) during a period of 1 year. Patients were divided into two groups i.e. Group I (individuals undergoing treatment within 8 hours after trauma) and Group II (individuals undergoing treatment after 8 hours of trauma). Following data was collected from the patient or from medical records i.e. time of accident, mechanism of injury, time elapsed between trauma and emergency surgery and length of hospital stay was also noted. The exact anatomical location of fracture and type of surgical treatment performed was also noted. The data was organised in a tabulated form and analyzed using SPSS software. **Results:** Total of 104 patients reported to the hospital during the study. 75% reported with road traffic accident, making it the leading cause of trauma. 10% reported with a fall from a level. There were 51 patients (49%) with fractured tibia making it the most common fracture of long bone. 69.2% patients (n=72) underwent external fixation. Cast was applied in 14.4 % (n=15). In patients treated within 8 hours of trauma, only 8 patients (12.7%) of total 63 patients suffered from infection. **Conclusions:** The delay between trauma and surgery can affect infection rate amongst fracture of long bones.

**Key words:** Debridement, Comparative, Immobilization, Tetanus.

Section – Orthopaedics

## INTRODUCTION

Intact skin and immune system protect our body from infection but they get disrupted due to trauma and surgery especially while open reduction and internal fixation of fractures. Prevention of sepsis of wound is the chief and prime objective in the management of fractures. Ideal

treatment sequence of open fractures include tetanus prophylaxis, immobilization, antibiotic prophylaxis, wound debridement with fixation of fracture. In the end soft tissue continuity is restored.<sup>[1]</sup> Infection rate following open fracture range from 3-25% and it is of great challenge to surgeons to minimize these rates.<sup>[2-4]</sup> The first and foremost step in order to reduce infection rates is careful hand washing with copious amount of water as given by Ignas Smellweis.<sup>[5]</sup> Most of the infections usually develop during first month after surgery; a vast majority develop during first seven days. The most common pathogens that were isolated were Staphylococcus aureus, Escherichia coli, Proteus and Pseudomonas.<sup>[6]</sup>

It has been established by some authors that delay in the treatment by more than 6 hours due to factors such as treatment of associated injuries, delay in transfer, and delay in availability of operating room etc results in higher chances of infection. According to Gustillo's classification, all the fractures must undergo copious irrigation with approximately 3L of saline per grade and thorough

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debridement of every fracture must be done.<sup>[6]</sup> The aim of present study is to establish the incidence of infection in fractures treated by open reduction.

### METHODS

The present comparative study was conducted in the Department of Orthopaedics, Mata Gujri Memorial Medical College, Kishanganj, Bihar (India) during a period of 1 year. In this study all the trauma patients reporting to the hospital with fracture of long bones were included in the study. The study was approved by the ethical committee of the institute. All the participants involved in the study were informed about the study and a written informed consent was obtained. Patients were divided into two groups i.e. Group I (individuals undergoing treatment within 8 hours after trauma) and Group II (individuals undergoing treatment after 8 hours of trauma). Information regarding time was obtained from patient or patient’s family or from the record by hospital rescue team or from hospital case records. The patients were admitted in the department and were given tetanus prophylaxis at the time of admission. All of them were treated according to the same protocol. Initially debridement of the site was done which was followed by surgical cleaning with saline and finally stabilization and fixation of the fracture site was performed. Postoperative antibiotics were given for 1 week period. Presence of infection was noted after a period of 4 weeks after injury. The following clinical signs denoted infection like redness, swelling, warmth or pus formation. Complementary tests such as leukogram, ESR, PCR and blood cultures were also performed.

Following data was collected from the patient or from medical records i.e. time of accident, mechanism of injury, time elapsed between trauma and emergency surgery and length of hospital stay was also noted. The exact anatomical location of fracture and type of surgical treatment performed was also noted. The data was organised in a tabulated form and analyzed using SPSS software. Chi square test was used for analysis and p value of less than 0.05 was considered significant.

### RESULTS

During the period of one year, total of 111 patients reported to the hospital. Out of them 2 died because of head injury, 1 patient underwent amputation and 4 patients did not report during the follow period. Hence these were excluded from the study.

Figure 1 depicts the mechanism of injury in trauma patients. Vast majority of them i.e. 75% reported with road traffic accident, making it the leading cause of trauma. 10% reported with a fall from a level. Other mechanisms of injury included fire (3.5%), sports injury (3%), and physical assault (2%) and crush injuries (1%).

Table 1 depicts the anatomical distribution of fracture in trauma patients. There were 51 patients (49%) with fractured tibia making it the most common fracture of long bone. 23.1% patients (n=24) has femur fracture. Least

number of fractures were seen in fibula (1.9%). Radius and ulna both were fractured in 15 patients (14.4%). There were 5 patients (4.8%) who suffered from fracture of humerus.

