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Review

Emergency Department Trends in Trampoline-Related Injuries Among Children

Sara Faisal Alhassan[1*], Abrar Saeed baraweih[2], Fatemah Mohammed Sabiani[2], Sarah Mujir Aljahdali[3]

[1] *Department of Pediatric Emergency Medicine, Ministry of Health, Mecca, Saudi Arabia*
[2] *Department of Pediatric Emergency Medicine, Ministry of Health, Jeddah, Saudi Arabia*
[3]*Department of Pediatric Emergency Medicine, King Abdulaziz University Hospital, Jeddah, Saudi Arabia*

Correspondence should be addressed **Sara Faisal Alhassan**, Department of Pediatric Emergency Medicine, Ministry of Health, Mecca, Saudi Arabia, Email: s.s12@hotmail.com

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Abstract

Trampoline-related injuries are a common type of injury among children. Their incidence has been rising significantly over the years. These injuries may occur due to structural factors or behavioral factors, such as collisions, resulting in various injuries, such as soft tissue injuries, bony fractures, and cervical spine injuries. Trampolines can be designed in different shapes and sizes and with various dynamic properties to suit different uses. Although various industry safety standards have been developed globally to reduce the incidence of trampoline-related injuries, their incidence is still rising. This review aims to explore current emergency department trends in trampoline-related injuries among children. Typically, most trampoline-related injuries are mild, with soft tissue injuries and fractures being the most common type of injury. Extremities, particularly the ankle, are the most frequently injured body parts due to trampoline accidents, followed by head and neck injuries. Furthermore, falling off trampolines was associated with the most severe injuries. Trampolines should be placed on a flat, hazard-free surface, equipped with high-quality padding, used by only one person at a time, and supervised closely by informed adults. Somersaults and flips are prohibited, and children under 6 years should not use trampolines. Future studies should focus on developing universal strategies that involve strict measures, aiming to reduce the incidence of trampoline-related injuries among children.

Keywords: *Trampoline-Related Injuries, Trampolines, Emergency Department, Children, Trends*

Introduction

The use of trampolines as a recreational activity is gaining popularity among children, reflected in rising sales of private trampolines and the opening of new trampoline centers (1). Trampolines can be designed in different shapes and sizes and with various dynamic properties to suit different uses. Conventional trampolines use coiled springs to generate a bounce of height when individuals jump on them. Historically, it was used for training acrobats, gymnasts, and military aviators when it was introduced in 1945 as a tumbling device by George Nissen, a competitive gymnast (2). Thereafter, the possibility for recreational use was recognized, and trampolines soon became available for indoor and home leisure.

Children are the most frequent users of trampolines, which have shown health benefits for them (3, 4). However, trampolining is associated with injury risk to children (5-7), which may result from improper use, overcrowding by multiple children, behavioral factors, such as collisions or 'double-bouncing' when multiple users are bouncing (8), a lack of parental supervision during play, or structural design issues that allow the user to fall from or become entrapped in the trampoline or to experience excessive trampoline forces (9, 10). Children bear a higher risk of trampoline-related injuries since they are less cognitively and physically adept and developed for the particular dynamics of this exercise, as they learn body coordination and synchronicity gradually throughout their life (11).

The incidence of trampoline-related injuries has been significantly rising worldwide. Trampolining accounts annually for nearly 100000 pediatric emergency visits in the USA (12) and is responsible for 50% of admissions to emergency departments in children under 14 years of age in the UK (13). In Australia, nearly 15,000 children (about 1,500 per year) were hospitalized for trampoline-related injuries between 2002 and 2011 (14). Various types and patterns of trampoline-related injuries have been reported, including soft tissue injuries, bony fractures, cervical spine injuries, focal neurology, and, in rare instances, fatalities (15-18). The majority of these injuries occur in children aged 5 to 15 years old (17, 19), with most trampoline injuries that occur within the home environment resulting from improper landing onto or falling off the trampoline (20, 21). However, there is emerging evidence that injuries sustained at trampoline centers are more severe, and the frequency of these injuries is rising dramatically (5, 22, 23).

