

Analysis of Injuries in Competitive Equestrian Events

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Abstract

Objective: Current equestrian sport-related acute injury research is sparse. The goal of this study is to explore equestrian injury types stratified by population and equestrian discipline. **Design:** Injury reports from the US Equestrian Federation (USEF) were compiled from 2015 through 2019, and the prevalence of different injury types within the main equestrian disciplines was calculated. **Setting:** Retrospective cohort study from USEF accident report data. **Participants:** Athletes competing at USEF sanctioned equestrian events. **Independent Variables:** Equestrian participant's age group, sex, and equestrian event type are the independent variables. **Main Outcome Measures:** Frequency of types of injuries in equestrian events stratified by equestrian discipline, age (junior vs senior), and sex. **Results:** Three thousand four hundred thirty equestrian athletes injured from 441 816 total athlete exposures during 2015 to 2019 were analyzed showing an injury rate between 0.06% and 1.18% for each discipline with an overall injury rate of 780 per 100 000 athlete exposures. Hunter-jumper and 3-day eventing had the highest injury rates. Head injuries and bone injuries were the most common types. No clinically significant differences in injury rates were observed between males and females or junior and senior equestrian athletes. **Conclusions:** Equestrian sports have an overall injury rate of 780 per 100 000 athlete exposures in the certified competition setting. Hunter-jumper and 3-day eventing have an increased injury rate compared with nonjumping disciplines. These data should help equestrian event clinicians to anticipate the types of injuries and help outpatient clinicians make preparticipation medical eligibility and assist in counseling for equestrian sports.

Key Words: equestrian injuries, riding injuries, equestrian sports, horse riding injuries, horse sports

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INTRODUCTION

Very little sport-related injury and prevention research exists on equestrian (participants in horseback riding) activities. Although there have been literature reviews on equestrian sports from 1992 up to 2020,^{1–6} there are very little original research data. A study from 1995 to 2005 on equestrian trauma victims in emergency departments (EDs) differentiated injury by body location (chest, head, abdomen, and extremities); however, this did not evaluate nontrauma victims or equestrian athlete injuries that were not transferred to the hospital.⁷ A study in Ireland from 2018 which surveyed ED

injuries of equestrian riders found an incidence of skeletal fractures of 27.5%, joint dislocation/subluxation 5%, concussion 12.5%, and splenic laceration/intraperitoneal hemorrhage 1%.⁸ A study of ED equestrian injuries in Germany found that female sex was predominantly affected⁹; however, baseline demographics of equestrian riders were not given, and the equestrian rider population is generally female-dominant.

This study aims to discover the types of equestrian injury, including those not seen in the hospital or ED, and the population characteristics of the equestrian community. We correlate type of injury with the specific equestrian activity to further explore risks associated with different equestrian sports. This information is expected to be helpful for physicians and equestrian participants in decision-making about equestrian injuries whether it be in preparticipation counseling or on competition sidelines or in the ED.

METHODS

Data were obtained from the US Equestrian Federation (USEF), an organization that oversees most equestrian competitions in the United States, on accidents/injuries that occurred at USEF-sanctioned competitions for the years 2015 to 2019. The 2019 USEF accident report form that was used to report injuries can be downloaded and viewed from the USEF web site.¹² Baseline demographic data were also obtained from all equestrian participants at USEF competitions during that timeline. An IRB exemption was requested and granted for this project by the University of Arkansas Medical Sciences.

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C. Haines conceived of the presented idea and obtained data set. C. Haines and L. McGhee obtained IRB exemption. C. Haines, H. K. Jensen, and S. A. Karim performed the analytic calculations on the raw data and verified results. C. Haines took the lead in drafting the manuscript with guidance from H. K. Jensen. All authors discussed the results and reviewed and edited the final manuscript.