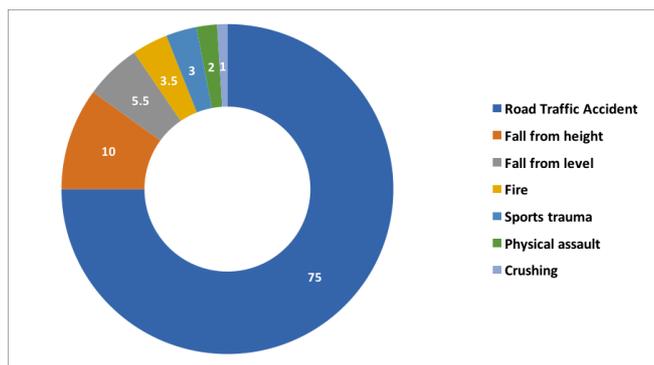


Figure 1: Distribution of fracture according to mechanism of injury

Table 1: Distribution according to location of fracture site

Site	Number of cases (n=104)	Percentage
Tibia	51	49.1%
Femur	24	23.1%
Radius	4	3.8%
Ulna	3	2.8%
Humerus	5	4.8%
Fibula	2	1.9%
Radius and ulna	15	14.4%

Table 2 demonstrates the treatment strategy followed amongst fracture patients. 69.2% patients (n=72) underwent external fixation. Cast was applied in 14.4% (n=15). Plate and screw fixation was used a mode of treatment in 5.7% patients (n=6). External fixation along with K wire was applied to 2.8% patients (n=3). 1.9% patients (n=2) were treated by k wire and external traction each.

Table 2: Distribution according to method of stabilization

Method of stabilization	Number of cases (n=104)	Percentage
External fixation	72	69.2%
Cast	15	14.4%
Plate and screw	6	5.7%
External fixation + k wire	3	2.8%
Tension band	4	3.8%
K wire	2	1.9%
Skeletal traction	2	1.9%

Table 3 demonstrates the infection rate in patients with fracture in relation to the time elapsed between trauma and surgery. In patients treated within 8 hours of trauma, only 8 patients (12.7%) of total 63 patients suffered from infection of the fracture site and rest 87.3% patients (n=33) were free of infection. In Group II patients i.e patients treated after 8 hours of trauma, 17.1% patients (n=7) out of 41 patients had infection at the fracture site and rest 34 patients (82.9%) were free of infection. The total infection rate amongst both the groups was noted to be 14.4%.

**Table 3: Relationship between times elapsed between trauma and surgery and infection rate**

Infection	< 8 hours		>8 hours		Total	
	n	%	n	%	n	%
Present	8	12.7	7	17.1%	15	14.4%
Absent	55	87.3	34	82.9%	89	85.5%
Total	63	60.5 %	41	39.5%	104	100%

## DISCUSSION

In our study, conducted upon 104 fracture patients, 14.4% of the patients suffered from infection at the fracture site. Out of these 12.7% patients were treated within 8 hours of trauma and 17.1% patients were treated after 8 hours of trauma. According to Friedrich,<sup>[7]</sup> bacterial growth in contaminated wound terminates within 6-8 hours after inoculation therefore debridement becomes less effective to control infection after this time period. The appropriate treatment for fracture management has always been a subject of controversy. Infection rate of open reduction with plate fixation has been reported to be 13%<sup>8</sup>, in case of debridement it has been 12.1%.<sup>[8,9]</sup> It has been seen that in case of closed reduction of fractures of tibia, infection rates range from 17.6%- 23.6%<sup>9,10</sup> while in those treated by open reduction infection rates were found to be 43.8%.<sup>[10]</sup>

According to Scully,<sup>[6]</sup> 4 C's should be followed to ensure adequate muscle viability following debridement, those are color, capacity to bleed, contractibility and consistency. There have been few studies only in the past which depict the relationship between infection and delay in surgical debridement.<sup>[11-13]</sup> According to a study conducted by Muller et al in 2003, infectious complications were reported in 20.5% of all fracture cases.<sup>[14]</sup> The timing of postoperative antibiotics is also considered as a crucial factor in prevention of infection. In a study reported by Lack et al<sup>[15]</sup> on 137 patients found that if antibiotics are given within 66 minutes post trauma leads to a significant decrease in rate of sepsis. In a study conducted by Gustilo et al,<sup>[6]</sup> 70.3% of open wounds yielded positive cultures. Therefore antibiotic administration is a prerequisite for fracture healing. In a study conducted by Spencer et al<sup>16</sup> and Gustilo et al the overall incidence of infection was found to be 13.24%. In a study conducted by Miguel De Castro Fernandes et al,<sup>[16]</sup> the overall infection rate was found to 13%.

Various reasons are found to be responsible for infection at the fracture site. Factors such as type of fracture i.e. severity and location of lesion, patient related factors like presence of any co morbidities, smoking etc and surgeon's related factors like experience, aggressiveness of debridement and mode of osteosynthesis can affect rate of sepsis. Several drawbacks have been associated with our study. History of smoking or any other co morbidities was not taken priorly and hence their effect was not studied on fracture healing.

## CONCLUSION

In our study, the overall infection rate was found to be 14.4%. In 12.7% cases infection was found to be occurring in less than 8 hours of trauma and in 17.1% cases infection occurred after 8 hours of trauma. In patients with most severe fracture, infection rate was reported even before 8 hours of trauma. The delay between trauma and surgery can affect infection rate amongst fracture of long bones.

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