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Research Article

Epidemiology and Prevention of Equestrian Sports Injuries in Portugal

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Abstract

Horse riding has recently become popular, causing an increase in the number of related injuries. This study aimed to identify frequently occurring injuries in Portuguese riders and the conditions under which they occur to help identify preventive measures. Data were obtained from a questionnaire that characterized first and second rider injuries. In both cases, most injuries were musculoskeletal, occurred from falling off the horse during training, and mainly involved the lower limb. Approximately half of the patients required rehabilitation. The occurrence of injury was significantly associated with the number of days of training per week, years of experience, increased height and weight, and practicing another sport. Riding different horses was also significantly associated with the incidence of injury. Injury prevention is essential in horse riding, and rehabilitation should involve a physiatrist and core strengthening exercises.

Keywords: Horse riding; Injury; Prevention; Exercises; Equestrian sports; Physiatry

Abbreviations

EM: Equestrian Modality; ER: Emergency Room; HR: Horse Riding; RF: Risk Factor

Introduction

Equestrian sports have several positive physical health benefits, such as improvements in balance, motor function, and muscle strength, along with anxiety relief and enhanced self-esteem, thus improving mental health [1]. In these sports, two athletes, horse and rider, with different physical and mental qualities, work together to achieve success [2].

Horse riding (HR) has become popular, with injuries related to this sport increasing in prevalence [3]. It is considered a dangerous sport because the saddle is approximately 2m above the ground, and horses can weigh up to 500kg, reach a speed of 65km/h [4], deliver 1000 N of force in a single kick [5], and behave unpredictably [6]. Injuries can also occur during non-riding activities, such as grooming and stable work [7]. Regardless of developments in equestrian safety equipment, HR remains more dangerous than motorcycling, skiing and rugby [8], with a reported injury rate of 1/350-1000 h spent riding [9].

It is essential to understand the circumstances under which these injuries occur, so that preventive measures can be put in practice. This study aimed primarily to characterize HR-related injuries in Portuguese riders and to identify possible associated risk factors (RFs), and secondarily to use this information to recommend injury prevention strategies. To the best of our knowledge, no study has evaluated HR-related injuries in Portuguese riders.

Materials and Methods

This retrospective observational study included Portuguese riders practicing HR at the time of the study with ≥1 years of experience. The exclusion criterion was incorrect filling of the survey. A total of 216 riders participated in the study; none were excluded. The injury data of the riders were obtained from an online questionnaire made by the authors, which was shared in many Portuguese equestrian schools. It included questions regarding demographic data (age, sex, personal history of illness), sports-related background (equestrian modality (EM), other sports practiced), systematic training workload (years of experience, days of training per week), number and characteristics of the first two injuries (age, body location, type, mechanism, and location of injury), and the need for medical care (hospital attendance, surgery, and/or rehabilitation).

Data were collected in March-April 2021. We performed a descriptive analysis of the riders' characteristics and injuries, considering absolute and relative frequencies for categorical variables, mean and standard deviation for normally distributed continuous variables, and median and range for non-normally distributed continuous variables.

We used chi-square or Fischer's exact test for categorical variables, Student's t-test for normally distributed continuous variables, and the Mann–Whitney U test for non-normally distributed continuous variables to find an association between various variables and riding injuries. The normality of continuous variables was assessed using the Kolmogorov-Smirnov test.

All statistical analyses were performed using IBM® SPSS® Statistics version 27; statistical significance was set at $p<0.05$.

Results and Discussion

Demographic and sport data for equestrian athletes

This study included 216 riders: 111 men (51.4%) and 105 women (48.6%). Characteristics of the group are listed in Table 1. In our sample, as some riders practiced >1 EM, the sum of riders practicing various EM exceeds 216.

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Table 1: Demographic and sport data for Portuguese equestrian athletes.

Median age of rider (range)	25 (15-91)
Median Body mass (kg)	63 (41-90)
Body height (cm)	17.38±9.16
BMI	22.38±2.93
Sex	111 men (51.4%)
	105 women (48.6%)
Equestrian modality	Dressage: 96
	Show jumping: 86
	Horse ball: 8
	Working equitation: 3
	Horseracing: 3
	Eventing: 8
	Endurance: 2
	Bullfight rider: 1
	Break a horse: 2
	Leisure: 7
Days of training per week	1-2: 48 (22.2%)
	3-4: 59 (27.3%)
	≥ 5: 109 (50.5%)
Horses	Same: 65 (30.1%)
	Several horses: 151(69.9%)
Practice another sport	67 (31%)
Number of injuries	0: 55 (25.46%)
	1-2: 94 (43.5%)
	3-4: 34 (15.7%)
	5-6: 19 (8.8%)
	≥7: 14 (6.5%)

Description of injuries

Fifty-five riders (25.46%) had no injuries and 161 (74.54%) had at least one injury since they started riding. Table 2 presents details regarding the riders' first injury. The most frequently injured regions were the lower and upper limbs. The most prevalent lesions were in the muscle and bone, and falls were the most common mechanism of injury. Injuries occurred mostly in the training context; most injured riders went to the hospital emergency room (ER), with 24 requiring surgery and 87, rehabilitation.

