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EQUESTRIAN ACCIDENTS – A REVIEW OF THE LITERATURE

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ABSTRACT

Introduction and objective: Horse riding is a sport that has become an increasingly popular form of physical activity in recent years, both at amateur and professional levels. The aim of the review was an epidemiological analysis of horse-riding-related injuries, along with the identification of their most common risk factors and mechanisms.
Review methods: A systematic literature search was conducted using PubMed and Google Scholar. The search employed terms such as 'horse riding,' 'injuries,' 'spine,' 'vertebral,' 'horse-related,'and 'back injuries.' Articles published between 2014 and 2025 were included in the search. Highly cited papers published more than a decade ago are also included
Brief description of the state of knowledge: Young women constitute the largest group among individuals sustaining horse-related injuries. This observation reflects their greater participation in equestrian activities rather than sex-related differences in injury susceptibility. The predominant mechanism of injury is a fall from the horse. Middle-aged men most commonly sustain injuries related to horse handling activities, typically resulting from mechanisms such as kicking, biting, or being stepped on by the horse. Injuries most frequently involve the extremities, the spine—predominantly the lumbar region—and the thoracic cage. Head injuries are associated with higher mortality rates and an increased risk of permanent health impairment. Available data regarding the effectiveness of protective equipment, including helmets and body protectors, suggest a reduction in the severity of sustained injuries.
Summary: Horse riding is a sport with an increased risk of injury. Multidirectional actions are needed to improve safety through appropriate and continuous training of riders, correct and efficient equipment and the use of certified protective measures.

KEYWORDS

Horse Riding, Injuries, Spine, Vertebral, Horse-Related, Back Injuries

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Introduction and Objective

Equestrianism is a sport that has gained increasing popularity in recent years. A growing number of individuals engage in horse riding at both amateur and professional levels, including participation in equestrian competitions at various stages (amateur, regional, national, and international). The sport is practiced across all age groups (children, adults, and older individuals) and by both sexes; however, women constitute a markedly larger proportion of participants [12,18–21].

The widespread interest in horse riding, combined with the specific human–horse interaction, places equestrianism among physical activities associated with an elevated risk of injury [13,17]. It is considered more hazardous than motorcycling, skiing, or rugby [15,16]. Despite substantial advancements in equestrian infrastructure, increased emphasis on the quality of training, and wider availability of protective equipment, the incidence of equestrian-related injuries has remained relatively stable over many years [30].

The available literature identifies falls from the horse as the most common cause of injury; however, injuries sustained during ground-handling activities represent the second most frequent mechanism and should not be overlooked. Kicking, trampling, and crushing by the horse are among the mechanisms associated with such injuries [22,23]. The most frequently reported injuries include long bone fractures and soft tissue injuries [24,25], predominantly affecting the upper extremities, the spine, the thoracic cage, and the head. Head injuries are associated with the highest mortality rates and, particularly in the pediatric population, represent a leading cause of hospitalization and are linked to the most severe neurological complications. Spinal injuries most commonly involve the thoracolumbar junction and the lumbar spine, and are frequently characterized by multilevel involvement [26–29].

Despite contemporary epidemiological research, significant gaps remain in the scientific evidence explaining the persistently stable incidence of equestrian-related injuries. Furthermore, there is a limited number of studies confirming the safety and effectiveness of protective equipment, such as helmets and body protectors. Nevertheless, a growing interest in this topic among researchers has been observed in recent years [14].

The aim of this literature review is to analyze the epidemiology of equestrian-related injuries, with particular emphasis on identifying the most common risk factors and injury mechanisms.

Review Methods

A literature search was conducted using the PubMed and Google Scholar database with the following keywords: *"horse riding"*, *"injuries"*, *"spine"*, *"vertebral"*, *"horse-related"*, and *"back injuries"*. Articles published between 2014 and 2025 were included in the review. Frequently cited publications published more than a decade ago were also considered.

