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10.4103/2230-8229.197177

# Prevalence, patterns, and correlates of equestrian injuries in Malaysia: A cross-sectional study

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## Abstract:

**BACKGROUND:** Equestrian sport carries with it an implicit risk of injury. Despite the frequency of injuries in equestrian sports, there is no published study on injuries of equestrian athletes in Malaysia.

**OBJECTIVE:** The objective of this study was to determine the prevalence of injuries and its correlates among horseback riders.

**SUBJECTS AND METHODS:** A web-based standardized questionnaire was used to collect data for this cross-sectional survey. Horseback riders aged 18 years and above were included in the study. Out of 169 participants, 93 were females and 76 were males. The correlation of injuries to gender, age, level of experience, exercise habits, use of safety measures, and type of equestrian sport were determined. Chi-square test was performed to test for statistical significance.

**RESULTS:** The prevalence was high with 85.8% of the participants reporting symptoms and characteristics of injuries in the past 12 months. The most frequently perceived symptoms reported were in the upper extremities (43.4%) followed by lower extremities (40.7%), head injury (8.3%) and injuries of upper and lower back (3.4%). There was a higher prevalence of injury among female participants (55.03%) than males (42.60%). A significant correlation was found between gender and prevalence of injuries. About 70% of the riders sustained soft tissue injuries. Fifty-five percent of the injured were involved in recreational riding. The most common mechanism of injury was a fall from a horse. Sixty percent of the injured riders did not seek medical attention after being injured, and physiotherapy consultation was even lower with 10.3%.

**CONCLUSIONS:** The high prevalence of injuries and low rate of medical consultation emphasize the need for education programs on safety in Malaysia. Sessions should be held to improve coaching for riders and instructors, and their knowledge of the nature of the horse, mechanisms of injuries, horse handling, and riding skills to help them host safe equestrian activities.

## Key words:

Equestrian, horse riding, injuries, prevalence, safety equipment

## Introduction

Horse riding, a popular sport, and hobby worldwide is now gaining popularity in Malaysia. Horse riding requires an amalgamation of skill, balance, and technique. Injuries sustained as a result of horse riding are common because of the nature of the sport. The athlete's partner is a nonhuman animal rather than a machine or other human teammates. The horse can act unpredictably and independently of the rider, both when it is being ridden and when it is not. This key aspect of the sport poses unique challenges not found in any other sport. Horses weigh an average of 1500 lb. Moreover, can travel up to speeds of 40 mph, and can deliver 1000 N of

force in a single kick. When mounted, the rider's head is approximately nine feet off the ground, unrestrained, and in English riding disciplines, tends to lean forward in the saddle while traveling at relatively high speeds. All of these factors contribute to put the rider at the significant risk of being thrown off.<sup>[1]</sup> Equestrian disciplines are said to be some of the most dangerous. Carmichael *et al.* reported an injury rate of 1 for every 350–1000 h spent riding.<sup>[2]</sup> Although horse riding has benefits to health, it can result in several injuries caused by such factors as improper equipment, clothing, and technique. There is ample opportunity for injury to occur in what has been described as the most dangerous sporting activity in terms of frequency and severity of injury. Hasler reported that the

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**How to cite this article:** Majeedkutty NA, Khairulanuar NA. Prevalence, patterns, and correlates of equestrian injuries in Malaysia: A cross-sectional study. *J Fam Community Med* 2017;24:18-22.

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most common injuries are head injuries with a percentage of 24%, followed by those of the upper extremities (17%) and the lower extremities (15%).<sup>[3]</sup> According to Silver, in contrast to other sporting accidents, there are more lumbar and thoracic injuries than cervical injuries, and more women are injured than men. Of all horse riding activities, jumping is the one most likely to cause a spinal injury.<sup>[4]</sup>

Despite the dangers posed by equestrian sport and its widespread popularity in Malaysia, literature on injury patterns to date remains sparse, and there is no published study that specifically characterizes the injuries among horseback riders in Malaysia.

The objective of this research was to get baseline information on the prevalence of injuries to horse riders. The findings of this study could pave the way for further research on injuries sustained by horseback riders to develop a better and safer equestrian sport.