The raw data were obtained from the United States Equestrian Federation (USEF), who requested to review this manuscript before publishing to ensure no confidential client/patient data were disclosed. The USEF had no influence on the content of this manuscript or the results that we obtained.

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Three thousand four hundred thirty USEF accident reports with identifying rider information removed (such as name, date of birth, date, and physical location of injury) were received for the 2015 to 2019 competition years. Information obtained from each accident report included year of injury, sex of participant, age range of participant, equestrian discipline (type of equestrian sport), and type of injury that occurred (multiple injuries can be documented).¹⁰

The US Equestrian Federation also provided us with demographic data on the overall competitive equestrian population for each year from 2015 through 2019, including total participants, and number of male, female, junior (aged 17 years and younger), and senior (aged 18 years and older) participants.

An equestrian athlete and injury were considered as a unique athlete encounter for each individual competition, although a rider could enter in many competitions throughout each season and even in different disciplines. Many equestrian riders will compete season after season and multiple times per season, so the actual number of unique riders is likely far less than the 443 730 total equestrian athlete exposures over the 5 years.

An injury report is generated at a USEF event for any injury or fall from horse that prevents the athlete from continuing the competition or any athlete seeking on-site medical attention. The accident form can be filled out by a physician, emergency medical services, or event official. This form is submitted to the USEF who records and responds to this information accordingly.

There were 30 different equestrian disciplines listed under the USEF. Some smaller disciplines had a very small number of participants. We grouped all of the disciplines of similar riding styles together in the following categories:

1. Breed specific (includes Andalusian/Lusitano, Arabian, Carriage Pleasure Driving, Connemara, Friesian, Hackney pony, Morgan, Paso Fino, Shetland, and Welsh)
2. Hunter–jumper (includes hunter, hunter equitation, jumper, jumping seat equitation, and saddle seat equitation)
3. Dressage
4. Three-day eventing
5. Western (includes western and western dressage)
6. Saddle seat (includes saddlebred and saddle seat)
7. Other (includes combined driving, endurance, National Show Horse, roadster, vaulting, and miscellaneous type)

The total participants and injuries by type for each of these categories were tallied. Seven ‘suspected type of injury/incident’ check boxes are listed on the USEF accident report form and a free-text field. The 7 categories are as follows:

1. Possible head injury (required transportation and further workup before a definitive diagnosis is made)
2. Fractures and bone injuries
3. Joint and ligament injuries
4. Muscle and tendon injuries
5. Lacerations and skin lesions
6. Concussion and head injuries (diagnosed onsite)
7. Back and spine injuries
8. Other

We went through all of the free-text entries and assigned them to 1 of the 7 categories by best match and an “other” category. This “other” category contained minor dental, ocular, and abrasion injuries that did not fit into any other category. In addition, some forms did not have the injury type portion filled out, and those were assigned the “uncategorized injuries.” These injury types were tallied by discipline as well as a total number of

riders injured and total number of injury types. One rider can have multiple injuries for 1 incident and may have multiple injuries throughout the season or years. Each of these injuries and competitions are recorded as separate events. Injury location was not provided by the accident report data. Proportions of injuries were obtained, and categorical variables were analyzed using χ^2 tests. Statistical significance was set at $\alpha < 0.05$.

We also counted the number of injured males, females, junior athletes, and senior athletes. Total number of athlete exposures for each of those demographics was tallied as well. Using these data, proportions were calculated and *P* values obtained using the χ^2 test. Calculations of sex proportions were based on the total male and female participants who had a documented sex. Competition forms which had no sex specified were not included. All participants did have junior or senior designation documented.

RESULTS

There were 443 730 total athlete exposures over the 5 years studied, with a fairly even distribution year to year (ranges from 85 631–92 139 athlete exposures per year). Of the total athletes in the 5-year period, 327 912 (91.51%) were female, 30 407 (8.48%) were male, 85 411 did not specify a sex, 148 530 (33.47%) were junior equestrian athletes, and 295 200 (66.53%) were senior athletes (Table 1). The distribution of age and sex was similar for each year studied.