Descriptive studies, case series, and research articles addressing injuries in adults and children, as well as in individuals working with horses or having regular contact with them, were included. The analyzed injuries encompassed spinal trauma of varying severity, with or without associated neurological deficits, injuries of the central nervous system, musculoskeletal injuries, and other horse-related injuries.

Only publications written in the English language were included in the review.

Description of the State of Knowledge

The results of studies investigating equestrian-related injuries are presented below. The findings are summarized with an emphasis on statistically significant mechanisms and types of injuries.

In the study *"Spinal Injuries from Equestrian Activity: A US Nationwide Study"*, a total of 554,830 spine injuries related to horse riding were analyzed. The majority of injuries occurred in women (73.6%). Fractures were diagnosed in 99.9% of cases. The most frequently affected spinal region was the lumbar spine (49.1%), followed by the thoracic spine (24.4%), the sacrococcygeal region (15.5%), and the cervical spine (11.0%). Injuries at the thoracolumbar junction (Th12–L2) accounted for 42.1% of cases. An interesting observation was the higher proportion of males among patients with cervical spine injuries, who constituted 43.7% of this subgroup. The authors also reported multilevel fractures in 4.0% of patients and associated visceral injuries in 5.7%. Alcohol involvement was documented in 1.7% of cases [1].

The study *"Systematic Review of Spinal Cord Injuries in Equestrian Athletics: Incidence, Risk Factors, and Outcomes"*by Emily A. Heinrich, Kayleigh D. Crane, Nicholas I. Chiaramonti, Julien Rossignol, and Michael Lohan analyzed 246 publications, of which 13 met all inclusion criteria. Young adult women were identified as the most frequently affected patient group. The most common moment of injury occurrence was during mounting the horse. Absence of helmet use was associated with a higher rate of hospitalization. Beginner riders constituted a high-risk group, likely due to limited experience, reduced body awareness,

impaired situational anticipation, and insufficient stability in the saddle. Cervical spine injuries were the most frequently reported. The authors emphasized that equestrianism is a high-risk sport due to the rider–animal interaction and the inability to predict all potentially hazardous situations [2].

In the study *"Characteristics of Equestrian Accidents and Injuries Leading to Permanent Medical Impairment"*, Helena Stigson and Maria Klingegård analyzed approximately 1,400 injured individuals out of 155,000 members of the Swedish Equestrian Federation who annually report acute equestrian-related injuries, corresponding to an incidence of approximately 1 injury per 1,000 insured riders. Women constituted the majority of injured individuals and exhibited a threefold higher injury risk compared to men. Falls from the horse were the most common mechanism of injury; however, ground-handling activities were also identified as a significant risk factor. Riders aged 21–40 years represented the largest group seeking medical care, whereas the highest risk of permanent medical impairment was observed in older individuals [3].

In the literature review *"Epidemiology of Horse Trauma: A Literature Review"* by Emily K. Neville, Henry Hicks, and Christine C. Neville, 39 publications were analyzed. Most studies reported a predominance of injuries among women, particularly beyond the beginner level. Men more frequently sustained injuries related to work in equestrian facilities and horse handling. An interesting finding was the comparable injury incidence among women and men competing at the highest competitive levels, suggesting that rider skill, experience, and the level of horse training constitute key injury risk factors. Falls from the horse and kicks sustained during ground-handling activities were the most common injury mechanisms. The highest number of injuries involved the thoracic cage and upper extremities. Head injuries were more frequently reported in children [4].

In the single-center study *"Horse-Related Injury Patterns: A Single-Center Report"* by M.F. Hoffmann et al., 95 patients presenting to the emergency department with equestrian-related injuries over a three-year period (July 2019–July 2022) were analyzed. The majority of injuries were associated with horse riding (60.6%), while kicking by the horse was the second most common mechanism. No statistically significant sex-related differences were observed; however, injury risk increased markedly with age. Upper extremity injuries were most common and frequently resulted from fingers becoming entangled in the reins. Head injuries accounted for only 10% of all injuries but were associated with the highest mortality rates. Lower extremity injuries comprised 20% of cases and were most commonly caused by kicking or being stepped on by the horse [5].