## Materials and Methods

This cross-sectional study was conducted using a standardized self administered online questionnaire. The survey was developed by a group of clinicians including physical therapists, physicians, recreational riders and licensed instructors. Questions were drawn from previous published literature as well as the authors' experience in the equestrian community and the rehabilitation setting. A pilot study was conducted to ensure the validity of the questionnaire. The participants were categorized according to their level of training or experience. The four levels of experience as per the Long Riders Guild Academic Foundation classification on different levels of riding ability were beginner/novice, intermediate, advanced, and professional.<sup>[5]</sup> The questionnaire consisting of three sections took approximately 10 min to complete. In the first section, basic demographic details about the participants were elicited. The second section included questions on horse-related injuries sustained by the participants, the area and the mechanism of injuries. Participants were also asked whether they had any medical consultation and underwent any physiotherapy for injuries sustained. The last section was for the participants to describe their background in horse riding and the safety measures they took. Male and female riders of 18 years and above were included in the study. Special consent had to be obtained from the parents for the inclusion of minors in the study, therefore, minors were excluded. The researchers obtained ethical approval from Scientific and Ethical Review Committee of Universiti Tunku Abdul Rahman, Malaysia. Informed consent was obtained from all participants and data were encrypted to ensure confidentiality. A  $p < 0.05$  was considered statistically significant for all comparisons.

## Results

A total of 169 horse riders participated in the survey. One hundred and forty-five (83.8%) of the participants reported having injuries in the past 12 months. The mean age of participants was 25.7, (standard deviation [SD] =7.725). Out of 169 participants, about 55% were females and 45% were males, as shown in Table 1. The mean height of

riders was 161.63 cm (SD = 3.50), and the mean weight was 55.12 (SD = 5.76).

Most of the participants (47.3%) belonged to the intermediate level, 29.3% were beginners, 21.8% were at the advanced level, and 1.2% were professionals. The majority of participants (94.48%) had <10 years of riding experience. However, age was not associated with the experience of the riders [Table 2].

There was no significant correlation between the level of experience and the prevalence of injuries ( $P = 0.10$ ). The results show that the type of sport practiced by the riders influenced the prevalence of the injuries ( $P = 0.05$ ). Most of the participants were involved in recreational horse riding. The results showed that 25.3% were involved in show jumping, 11.8% in dressage and 6.5% of the participants were involved in the polo. However, only 1.2% of the participants were involved in events as their main practice. Riders were more interested in show jumping than other types of equestrian sports. However, 55% of the participants chose "Other" option in the question.

The most common injuries were of the upper extremities (43.5%), followed by lower extremities (40.7%), head (8.3%), and trunk area (3.4%). Surprisingly, there were no reported injuries of the neck region. The data in Table 3 shows that of the 8.3% total head injuries sustained, 6.9% of the participants sustained nonfacial injuries, and only 1.37% had injuries of the facial area. Of the injuries of the upper extremities, 10.34% of the participants had injuries to the shoulders and 13.79% sustained injuries to the arms. The percentages of injury to the elbows and the forearms were the same, at 6.9%, and percentage of injuries to the palm and fingers was 5.52%. The total injuries to the trunk area reported were 3.4%. No injuries to the chest were reported and none to the abdomen. However, 0.7% had injuries the upper back region and 2.76% to the lower back region. Total injuries reported of the lower extremities amounted to 40.7%; more at the ankle and foot (19.31%), injuries to the thighs and knees reported were 8.28% and 6.90%, respectively. Most of the participants had suffered soft tissue injury. About 70% of the participants had had soft tissue injury in the previous 12 months, 28.3% of the participants had lacerations and 25.2% had contusion. About 15% of the participants had abrasions, 11% had fractures, and only 6.9% of the participants had concussions.

