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Equestrian Injuries

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Abstract

Objective: This chapter reviews the current evidence for the epidemiology of pediatric equestrian injuries. **Data sources:** The relevant literature was searched through the use of MEDLINE (1966–2004) and SPORT DISCUS (1975–2004) searches, hand searches of journals and reference lists and discussions with experts and sporting organizations worldwide. Keywords and Mesh headings used in all searches included horse racing, children, pediatric injuries, sports injuries, equestrian injuries and sports trauma. **Main results:** Limited data exist on the epidemiology of pediatric equestrian injuries. Most studies note the high preponderance of females with a peak incidence at approximately 14 years of age. This is likely to reflect the higher rate of female riders. The two most common horse riding-related injuries are long bone fractures and head injury. Although most injuries occur during recreational riding, approximately 15% of injuries occur in nonriding activities such as feeding, handling, shoeing and saddling. **Conclusions:** While there is little knowledge of injury demographics or the efficacy of prevention countermeasures in this field, it is likely that injuries will continue to occur. The major challenge in reducing pediatric equestrian injuries is the formal scientific demonstration that the various proposed injury prevention measures are effective. With the majority of equestrian injuries happening during unsupervised leisure riding, the prospect of injury prevention is limited.

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Introduction

The demographics and nature of horse riding injuries suffered by children is largely unknown. Although retrospective case series studies have been published, there are no prospective studies detailing these injuries. This is also the case for equestrian injuries in adults, although more information is available in specific subgroups of riders, such as professional jockeys, rodeo riders and polo participants [1].

The limited available pediatric injury data are largely a reflection of the way horse riding is conducted. Namely the sport is amateur, variably supervised and apart from limited competitive situations, is not subject to administrative control that would enable the compilation of injury data. Injuries, especially minor injuries, are seldom reported, and there are no regulatory requirements anywhere in the world that compel formal injury notification for this sport. This lack of detailed information is somewhat surprising given that horse riding is one of the most popular participation sports with tens of millions of active riders in most Western countries.

Although falling from horses or being kicked are the most familiar mechanisms of injury, horses can also inflict injuries by biting, pulling, kicking the rider, standing or rolling on the rider and hitting the rider with sudden movement of the head [2]. Further, horses may injure their riders during nonriding activities such as grooming, feeding, handling, shoeing and saddling. Fully-grown horses can weigh up to 550 kg (1,200 lbs) and are capable of reaching speeds of over 60 kph (40 mph). It is not surprising that severe injuries do occur in this sport [1].

This chapter reviews the current evidence for the epidemiology of pediatric equestrian injuries. The relevant literature was searched through the use of MEDLINE (1966–2003) and SPORT DISCUS (1975–2003) searches, hand searches of journals and reference lists and discussions with experts and sporting organizations worldwide. Keywords and Mesh headings used in all searches included horse racing, children, pediatric injuries, sports injuries, equestrian injuries and sports trauma.

Frequency of Injury

Participation Level

There is little or no detailed information about the demographics of pediatric equestrian injuries. Although numerous case series have reported specific injury occurrences, such as catastrophic head or spinal injury, the common thread missing throughout all these studies is information on exposure. Similar criticisms can be made about electronic injury surveillance systems, such as the US national injury surveillance system (<http://www.nyssf.org/statistics1998.html>) or the North American CHIRPP database (<http://www.hc-sc.gc.ca/pphb-dgspsp/publicat/>).

In broad terms, the approximate numbers of horse riders is known. In the USA, over 30 million people ride on a regular basis with more than 2 million of these being under the age of 19 years [3–5]. In the UK, this figure is put at 3 million regular participants with one third being children [6]. In Australia, there are over 250,000 people actively engaged in recreational horse riding with

