ORIGINAL RESEARCH PAPER
Volume - 15 | Issue - 05 | May - 2026 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

# KITE STRING (MANJA) INJURIES TO THE LOWER LIMB: A CASE SERIES HIGHLIGHTING OCCULT STRUCTURAL DAMAGE AND A PROPOSED CLASSIFICATION SYSTEM

**Orthopaedics**

**Dr. Abhishek Samuel** MS Orthopaedics Associate Professor, Department of Orthopaedics, Christian Medical College Ludhiana, Punjab

**Dr. Rohit Theodore*** MS Orthopaedics Assistant Professor, Department of Orthopaedics, Christian Medical College Ludhiana, Punjab*Corresponding Author

## ABSTRACT

**Introduction:** Kite flying is a culturally significant recreational activity across South Asia, particularly during festivals such as Makar Sankranti. However, the increasing use of abrasive, glass-coated kite strings ("manja") has transformed this into a source of significant morbidity and mortality[1]. This study aims to synthesize available literature to analyze the mechanisms, injury patterns, clinical implications, and preventive strategies related to kite string injuries. **Methods:** A narrative review was conducted using selected peer-reviewed articles focusing on kite string-related injuries, including epidemiological studies, case reports, and forensic analyses[2,6]. **Results:** Kite string injuries range from superficial lacerations to severe, life-threatening trauma involving neurovascular structures[2–4]. The neck is the most vulnerable site, particularly among motorcyclists, with injuries often resulting in vascular compromise and airway damage[1,3,6]. Upper limb injuries, including tendon and nerve transections, are common among kite flyers[2,4]. Fatal cases are associated with high-velocity impact and deep incised wounds[6]. Early surgical intervention significantly improves outcomes in limb-threatening injuries[4].**Conclusion:** Kite string injuries represent a preventable health hazard. Implementation of regulations, public awareness campaigns, and use of protective measures are essential to reduce injury burden and associated fatalities[1,3].

## KEYWORDS

Kite String, Manja, Tendon, Hazard, Public Health

## INTRODUCTION

Kite flying is a popular recreational and cultural activity practiced worldwide, particularly in countries such as India, Pakistan, and Brazil[1]. In India, festivals like Makar Sankranti and Basant Panchami are marked by widespread participation in competitive kite flying[1,3]. Traditionally, kite strings were made of cotton; however, the introduction of synthetic and glass-coated strings, commonly known as "manja," has significantly increased the risk of injury[2,3].

Manja is typically coated with finely ground glass or metallic particles to enhance its cutting ability during kite competitions[2]. While effective in severing rival kite strings, this modification renders the string capable of causing severe injuries upon contact with human tissue[2,5]. The literature describes a wide spectrum of injuries, ranging from superficial abrasions to deep lacerations involving muscles, tendons, nerves, and major blood vessels[2–4]. In extreme cases, fatal injuries have been reported, particularly involving the neck[1,6].

Epidemiological studies highlight that young males are the most commonly affected demographic, with injuries frequently occurring during outdoor activities or while commuting, especially on two-wheelers[1,3]. The mechanism of injury often involves high-speed contact with a taut string, resulting in sharp, incised wounds resembling those caused by a blade[6].

Despite the frequency and severity of these injuries, there remains a relative paucity of comprehensive literature addressing their patterns, mechanisms, and prevention. This manuscript aims to consolidate available evidence from clinical, forensic, and epidemiological studies to provide a detailed overview of kite string-related injuries and to emphasize the need for preventive strategies.

## MATERIALS AND METHODS

A retrospective review was conducted of patients presenting with confirmed kite string injuries to the lower limb at a tertiary care centre between [January 2025– January 2026].

**Inclusion Criteria:**

- Documented history of kite string injury
- Lower limb involvement
- Underwent surgical exploration

**Data Collected:**

- Age and gender
- Mechanism of injury
- Site of injury
- Structures involved
- Time to surgery
- Type of repair
- Complications

Written informed consent was obtained from all patients.

**Case 1 Images**

**Figure 1. Preop images**

**Figure 2: Intra operative images**

**Figure 3: Post operative suture line images at 2 weeks**

**Case 2 Images**

**Figure 4: Pre operative images**

**Figure 5: Intra op images**

**Figure 6: Post op image at 2 weeks**

## RESULTS

Six patients with kite string injuries to the lower limb were included. The mean age was 38.3 years (range 12–60 years), with four males and two females. The most common mechanism of injury was pedestrian exposure (5 cases), followed by a single two-wheeler-related injury.

The tendoachilles was the most frequently involved structure (4 cases, 67%). Two patients had multi-tendon involvement involving tibialis anterior, extensor hallucis longus, and extensor digitorum longus. One patient had partial posterior tibial artery injury, and one had superficial peroneal nerve involvement.

Based on the proposed classification, three cases were Type I and three were Type IV injuries.