In the literature review *"CNS and Thorax Injury and Associated Risk Factors in Equestrian Sports"* by Anna E. Crawford et al., 53 scientific publications were analyzed. Young women aged 18–45 years were identified as the most frequently injured group. Sex itself was not identified as an independent risk factor, with the predominance of women reflecting higher participation rates. Injuries most commonly affected the musculoskeletal system and the central nervous system. More severe injuries were observed in mounted riders compared to individuals engaged exclusively in ground-handling activities. Some studies demonstrated a reduced risk of intracranial injury, skull fractures, and concussion with helmet use; however, the authors emphasized that these data were limited and required further validation. Body protectors did not significantly reduce spinal injury risk but were associated with a reduced incidence of thoracic injuries and rib fractures. Rider experience was also evaluated, revealing that each additional 100 hours of riding significantly reduced fall-related injury risk. Continuous training, education, proper equipment preparation, and adequate physical fitness were identified as key protective factors [6].

In a retrospective study, Cameron R. Adler et al. analyzed 222 patients presenting with equestrian-related injuries. The mean age was 38.5 years (range 4–79 years), with a mean age of 36.9 years in women and 43.3 years in men. Falls from the horse were the most common injury mechanism (83.2%), followed by kicking (8.1%) and being stepped on by the horse (4.1%). Patients injured by kicking incurred the highest treatment costs and were exposed to the greatest levels of diagnostic radiation due to a higher incidence of head injuries in this subgroup (OR 4.12; $p = 0.006$). Spinal injuries were the most prevalent overall. Older age was associated with increased imaging utilization, longer hospital stays, and higher treatment costs. No statistically significant sex-related differences were observed in injury type, mechanism, or severity [7].

In the single-center study *"Horse-Related Trauma in Children and Adults During a Two-Year Period"* by Jakob Altgärde et al., patients presenting with equestrian-related injuries between 2003 and 2004 were divided into children ($n = 147$) and adults ($n = 141$). Falls from the horse were the most common mechanism in both children (85%) and adults (65%). Other frequent mechanisms included the horse falling onto the rider, kicking, and trampling. Injuries predominantly involved the extremities (fractures) as well as the head and neck in both groups. Most injuries were mild and did not result in permanent sequelae. Children more frequently required hospitalization

and incurred higher healthcare costs. No statistically significant differences were observed between individuals using protective equipment (helmets and body protectors) and those who did not [8].

In the study *"Equestrian Injuries: Incidence, Injury Patterns and Risk Factors for 10 Years of Major Traumatic Injuries"*by Chad G. Ball et al., data from 7,941 adult patients admitted to emergency departments between January 1, 1995, and July 1, 2005, were analyzed. Additionally, 151 individuals completed a telephone survey. The typical respondent was a middle-aged male (mean age 47 years). The most common injuries involved the thoracic cage (54%) and the head (45%). Falls from the horse accounted for 60% of injuries, followed by crushing (16%), kicking (8%), and trampling (4%). Frequently reported causes included horse spooking (35%), mismatch between rider skill and horse training (27%), aggressive temperament of the horse (15%), horse falls (12%), equipment failure (6%), and insufficient rider training (5%). Most participants were recreational or working riders, with a median riding experience of 27 years; only 6% had less than one year of experience. Environmental factors were also assessed, revealing that 88% of incidents occurred outdoors and 45% in open terrain. The majority of riders believed that the injury could have been prevented [9].