Although various industry safety standards have been developed globally to reduce potential hazards associated with the manufacture, assembly, maintenance, and use of trampolines, rates of trampoline injuries have not declined. The aim of this review is to analyze the worldwide emergency department trends in trampoline-related injuries among children, with more focus on special anatomical patterns and rare presentations of trampoline-related injuries.

Methods

A comprehensive literature search was conducted in Medline (via PubMed), Scopus, and Web of Science databases up to November 21, 2025. Medical Subject Headings (MeSH) and relevant free-text keywords were used to identify synonyms. Boolean operators (AND', OR') were applied to combine search terms in alignment with guidance from the Cochrane Handbook for Systematic Reviews of Interventions. Key search terms included: "Trampoline-related injuries" AND "Emergency department" AND "Children". Summaries and duplicates of the found studies were exported and removed by EndNoteX8. Any study that discusses the emergency department trends in trampoline-related injuries among children and published in peer-reviewed journals was included. All languages are included. Full-text articles, case series, and abstracts with the related topics are included. Case reports, comments, and letters were excluded.

Discussion

Trends in Trampoline-Related Injuries Among Children

Various studies have evaluated the trends in trampoline-related injuries and their incidence

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among children in the emergency departments of various countries. Saltajai (2025) et al. explored the incidences of and trends in varieties of trampoline-related orthopedic injuries in pediatric patients presenting to trauma and emergency departments in London, United Kingdom (16). The majority of patients were female, with an overall average age of 8.7 years old. Fracture was the most frequent injury, with the ankle being the most commonly involved site, followed by wrist and elbow fractures. Soft injuries were also observed mostly in the ankle region, followed by foot and knee injuries (16). Except for one case, all soft injuries and fractures in the ankle region cases were treated with conservative and supportive treatment, such as immobilization in a walking boot or cast. Admission was required for only two cases: one case for operative management and one case for neurovascular status monitoring. This study stated that while trampoline-related injuries are common, they are usually minor and manageable in an outpatient setting. It also stated that this type of injury may lead to severe outcomes (16).

Teague (2024) et al. aimed to measure the exposure-adjusted incidence of trampoline-related injuries and to evaluate trends in injury rates over years (2017 to 2019) in trampoline parks in Australia and the Middle East (24). The study reported 13,256 trampoline-related injuries over the study period, with the majority of injuries being minor (89.2%). The incidence of trampoline-related injuries was highest in children aged 10 to 14 years old (41.3%), with more incidence observed in males (58.6%). Most common injuries reported by these parks occurred during free jumping (30.9%) and high-performance jumping (20.2%) (24). According to injury rates adjusted for exposure, the study reported that both trampoline-related injuries of any severity and severe injuries are uncommon, with 1 injury of any severity every 877 jumper hours and 1 severe injury every 9090 jumper hours. A joinpoint regression analysis was also performed to evaluate time trends in the incidence of both trampoline-related injuries of any severity and trampoline-related severe injuries (24). It revealed a significant downward trend in overall injury rate, with a 0.72% rate reduction per month from January 2017 to December 2019. On the other hand, the rate of significant trampoline-related severe injuries varied remarkably over time, with an initial fall of 6.61% per month from January 2017 to June 2017, followed by a rise of 1.69% per month until June 2018, when it started to fall sharply from June 2018 to October 2018 by 16.16% per month, and eventually it rose again by 3.49% per month until December 2019 (24).

Another study was conducted by Eager et al. (2023) in Queensland, Australia, aimed at exploring the incidence of trampoline-related injuries over two decades (25). They found 10,726 trampoline-related injuries, and 10,353 of them occurred in children aged 14 years and younger. The sex distribution was almost similar between males and females. The highest incidence of trampoline-related injuries was observed in children aged 8 and younger (25). This can be attributed to the better skills and stronger bodies of older children that support bouncing stability and, therefore, prevention of injury. Falling off trampolines was associated with the most severe injuries; however, falls off trampolines have declined over the study period due to the introduction of round trampolines into Australia. Furthermore, the most common injuries experienced were dislocations, sprains/strains and fractures (25).