All patients underwent surgical exploration and repair. Complex injuries required additional procedures including flexor hallucis longus tendon transfer and and VY plasty.

At a mean follow-up of three months:

- Three patients had no complications
- Two patients developed superficial flap necrosis (both Type IV)
- One patient was lost to follow-up

All remaining patients achieved satisfactory functional recovery without major disability.

- **Complications by Injury Type:** This stacked bar graph clearly illustrates that while Type 1 injuries had better overall outcomes, Type 4 injuries were specifically associated with **superficial flap necrosis**.

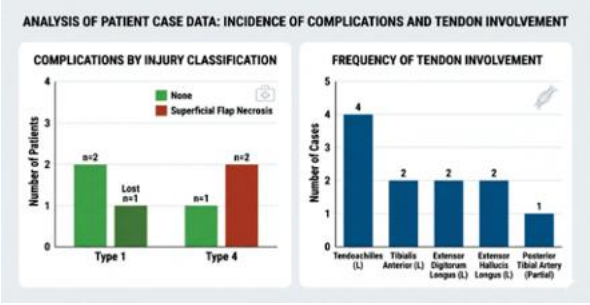


**Figure 6: Analysis of Patient case data**

**Table 1: Statistical Breakdown**

| Category | Finding | Detail |
|---|---|---|
| **Demographics** | Mean Age: 38.3 | Mean Age: 38.3 |
| **Severity** | 50% Type 4 | 50% Type 4 |
| **Surgical Need** | 100% Primary Repair | 100% Primary Repair |
| **Complications** | 33% Necrosis Rate | 33% Necrosis Rate |

- **Anatomical Focus:** The left-sided predominance suggests a specific vulnerability in traffic patterns or gait during kite-string encounters.

- **Complexity:** Type 4 injuries frequently involve multiple structures, requiring multiple procedures.

- **Prognostic Factor:** Injury classification is a strong predictor of postoperative flap necrosis, with Type 4 injuries being significantly more high-risk.

## DISCUSSION

### Mechanism of Injury

The primary mechanism of kite string injury involves high-tension, abrasive strings coming into contact with exposed body parts[2,3]. The kinetic energy generated during motion—particularly in motorcyclists—combined with the sharpness of glass-coated manja results in a slicing action often described as a "guillotine effect"[1]. This mechanism explains the characteristic clean-cut incised wounds observed in such injuries[6].

Additionally, injuries may occur due to entanglement of the string around body parts, leading to circumferential lacerations or even subtotal amputations[4]. The severity of injury is influenced by factors such as speed, tension of the string, and the nature of the abrasive coating[3].

### Epidemiology and Risk Factors

Multiple studies consistently report a predominance of injuries among males, particularly in the age group of 16–45 years[1,3]. This demographic is more likely to engage in kite flying or outdoor activities and is also more commonly involved in two-wheeler commuting[1].

Motorcyclists represent the highest-risk group due to the exposed nature of their posture and the speed at which they travel[3,6]. Pedestrians and children are also vulnerable, especially in urban areas during peak kite-flying seasons[2,5]. Seasonal clustering of cases, particularly during January, corresponds with major kite-flying festivals[3].

**Patterns and Distribution of Injuries**

Kite string injuries exhibit distinct anatomical patterns:

- **Neck injuries:** The most severe and potentially fatal injuries occur in the neck, involving major vascular structures and airway compromise[1,6].
- **Upper limb injuries:** Common among kite flyers, including tendon and nerve injuries, and even digital amputations[4].
- **Maxillofacial injuries:** Deep facial lacerations causing cosmetic and functional impairment[2,5].
- **Other injuries:** Lower limb injuries in pedestrians and associated trauma such as fractures and falls[2,3].

**Clinical Implications and Management**

Management depends on injury severity. Superficial injuries require basic wound care, whereas deep injuries demand surgical exploration[2,3].

Microsurgical repair of tendons, nerves, and vessels is essential in limb-threatening injuries, with early intervention improving outcomes[4].

Neck injuries require immediate airway management and hemorrhage control, often necessitating emergency surgery[1,6].

Importantly, minor-appearing wounds may conceal significant underlying damage[4].

**Forensic and Public Health Perspective**

Kite string injuries can mimic sharp weapon injuries due to their clean incised nature, posing medico-legal challenges[6].

Public health data indicate a rising trend, especially with synthetic manja use[1]. Fatal cases, though uncommon, highlight the lethal potential of such injuries[1,6].

**Prevention Strategies**

**Preventive measures include:**

- Regulation or ban on glass-coated manja[1]
- Public awareness campaigns[3]
- Protective gear for motorcyclists[1]
- Use of vehicle-mounted guards[6]
- Promotion of safe kite-flying practices[2]

Most injuries are preventable with appropriate interventions[3].