Falls were estimated at 42.7% while "others" accounted for 47.6% of injuries. Mechanical problems accounted for 24.1%

**Table 1: Demographic data of the participants (n=169)**

Gender	Number of participants (%)
Male	76 (44.97)
Female	93 (55.03)

**Table 2: Level of experience**

Level of experience	Number of participants (%)
Beginner/novice	50 (29.6)
Intermediate	80 (47.3)
Advanced	37 (21.8)
Professional/trainer ( $P=0.01$ using correlation)	2 (1.2)

of injuries; 19.3% of the participants had injuries in various parts of the body as a result of the mechanism being dragged. However, only 1.4% of the participants reported being trampled on by a horse. All the participants reported that they wore helmets to ride. About 98% of the participants used gloves, and 96.6% of the participants reported that they wore special trousers to ride [Table 4].

Only 16.55% participants reported doing substitute with performed any warm up exercises before riding. The majority of the injured riders did not seek any medical help. Sixty percent of the participants did not seek medical help after injuries, and 10.3% received any kind of physical therapy after injury.

### Discussion

Horse riders are one of the top four groups being targeted by the Commonwealth Injury Prevention Department to reduce their injuries in sport and recreation.<sup>[6]</sup> The majority of the participants (83.8%) reported being injured as a result of horse-related activities. A previous study by Christey on equestrian injuries had also reported a high prevalence rate of injuries in equestrian sports and estimated the injury rate as 0.6/1000 riding hours.<sup>[7]</sup> In the adventure and tourism industry, it is suggested that prevalence rate is as low as 1 per million participation hours.<sup>[8]</sup> In 2004, Petridou *et al.* estimated that the incidence of injury from horse riding was 21/100,000

in Greece and that the incidence was 160 times higher for horse racing.<sup>[9]</sup>

The present study demonstrated that the prevalence of injury for female participants was higher (55.03%) than males (42.60%). Similar results were reported by in a study conducted in US on orthopedic injuries in equestrian sports.<sup>[10]</sup> Our results are in accord with another study that stated that the group most commonly injured was made up of women.<sup>[11]</sup>

The upper limb injuries outnumbered lower limb injuries with 43.4% of the riders reporting injuries of upper extremities. All riders wore normal shirts with no protective clothing on the upper extremities. Therefore, when there was a fall, the shirt was easily ripped resulting in an injury to the upper extremities. The incidence of upper limb injuries appears to be more in our study compared with other studies. A similar study found that 24.3% of injuries affected the upper limbs, 42.3% of which were fractures.<sup>[12]</sup> Our results are in accord with the findings of a systematic review of common injuries in horseback riding, which states that the most common location of horse-related injuries is the upper extremities (24%–61%). Fractures and dislocations of the wrist may result from falls from horses riding,<sup>[13]</sup> perhaps as a result of the lack of protection for this region. Injuries to the lower extremities were second in frequency (36%–40%). This is in agreement with patterns of injury reported from Australia.<sup>[14]</sup> Effective protection for hands particularly fingers for handling ropes needs to be investigated.

Lower extremities accounted for 40.7% of the injuries reported by the riders. Most of the injuries were due to falls. The most common injuries of the lower extremities were soft tissues injuries, lacerations, and abrasion of the skin. Equestrian clubs should consider the height of the horse in training sessions since the horse's height from the ground can contribute to the severity of the injuries when there is a fall. Most of the riders wore specially designed trousers and boots for riding. The majority of the participants had <10 years of involvement in equestrian sport or horse riding. This might be one of the reasons for the high prevalence of lower limb injuries. Strength of the core and lower body is very important to maintain the stability on the horse as it helps to maintain the grip of the riders' legs on the body of the horse. Riders need to improve their core strength for overall balance on horse. They need to perform exercises that help restore the natural biomechanics of the body and enhance their posture and strength.<sup>[15]</sup> To strengthen the legs, complicated exercises that require the rider to stabilize their own body weight are recommended. Pilates and yoga are amazing and fundamental for all equestrians.<sup>[16]</sup> Riders are advised to choose a horse of appropriate size, temperament, character and age to their size and skill level, in conjunction with a trained and experienced horseperson as instructor.<sup>[17]</sup> A study in 2011 stated that the traumatic events cause different types of fractures and ruptures such as lisfranc fractures, dislocation, ankle injuries, and foot fractures. The severity of lisfranc injury can vary from simple to complex, involving many joints and bones of the mid-foot.<sup>[18]</sup>

The prevalence of head injuries reported by the participants was low. All participants wore helmets on while riding.