Hussein et al. (2022) investigated trampoline-related injury trends in emergency departments in the US between 2009 and 2018 (26). The study detected 800,969 pediatric trampoline-related injuries over the study period; 80.3% of them occurred in children, 17.8% in adolescents, and 1.9% in toddlers. Lower and upper extremities were the most common injury sites, accounting for 41.1% and 30.5%, respectively (26). Head and neck injuries occurred in 22% trampoline injury cases, with toddlers being the most likely to experience head and neck injuries. No fatalities were recorded among the injured patients. Trampoline-related injury trends analysis showed increased prevalence during the study period. Compared to adolescents, children and toddlers had a higher likelihood of being presented with soft tissue injuries,

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hemorrhage, or internal organ injury and were less likely to have a concussion or musculoskeletal injury. Furthermore, they are more likely to experience an injury to the head and neck region, upper trunk, lower trunk/pubic region, upper extremities, and lower extremities (26).

In France, Runtz et al. (2022) monitored trampoline-related injuries in children presented to the emergency department of a single center (15). They reported 103 cases of trampoline-related injuries, with a mean age of 8 ± 3.5 years and a male-to-female ratio of 0.98. Lower limbs were the most common site for trampoline-related injuries (53%), followed by upper limbs (36.5%), the spine (5.8%), the head (3.8%), and the trunk (0.9%). 16.5% of these injuries were severe, and most of them occurred in the upper limbs, followed by the lower limbs (15). Of injuries without fractures, ankle sprain was the most common injury in lower limbs, whereas the wrist was the most common site of non-fracture injuries in upper limbs.

Lim et al. (2021) reported 137 pediatric trampoline-related injury cases who presented to the emergency department in Singapore, with higher incidence among females (53.3%) (27). Of all injuries, 60.6% occurred in a public trampoline park, 24.8% occurred in school and 14.6% at home. Mechanisms of injuries included injuries being sustained on the trampoline plane (61.3%), injuries sustained outside the trampoline (25.5%), and injuries sustained by falling on the trampoline frame (7.3%) (27). Lower and upper limbs were the most common sites for trampoline injuries (80.3%), with lower limbs being more common in the < 6 years and 11–16 years age groups and upper limbs being more common in the 6–11 years and 11–16 years age groups. The most common injury type was soft tissue injuries (59.1%), followed by fractures and dislocations (43.8%) (27). Trends and incidences of trampoline-related injuries in children of South Korea were assessed by Lee et al. (2020), who found an increase in the annual rate of trampoline-related injuries per 1,000 injured pediatric patients (28). The median age of the injured patients was 5 years. Lower limbs were the most common injured site, with fracture being the most common diagnosis, followed by superficial injuries and sprains (28).

Special Anatomical Patterns of Trampoline-Related Injuries

Neck Injuries

Trampoline-related neck injuries in children can present with various outcomes, ranging from mild contusions, cervical sprains, and concussions to more severe outcomes, such as hemorrhages and fractures (29). Neck injuries mainly occur due to hyperextension or hyperflexion of the neck as a result of mislanding (5, 30, 31). It has been reported that the incidence of this type of injury is higher in adolescent males in comparison with females; however, neck injuries in females have been associated with more hospital admissions (26). A recent study by Akella et al. (2025) aimed to determine the incidence of neck injuries in children with trampoline-related injuries (32). They reported a higher incidence of neck injuries in older and male children compared to younger and female children. Additionally, they found that neck strains/sprains were the most common trampoline-related neck injury in children, followed by neck contusions and fractures (32). Treatment of neck injuries typically includes a collar application, rest, and analgesics (33). Notably, CT of the cervical spine should also be considered.

Knee Injuries

The knee is one of the most commonly injured body parts due to collisions, falls, and overuse occurring from sports (34). Trampoline-related knee injuries are a significant hazard for knee injuries among both children and adults. Husen et al. (2023) aimed to evaluate trampoline-related knee injuries among children and adults, with a total of 229 patients (118 children and 111 adults) (35). In children, most accidents occur on a trampoline in the patient's backyard, while the majority of adults' accidents occurred in commercial trampoline parks. The incidence of knee-related trampoline injuries has increased over years, reaching a temporary peak in 2021, with 49 incidents (35). A direct collision with a hard object was the most common trauma mechanism in children, followed by a crash with

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another person within the trampoline. In adults, the most common trauma mechanism was a sudden pivoting or cutting maneuver with a flexed knee that resulted in giving way and an instability of the knee (35).