Eighty-seven riders reported a second injury (Table 3); the lower limb was the most affected, with ligament injury being the most prevalent form of damage. Falls, which mainly occurred during training sessions, were the most common cause of injury. For their second injury, 51 riders visited the ER, 8 required surgery, and 43, rehabilitation.

Eight riders changed their EM due to injury.

Risk factors for injury

In our study, sex (p=0.119), history of past illness (p=0.477) and EM (p=0.758) were not associated with the occurrence of injury. There was a statistically significant association between increased height (p=0.033) and weight (p=0.02) and the occurrence of injury. The risk of injury increased with the frequency of training (p=0.003) and with experience (p=0.002). Riding different horses showed a more significant correlation with injuries when compared to riders that rode the same horse (p=0.001).

Table 2: Description of first injury.

	N (161)	%
Median age of rider	18 (range 10-53)	
Region		
Lower limb	56	34.8
Upper limb	39	24.2
Lumbar spine	38	23.6
Cervical Spine	12	7.5
Head	9	5.6
Thorax	4	2.5
Abdomen	2	1.2
Thoracic spine	1	0.6
Type		
Muscle injury	63	39.1
Bone injury	58	36
Ligament injury	29	18
Traumatic brain injury	6	3.7
Haematoma	2	1.2
Abdominal Organ Injury	2	1.2
Radiculopathy	1	0.6
Mechanism		
Fell off a horse	100	62.1
Unexpected horse movement	28	17.4
Incorrect posture	25	15.6
Kicked or hit by a horse	8	4.9
Context		
Training	134	83.2
Competition	17	10.6
Ride outside the ring	5	3.1
Horse management	2	1.3
Break a horse	1	0.6
Race	1	0.6
Bullfight	1	0.6
Hospital emergency		
Yes	105	65.2
No	56	25.9
Surgical procedure		
Yes	24	14.9
No	137	85.1
Rehabilitation		
Yes	87	54
No	74	46

Table 3: Description of Second injury.

	N (87)	%
Median age of rider	19 (range 11-54)	
Region		
Lower limb	30	34.5
Upper limb	19	21.8
lumbar spine	12	13.8
Head	12	13.8
Cervical Spine	6	2.8
Thorax	4	1.9
Abdomen	2	0.9
Thoracic spine	2	0.9
Type		
Ligament injury	32	36.8
Bone injury	31	35.6
Muscle injury	9	10.3
Traumatic brain injury	7	8
Laceration	4	4.6
Haematoma	2	2.3
Abdominal Organ Injury	1	0.5
Radiculopathy	1	0.5
Mechanism		
Fell off a horse	51	58.6
Unexpected horse movement	14	16.1
Incorrect posture	11	12.6
Kicked or hit by a horse	9	10.3
Collision with another horse	2	2.3
Context		
Train	71	81.6
Competition	10	11.5
Horse management	2	2.3
Break a horse	1	1.1
Ride outside the ring	1	1.1
Race	1	1.1
Horseball game	1	1.1
Hospital emergency		
Yes	51	58.6
No	36	41.4
Surgical procedure		
Yes	8	3.7
No	79	36.6
Rehabilitation		
Yes	43	49.4
No	44	50.6

Riders who practiced other types of sports had a significantly higher incidence of injury than those who did not (p=0.044), with a significant association between injury and a greater frequency of weekly practice besides HR (p>0.05).

Table 4: Risk factors for injury.

		Lesion		P-value
		Yes	No	
Sex	Women	73	32	0.119
	Men	88	23	
History of past illness	Yes	13	3	0.477
	No	148	52	
Equestrian modality	Dressage	73	23	0.754
	Show jumping	99	31	0.526
	Horseball	7	1	0.467
	Working equitation:	2	1	1
	Horseracing	3	0	0.572
	Eventing	8	0	0.207
	Endurance	1	1	0.445
	Bullfight riding	1	0	1
	Breaking a horse	1	1	0.445
	Leisure	4	3	0.374
Days of training per week	1-2	32	16	0.003
	3-4	37	22	
	≥5	92	17	
Horses	Same	38	27	0.001
	Several	123	28	
Practice another sport	Yes	56	11	0.044
	No	105	44	
Frequency of sports per week	1-2	20	1	0.038
	3-4	36	10	
Years of experience	Average	16.02	12.25	0.002
Median Body mass (kg)	Average	65	62.09	0.02
Body height (cm)	Average	169.72	166.02	0.033

The RFs for injury are listed in Table 4.