## STRENGTHS & LIMITATIONS

**Strengths**

- First institutional series focusing on lower limb kite string injuries
- Demonstrates spectrum of structural involvement
- Highlights orthopaedic surgical decision-making
- Provides clinical learning points and proposed classification

**Limitations**

- Small sample size
- Retrospective design
- Single-centre study
- Limited long-term functional outcome data

## CONCLUSION

Kite string injuries represent a significant yet preventable cause of trauma in regions where kite flying is culturally prevalent[1]. The use of abrasive manja has transformed a recreational activity into a public health hazard with potential for severe morbidity and mortality[1,3].

Characteristic injury patterns, including deep incised wounds and life-threatening neck injuries, necessitate increased awareness among clinicians and the public[2,6]. Early diagnosis and prompt management are crucial for improving outcomes[4].

Stricter regulations, combined with public education and preventive strategies, are essential to reduce the burden of these injuries and ensure safer participation in cultural practices[1,3].

**Proposed Theodore and Samuel classification for management of kite string injury around the ankle**

| Type | Level | Structures involved | Radiological Investigations | Surgical Procedure | Post op rehabilitation |
|---|---|---|---|---|---|
| I | Superficial | Skin and fascia only No tendon or neurovascular involvement | None | Wound debridement + Primary Closure | Immobilisation in a slab for 10 days – 14 days followed by full ROM and full weight bearing |
| II | Tendinous | Partial or complete clean cut tendon injury No neurovascular injury | Radiographs Ultrasound doppler MRI (if doubtful) | Wound debridement + end to end repair of tendon + Primary closure | Immobilization (non weight bearing) in slab for 2 weeks followed by full ROM and partial weight bearing with brace/boot till 6 weeks after that full weight bearing |
| III | Neurovascular | Nerve and/or vascular involvement | Radiographs Ultrasound doppler MRI CT angiography (if needed) | Immediate Arterial + nerve repair (Vascular/Plastic surgery teams) + Primary wound closure + Exfix | Immobilization (non weight bearing) in slab/exfix for 2 weeks followed by full ROM and partial weight bearing with brace/boot till 6 weeks after that full weight bearing |
| IV | Complex | Combined tendon (loss of tendon, shredded ends, Diseased tendon, loss of normal excursion) and Extensive soft-tissue damage (including skin problem) or contamination | Radiographs Ultrasound doppler MRI CT angiography | Wound debridement + VAC +Tendon transfer * (can be done as primary or secondary procedure) + secondary Skin coverage with either a flap or STSG | Immobilization (non weight bearing) in slab till wound heals and after 3 weeks of tendon transfer followed by initiation of ROM and partial weight bearing with brace/boot till 6 more weeks after that full weight bearing |

Tendon transfer may be performed as a primary procedure in acute trauma provided that adequate debridement has achieved clean surgical margins, the wound demonstrates uncompromised vascularity, there are no tenuous or thin skin flaps, and primary wound closure can be achieved without tension. Careful intraoperative assessment of tissue viability and perfusion is essential to minimize the risk of infection, flap necrosis, and failure of the transfer. Otherwise, secondary tendon transfer is preferred once the wound has healed.

## DECLARATIONS

**Conflict of Interest:** None
**Funding:** None
**Ethical Approval:** Obtained

**Consent:** Obtained from all patients

## REFERENCES


1. Singh, J. P., Basra, S., Chowdhary, P., Sharma, P., Kaur, A., Shubham, & Kaur, S. (2025). Deadly Threads in the Sky: A Forensic and Public Health Analysis of Kite String-Related Injuries and Fatalities in Northern India. *Cureus*, *17*(8), e91233. https://doi.org/10.7759/cureus.91233
2. Singh V, Puri P, Agrawal A, Kumar P, Singhal R. Kite string: an unusual mode of maxillofacial injury. *J Indian Soc Pedod Prev Dent*. 2013;31(3):188-190. doi:10.4103/0970-4388.117976
3. Prajapati C, Agrawal A, Atha R, Suri MP, Sachde JP, Shaikh MF. Study of kite string injuries in Western India. *Int J Inj Contr Saf Promot*. 2017;24(1):136-139. doi:10.1080/17457300.2015.1076850
4. Dhull K, Gupta D, Sarabahi S, Aggarwal N. Kite String Injury Causing Digital Subtotal Amputation. *Indian J Plast Surg*. 2022;55(1):115-116. Published 2022 Feb 21. doi:10.1055/s-0041-1740086
5. Hettige R, Snelling J, Bleach N. The dangers of kite flying: pseudoaneurysm of the facial artery following blunt trauma. *J Laryngol Otol*. 2010;124(2):223-225. doi:10.1017/S0022215109991174
6. Borkar JL, Tumram NK, Ambade VN, Dixit PG. Fatal Wounds by "Manja" to a Motorbike Rider in Motion. *J Forensic Sci*. 2015;60(4):1085-1087. doi:10.1111/1556-4029.12747