Furthermore, the type of knee injuries varied significantly between children and adults. Fracture was the most frequent type of injury in children, followed by muscle strains, soft tissue injuries, such as lacerations, and patellar dislocations. In adults, cruciate ligaments were the most common type of injury, followed by muscle strains, meniscal tears, and ligamentous tears other than the anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL) (35). The increased risk of fractures in children is attributed to the weakness of their physis due to its unique anatomic and physiological properties, making it more susceptible to injury because it is the weakest part of the long bone structure. On the other hand, adults have fully developed growth plates, making the physis less susceptible to injury, shifting the injuries to the cruciate ligaments, which are vulnerable to injury during movements that require sudden directional shifts, abrupt stopping, or direct impact.

Rare Presentations

Bilateral true vocal fold avulsion

Trampoline-related injuries may present with various rare presentations in the emergency department. Epstein et al. (2025) reported a rare case of a 10-year-old female with bilateral true vocal fold avulsion following a trampoline accident (36). Vocal cord avulsion occurs due to trauma to the larynx, leading to the separation of the soft tissues of the true vocal cord from the vocal process and anterior face of the arytenoid cartilage, mainly as a result of external or internal forces (37). The patient presented to the emergency department with chief complaints of odynophagia, dysphonia, and decreased oral intake after a blunt force trauma to her neck (36). The mechanism of injury was a hit of the anterior aspect of her neck on the metal support of a trampoline while playing outside. Repeat flexible nasolaryngoscopy and a microdirect laryngoscopy confirmed the diagnosis of bilateral true vocal fold avulsion, and a successful, eventless surgery was performed (36).

Hip Dislocation

Traumatic hip dislocation is a rare clinical picture in childhood, with most dislocations occuring in a dorsal direction. Mester and colleagues (2024) reported a rare case of hip dislocation in a 5-year-old female patient due to a trampoline injury (38). The patient presented with sudden-onset inability to walk as well as painfully restricted movement in the left hip. The parents stated that the child fell on an outdoor trampoline surface and landed awkwardly (38). A diagnosis of atypical anterior hip dislocation was reached clinically and radiographically. Immediate closed reduction and restoration of joint congruence were performed, and the patient became symptom-free in the further course (38).

Recommendations

Multiple preventive measures could be taken to mitigate the rising incidence of trampoline-related injuries. Padding along the frames of trampolines should be increased to minimize improper dismounts from the trampoline and blunt force trauma experienced by jumpers (30). In order to minimize the risk of landing off the jumping mat of the trampoline, netting enclosures should be installed (30). Additionally, it is recommended that children should use trampolines only in facilities supervised by properly trained staff to help ensure safety and reduce the risk of injury. Assigning a separate jumping area for younger children, or children by weight, and limiting the number of jumpers to one individual per trampoline may decrease the number of injuries that result from multiple jumpers colliding (5, 39). Flips and upside-down maneuvers while jumping on trampolines should be prohibited to reduce the occurrence of head and neck injuries, and families should be educated about the potential risk of trampoline-related injuries (30). Notably, many organizations that advocate for the advancement of pediatric health like, the American Academy of Pediatrics (AAP) state, that trampoline use should be banned completely (29, 30).

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Conclusion

This review aimed to explore current evidence for emergency department trends in trampoline-related injuries among children in various countries and to address special anatomical patterns and rare presentations of this type of injury. The incidence of trampoline-related injuries has been remarkably increasing and is still increasing in various countries, requiring additional measures to lower their occurrence. Extremities are the most common injured body parts due to trampoline injuries in children, followed by head and neck injuries. Soft tissue injuries, sprains, and fractures are common injuries associated with trampoline-related injuries among children. Future studies should focus on developing universal strategies that involve strict measures, aiming to reduce the incidence of trampoline-related injuries among children.

Disclosure

Conflict of interest

There is no conflict of interest.

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Ethical consideration

Non applicable.

Data availability

Data that support the findings of this study are embedded within the manuscript.

Author contribution

All authors contributed to conceptualizing, data drafting, collection and final writing of the manuscript.

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