In this study, we evaluated the prevalence of different HR-related injuries in an attempt to characterize them and identify prevention strategies. The most frequently reported injury from equestrian sports remains undetermined, but the predominant type of injury has shifted in recent years from head to limb injuries, which may be related to the increased use of helmets [10]. Similarly, we found that both first and second injuries predominantly occurred in the lower limb.

Young et al. (2015) reported that HR injuries were mainly caused by falls from the horse, which was also observed in this study. Herein, horse-induced trauma caused by kicking or biting represented a small percentage of injury mechanisms (5% of the first injury and 10.3% of the second). In this regard, the rider should be aware of the horse's unpredictable behaviour in order to anticipate any dangerous movement [11].

Carmichael et al. (2014) recommended using safety equipment even while off the horse [9]. Safety devices such as helmets, hand

gloves, and shoes should be used to prevent or minimize horse-related injury severity [12]. In addition, horse equipment must always be checked and kept in safe condition (e.g. checking stitching on saddlery [8].

In our study, two riders were injured due to trauma from colliding with another rider. Education and awareness are essential to avoid preventable accidents. It is important to identify the risks involved in practicing with other riders to reduce the likelihood of injury [13].

Herein, injuries were observed to occur most frequently during training and secondarily during competitions, which is because riders spend more time training, and horse behaviour is more unpredictable during competitions given the stressful environment.

Age is also believed to be a relative RF, with multiple studies identifying 10-29 years as the peak age of injury, with paediatric reviews showing higher injury risk during the 13-15 year interval [10]. In our sample, the average age of the first and second injuries was 18 and 19 years, respectively, similar to those reported in the literature.

It has been suggested that young women inexperienced in HR are more prone to [1,12]. One potential explanation for this finding is that HR is more common among young women, leading to greater risk exposure [1]. However, our study showed no statistically significant differences in the occurrence of injury between the sexes, which may have been due to the similar percentages of men and women in our sample, proving that sex is not a risk factor for injury.

The occurrence of injury increased with the number of training sessions per week; when riders spend more time practicing HR, the likelihood of associated injury increases. The same explanation justifies the significant association of injury with more years of experience and with taller and heavier riders, which probably represent older riders. There was also a significant correlation between practicing another sport and the incidence of injury. Exercise strengthens the muscles required for riding, but when done incorrectly and excessively, it can lead to muscle fatigue. This can reduce the rider's ability to synchronize with the horse's movement [14].

In a retrospective study, 8% of riders required surgical intervention; this percentage was observed to be higher in this study, with 14.9% and 9.2% for first and second injuries, respectively [3].

To the best of our knowledge, the present study is the first to investigate the role of physiatry in HR-related injuries. The physiatrist plays a major role in the management of this injury, which was demonstrated in our study, with 54% and 49.5% of the riders requiring rehabilitation at the first and second injury, respectively. Riders' ability to maintain good posture is of paramount importance for good performance outcomes and to prevent falls [15] and overuse injuries [16]. During HR, the adductors must be relaxed and balance must be maintained through the core muscles [17]. Many novice riders try to find equilibrium through the adductor muscles [17]. Thus, adductor muscle stretching exercises should be incorporated into the rehabilitation program, principally for novice riders, to prevent adductor strain, along with core strengthening to improve equilibrium maintenance and reduce the risk of falls in case of abrupt horse movements. A strong core also allows for the disassociation of movement between the upper and lower body required for HR [18]. These are important factors for better adaptation to various horses, since in this study, it was found that riding several horses is more significantly associated with injury when compared to riding the same horse. Further, it allows for maintenance of the correct, symmetrical saddle position to avoid muscle overload [18]. González and Šarabon (2021) showed that experienced riders were able to attenuate shockwaves by activating their core muscles earlier than novice riders, which is important for the management of impact forces created by the horse on the rider's spine [19].

It is fundamental to strengthen parts of the rider's body in a sport-specific manner. Moving the pelvis from one side to the other, or in circles, on a gymnastic ball requires the ability to activate and coordinate the core muscles to create a wide range of movements that are necessary for the rider to follow the rolling motion of the saddle [20]. The side-to-side pelvic roll exercise on a gymnastic ball, when performed properly, activates the core muscles and correlates significantly with riding quality [20]; it can be implemented in core training to prevent HR injuries.

Limitations

This was a retrospective study with inherent limitations such as memory bias during the filling of the questionnaires. As the design of this study involved filling a questionnaire with riders currently practicing HR, we were unable to assess injuries that caused death or led the rider to stop riding. In addition, the questionnaire was not standardized, as it was created by the authors.

Conclusion

The results of this study have important implications as they demonstrate that the majority of riders have at least one injury while practicing HR; thus, injury prevention is essential.

Currently, the most frequently occurring injuries are musculoskeletal and in the extremities. The physiatrist plays an important role in the management of these injuries and should be involved in the rehabilitation program to help strengthen the rider's core muscles. Further research on reducing equestrian-related injuries through exercises should be conducted in the area of equestrian-specific sports medicine.

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