**Table 3: Injuries in various anatomical areas (n=145)**

Area of injuries	Number of riders (%)
Head	12 (8.3)
Facial	10 (6.9)
Nonfacial	2 (1.4)
Neck	0
Upper extremities	63 (43.4)
Shoulders	15 (10.34)
Arms	20 (13.79)
Elbows	10 (6.9)
Forearms	10 (6.9)
Palms and fingers	8 (5.52)
Trunk	5 (3.4)
Chest	0
Abdomen	0
Upper back	1 (0.7)
Lower back	4 (2.7)
Lower extremities	59 (40.7)
Hips	2 (3.4)
Thigh	12 (20.3)
Knees	10 (16.95)
Calf	7 (11.84)
Foot and toes	28 (47.46)

**Table 4: Protective clothing used by riders**

Protective clothing	Number of participants (%)
Helmets	145 (100)
Gloves	142 (97.9)
Boots	141 (97.2)
Trousers	140 (96.6)

Indicating that riders were well informed about the need for helmets. The use of helmets or headgear is compulsory for horse riding in Malaysia, so the clubs provide helmets or headgear to riders. The last few decades have shown drastic changes in the attitudes of riders toward the use of helmets when riding. In 1993, a survey of 837 horse riders on attitudes to helmet showed that only 20% wore helmets when they rode, and 40% never wore an equestrian helmet.<sup>[19]</sup> A decreased incidence of head injuries has been demonstrated with the use of approved riding helmets.<sup>[20]</sup> A study in 1971 noted that 66% of admissions to hospital were attributable to a head injury<sup>[21]</sup> but 20 years later this figure had fallen to 26%.<sup>[22]</sup> Another study reported that head injury admissions of a mainly professional group of jockeys were 40%.<sup>[23]</sup> The main reason for the reduction in head injuries is the improved design of the protective helmet. In addition to headgear, the focus should be on protective equipment for the upper extremities because of the high frequency of injuries involving those parts of the body. The use of properly fitted protective equipment will not eliminate all injuries, but should substantially reduce the severity and frequency of injury.

The results show that recreational riding is the most popular type of equestrian sport in Malaysia. Show jumping was second among the participants' activity with a percentage of 25.3%. Our research did not show a clear link between the experience of the rider and the risk of injury. Previous studies reported that riders with less experience were at a higher risk of injury.<sup>[24,25]</sup> However, another study reported that there was no correlation between rider's experience and injury.<sup>[26]</sup> Further research is needed to clarify this relationship. This study found no significant differences between the number of participants who had injuries and the skill of the riders.

Certification of instructors is very critical. The choice of an instructor should be based on the accident rate of his or her students, both those riding under supervision and those who ride unsupervised. It is recommended that riding establishments and schools should keep records of each horse and any incidents that occur. Riders need to be examined before they return to the saddle after an injury for their own good.<sup>[27]</sup> Organizers of equestrian events should ensure that adequate first aid and medical services are available. All horse riders should receive basic training in the principles of first-aid as part of their rider education. The use of rules and regulations for the conduct of events, knowledge of horse behaviour, well-conducted lessons, contraindicated medical conditions, public education, rider education, appropriate equipment and clothing, the riding environment, rider experience, safety stirrups, body protectors, and instruction on first aid are some of the measures to be taken to reduce injuries.

Further research with a larger number of participants is recommended. The effectiveness of public education campaigns to reduce horse-related injuries should also be evaluated. Our study shows a high prevalence of injuries among horseback riders in Malaysia. This evaluation of trauma of riders indicates different patterns of injury, contributing to the growing body of literature in this field. Upper limb injuries outnumber other injuries in equestrian sport.

## Conclusion

A significant reduction in the morbidity of equestrians could be obtained with the use of safety equipment. Certified instructors and first aid training at horse riding facilities would also be beneficial but no single measure would be as effective as the use of approved helmets for every ride. Younger female riders tend to have more injuries, though all participants are at risk. Most injuries tend to be orthopedic, involving large number of upper limb injuries. Furthermore, the true prevalence of injuries is likely under-reported with many patients not seeking medical care.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

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