Table 1. Retrospective and case series studies including pediatric data

Study reference	Patient source	Total number of equestrian injuries	Number of injuries <15 years old (% of total)	Demographics
[8]	Horse Shows Association survey, United States	290	62 (21%)	85% female 34% falls 15% fractures
[8]	Pony Club survey, United States	31	19 (61%)	No analysis performed
[9]	Hospital admissions, United States	136	NS	76% female 75% falls 62% fractures
[10]	Pediatric hospital, Norway	23	23 (100%)	90% female 60% falls 50% fractures
[11]	National Electronic Injury Surveillance System, United States	167,578	48,822 (29%)	65% female
[12]	National Injury Database, New Zealand	827	315 (38%)	74% female 46% fractures
[3]	Postal survey, United States	589 (27% of total surveyed)	46 (8%)	IR 0.4/1,000 h
[13]	Pediatric hospital data, Sweden	516		95% female 27% fractures IR 14/1,000 h
[14]	Pediatric Emergency Dept, United Kingdom	41	41 (100%)	95% female 66% falls 26% fractures
[15]	National Pediatric Trauma Registry, United States	720	276 (38%)	62% female 64% falls 35% fractures
[7]	Australian Bureau of Statistics data, Australia	64		
[16]	Emergency Dept, United Kingdom	260 (10% of all sports injuries)	62 (23%)	80% female 80% falls 60% fractures

IR = Injury rate.

Fig. 1. Specific equestrian injuries by age and sex. Adapted from [7].

74,000 registered child participants in events run by pony clubs and the Equestrian Federation of Australia [7].

Incidence of Injury

A summary of retrospective and case series studies including pediatric data on equestrian injuries is shown in table 1 [3, 7, 8–16]. Virtually all studies note the high preponderance of females suffering horse riding-related injuries (table 1). Crude injury rates of the two most common injuries, long bone fracture and head injury, consistently note higher rates in females and these peak at approximately 14 years of age (fig. 1). This is likely to reflect the higher rate of female riders. However, no precise figures exist in this regard (with the limited exception of pony club membership) to allow accurate analysis of injury rates.

Injury Characteristics

Injury Onset

All published studies of equestrian injuries report acute injuries only. There is no published information in the pediatric age group as to whether riders suffer from chronic musculoskeletal injuries related to riding or whether these may contribute to the acute injury episode.

Both Gierup et al. [17] and Williams and Ashby [18] have reported a one third incidence of previous injuries in riders presenting to hospital with a new acute

injury. No specific details nor exposure information were provided to suggest that the injured riders represent the typical horse riding population.

Injury Location

Injuries to the extremities comprise the largest group of injuries. They are predominantly soft tissue injuries and long bone fractures [19, 20]. Typically such injuries are not routinely admitted to hospital and may be under-represented in published studies. Equestrian-related head injuries in children are typically admitted to hospital, and hence recorded more accurately.

Head injuries are responsible for the majority of serious equestrian injuries and deaths [4, 6, 11, 21, 22]. Such injuries are almost invariably related to falls. Injuries to the thorax, abdomen and pelvis are also often severe and account for a smaller but substantial number of hospitalizations [4, 11].

Situational

No information exists as to the situation where injuries occur such as in training or in specific maneuvers such as jumping. The majority of injuries, however, occur during leisure riding rather than in competition [23, 24].

Furthermore, approximately 15% of equestrian injuries occur in nonriding activities such as feeding, handling, shoeing and saddling [9, 25, 26].

Action or Activity

No published information exists regarding the specific activities that were engaged in at the time of the injury with the possible exception of where an injury occurs from a collision between horse and car whilst road riding [6]. Most published studies report mechanisms of injury in terms of falls from the horse or other specific factors related to riding.

Chronometry

Equestrian injuries tend to occur when the rider is mounted [3, 5, 9, 21, 25], during lessons [26], on farms or in paddocks [18], during warm weather and in school holidays [6, 18] and on weekends [18]. These likely represent the most frequent type of riding conducted rather than suggest that they represent a particular propensity to injurious situations.

Injury Severity

Injury Type

There are no data available from prospective studies or where the exposure incidence is known that enables injury rate calculation. The published

retrospective and case series studies are outlined in table 1 and are presented as a percentage of total injuries. Although the broad categories of anatomical injuries are commonly reported, the widely varied methodologies make comparison impossible.

Catastrophic Injury

Various case series and recommendations have been reported detailing catastrophic head and spinal injury from pediatric equestrian participation [7, 12, 16, 24, 27–36]. In general, fatal head injury from horse riding is relatively low both in general terms and by comparison to other sports [27, 28]. In one of the few prospective estimates, this horse riding-related mortality risk was put at 0.08 per 100,000 population [7]. This risk estimate includes all age groups.

Time Loss as a Result of Injury

Limited published information exists and is summarized in the section below. The time lost reported in those studies generally refers to either chronic injuries or those severe enough to warrant hospital presentation. There are no prospective data available for acute injuries.