In the study *"Equestrian Injuries"* by Paul McCrory and Michael Turner, injury characteristics in the pediatric population were examined. The majority of injuries occurred in girls, likely reflecting higher participation rates. Long bone fractures and head injuries were the most common injury types. Head injuries represented the leading cause of severe trauma and were associated with a higher likelihood of hospitalization. The estimated mortality rate was 0.08 per 100,000 population across all age groups. Falls from the horse were the predominant mechanism, with only 15% of injuries related to ground-handling activities. Risk factors were categorized as intrinsic (rider-related) and extrinsic (environmental). Intrinsic factors included inadequate training, balance impairment, poor coordination, alcohol use, and medications affecting riding ability. Extrinsic factors included horse temperament and improperly fitted or defective equipment. Although helmet use is widely recommended, conclusive evidence regarding its effectiveness remains limited. Indirect evidence suggests a reduction in head injury severity; however, further validation is required. No data supporting the effectiveness of body protectors were identified [10].

In the review *"Common Injuries in Horseback Riding"* by Doris Bixby-Hammett and William H. Brooks, falls from the horse—typically during recreational riding or riding lessons—were identified as the most common injury mechanism. Approximately 80% of riders did not wear helmets, and helmet absence was strongly associated with increased head injury severity and mortality. The most frequent injuries included soft tissue injuries, fractures, and concussions. Women were more frequently injured, reflecting higher participation rates. Although overall mortality was low (<1%), it occurred more often in men, particularly those over 40 years of age [11].

Summary

Data derived from the available scientific literature indicate that horse riding remains a sport associated with a substantial risk of injury, ranging from minor bodily injuries to severe trauma, particularly involving the central nervous system, which may result in permanent health impairment.

Across all reviewed studies, women constituted the larger proportion of injured individuals, reflecting their higher participation in equestrian activities. There is no scientific evidence to suggest that biological sex itself is an independent risk factor for injury, as demonstrated, among others, by the comparable incidence of injuries among women and men competing at the professional level. Men were more frequently injured during ground-handling activities and within age groups over 40 years.

Falls from the horse were identified as the most common injury mechanism in all included studies, followed by injuries resulting from being kicked or stepped on by the horse. Injuries associated with ground-handling activities represented a substantial proportion of cases and should not be overlooked as significant risk factors. Greater emphasis on preventive strategies in this area is warranted. The most frequently affected anatomical regions were the upper extremities and the thoracic cage. Head injuries occurred less frequently but were associated with higher rates of hospitalization, neurological sequelae, and mortality. This pattern was particularly pronounced in the pediatric population. Among spinal injuries, multilevel trauma predominated, most commonly involving the thoracolumbar junction and the lumbar spine. Older individuals more frequently sustained injuries requiring extensive imaging diagnostics and prolonged hospitalization, which was associated with increased healthcare costs.

Failure to use equestrian helmets was associated with a higher likelihood of sustaining severe intracranial injuries. Data regarding the effectiveness of helmets and body protectors remain inconclusive. Available evidence suggests a reduction in the risk and severity of injuries resulting from falls from the horse—

particularly head and thoracic injuries—among individuals using protective equipment; however, these findings require further investigation and validation.

Key preventive factors include appropriate rider training and the use of properly fitted and well-maintained equestrian equipment. Matching the level of horse training to the rider's experience may further reduce injury risk. It is essential to acknowledge the animal nature of the horse and the inherent unpredictability of its behavior, even when internal and external risk factors are considered. Rider experience allows for the avoidance of many hazardous situations; therefore, continuous education and high-quality training, including coordination and physical fitness training, are of paramount importance. The reviewed publications emphasize that a significant proportion of equestrian-related injuries may be preventable through the implementation of these precautionary measures.

In conclusion, improving safety in equestrian activities requires a multifaceted approach. The use of certified helmets, enhanced rider education, regular assessment of riding skills and physical fitness, systematic inspection of equestrian equipment, and proper equipment use are essential. Effective preventive strategies should be implemented based on reliable and high-quality scientific evidence.

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