Clinical Outcome

No published prospective information exists. There are a variety of case series and retrospective questionnaire-based studies reporting long-term outcome and time lost from equestrian injuries. In general terms, all of these papers suffer from selection bias given the population by which injuries are obtained in addition to the methodological limitations of the study design [5, 14, 15, 38–42].

Injury Risk Factors

There are no published data on injury prevention or risk factor analysis that have been subjected to formal analysis. In the absence of specific information, a conceptual framework based upon published studies is presented in figure 2 and discussed in the next section.

Suggestions for Injury Prevention

As discussed above, all suggestions in this section relate to retrospective, case series and other limited data. At best, this could be described as sufficient for Level 3 or 4 recommendations.

Fig. 2. Injury countermeasures in equestrian sports. Adapted from [10].

Intrinsic Factors

There are relatively few intrinsic factors that predispose a rider to injury with none that have been validated scientifically. In general, a rider requires a sense of balance, reasonable physical fitness and alertness to ride. Clearly anything that impairs these functions would be a contraindication to riding. In the same manner, avoidance of alcohol and drugs that may impair riding should be mandatory.

Some authors [43] have suggested specific neurological contraindications including unstable spinal cord lesions, permanent sequelae from head injury and repeated painful injury to the cervical and lumbar spine. None of these have been validated prospectively, and would need to be individually assessed.

Rider and public education may assist in informing riders about specific risks with riding and hence alter the behavior toward avoiding such situations as well as encouraging protective equipment use. Although laudable, such campaigns need to be validated against defined outcomes [44].

Extrinsic Factors

Most equestrian organizations have regulations governing the conduct of the sport and include specific equestrian safety issues. In professional horse racing and to a lesser extent in amateur racing, there are strict licensing requirements,

supervision of racecourses, veterinary assessment of horses, medical assessment of jockeys, and enforcement of riding and safety rules. Pony clubs and similar groups in the pediatric age group have specific safety standards for supervisors and riders, and strict requirements for helmet use.

Ensuring that riding instructors are certified, experienced and have a good knowledge of horses are all reasonable measures, although no formal analysis has correlated injuries with instruction, and any certification needs to be formally evaluated. Horse selection may have a role whereby instructors can match suitable horses with the level of rider experience. As with all primary prevention measures, the efficacy depends upon both whether the regulations are enforced and whether the safety requirements are themselves effective.

Horse behavior is also a significant factor in many equestrian injuries. In US Pony Club surveys, it has been estimated that up to 80% of injuries resulted from the behavior of the horse [26]. Although horses are by their very nature unpredictable, some basic principles are important and may be taught as part of the basic horse riding instruction. Warm-up procedures for the horse, rider training, supervisor awareness of aberrant horse behavior, specific instruction in the safe approach to horses and avoidance of situations where other animals or vehicles may frighten a horse, have all been proposed [18, 19]. Specific ‘tuck and roll’ techniques if dismounted have been suggested as a means, albeit unproven, of reducing injuries in falls [45].

Appropriate and well-maintained equipment (e.g., tack or saddlery) is important to prevent falls. The checking of equipment as part of a premounting and dismounting routine is critical, although it has not been rigorously assessed [46]. Similarly appropriate clothing such as riding boots and gloves are important.

Protective equestrian helmets are widely recommended. Such helmets need to be certified to an appropriate materials testing standard. Although they are widely recommended, there has been no formal prospective or controlled study conclusively demonstrating their benefit or, in fact, that the current helmet standards are adequate to prevent injury [19]. There is some anecdotal evidence, however, suggesting a benefit for helmet use in preventing or lessening the severity of head injuries [33, 47]. Similarly other safety equipment such as body protectors and safety-release stirrups remain unproven.

Suggestions for Further Research

The major challenge facing pediatric equestrian injuries is the formal scientific demonstration that the various proposed injury prevention measures are effective. Ideally, this should be performed before they are implemented or promoted. In addition, the barriers to the adoption of injury prevention measures should be studied.

Given the high participation in organized instructional programs such as Pony Club, an assessment of the effectiveness of rider (and supervisor) training should be undertaken. External accreditation of instructors and riding schools should be performed to set standards that have been independently verified.

With the majority of equestrian injuries happening during unsupervised leisure riding, the prospect of injury prevention is reduced. Rider education campaigns to ensure adequate training, maintenance and inspection of equipment, wearing of appropriate clothing and helmets may all assist in reducing injuries.

While there is so little knowledge of injury demographics or the efficacy of prevention countermeasures in this field, it is likely that injuries will continue to occur.

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