Our results showed the total injury rate across all equestrian disciplines to be 780 injuries per 100 000 athlete exposures during the USEF 2015 to 2019 competition dates. Total injury rates per discipline were less than 1.2% with the highest being 3-day eventing at 1.18% and hunter–jumper at 1.11%, and western with the lowest injury rate at around 0.06% (Figure 1 and 2). In addition, both 3-day eventing and hunter–jumper had the highest injury rates for every 1 of the 7 specified categories of injury (Figure 1), with a significant difference between disciplines ($P < 0.001$).

The most common injury types in 3-day eventing and hunter–jumper were ‘possible head injury’ and ‘fractures and bone injuries,’ followed by ‘muscle and tendon’ injuries. These were also the most common injury types over all disciplines. Dressage, breed specific, western, saddle seat, and other disciplines had a low and uniform distribution of injury types (Figure 1). There were 779 injury reports (~23%) that had no injury type filled out on the form that were filed into the ‘uncategorized’ injury type.

Male and Female equestrian athletes had an injury rate of 0.84% and 0.97%, respectively, with a χ^2 *P* value of < 0.001 (Table 1). Of note, 23.8% of participants did not have a sex specified, so these results are only based on the 76.2% of participants who did fill out that field on their competition forms when registering for the events. Senior and junior athletes both had very low injury rates, with junior athletes being 0.91% and senior athletes around 0.70%, with a χ^2 *P* value of < 0.001 . Although statistically significant, the difference between male and female and between junior and senior does not have clinical relevance.

DISCUSSION

Overall, our results show a relatively low injury rate for equestrian athletes, especially considering the inherent dangers

TABLE 1. Injured and Total Equestrian Athletes by Sex and USEF Age Grouping, Including Proportions and P Value

Sex Demographics	Total Competitors	Competitor Proportions*	Total Injured	Proportion Injured*	P
Male equestrian competitors	30 407	8.48%	256	0.84%	0.033
Female equestrian competitors	327 912	91.51%	3172	0.97%	
Total unspecified sex competitors	85 411				
Total competitors with specified sex	358 319				

Age Demographics	Total Competitors	Competitor Proportions	Total Injured	Proportion Injured	P
Junior competitors (≤17 yo)	148 530	33.47%	1350	0.9089%	<0.001
Senior competitors (≥18 yo)	295 200	66.53%	2068	0.7005%	
Total competitors	443 730				

* Based off of total competitors with a specified sex.

of large animal-related activities. The significant increased safety awareness and injury prevention in equestrian sports over the past 2 decades likely contributed to the low injury rates. The prevention strategies included American Society for Testing and Materials/Safety Equipment Institute-certified helmets, hard protective and CO₂ airbag vests for 3-day eventing, and strict jump build specifications and safety measures.

Three-day eventing and hunter-jumper athletes have higher injury rates, especially in the fractures and possible head injuries categories (Figure 1). Both disciplines require equestrian athletes to jump their horses over fences, which are solid or collapsible obstacles ranging from 6 inches up to 6 feet in height and up to 6 feet wide. Common sense suggests that this jumping is likely what is causing the increased injury rates in these disciplines; however, direct attribution cannot be determined by this study.

The other disciplines where horses do not jump have a much lower injury rates overall, with western being the lowest (Figure 1). This may be related to the slower pace that these western riders and horses usually strive for. This number is likely artificially low for western riders overall because the USEF only covers a portion of western riding performed in the United States and does not oversee western sports involving cattle such as roping and other rodeo sports that are generally considered to be higher risk activities.

Both men and women as well as seniors and juniors had a statistically significant difference in the injury rates. These results are not clinically relevant because they are all just under 1%, indicating that injury rate is similar regardless of sex or age group. Future research could be performed to further subdivide the “senior” age group into smaller cohorts.

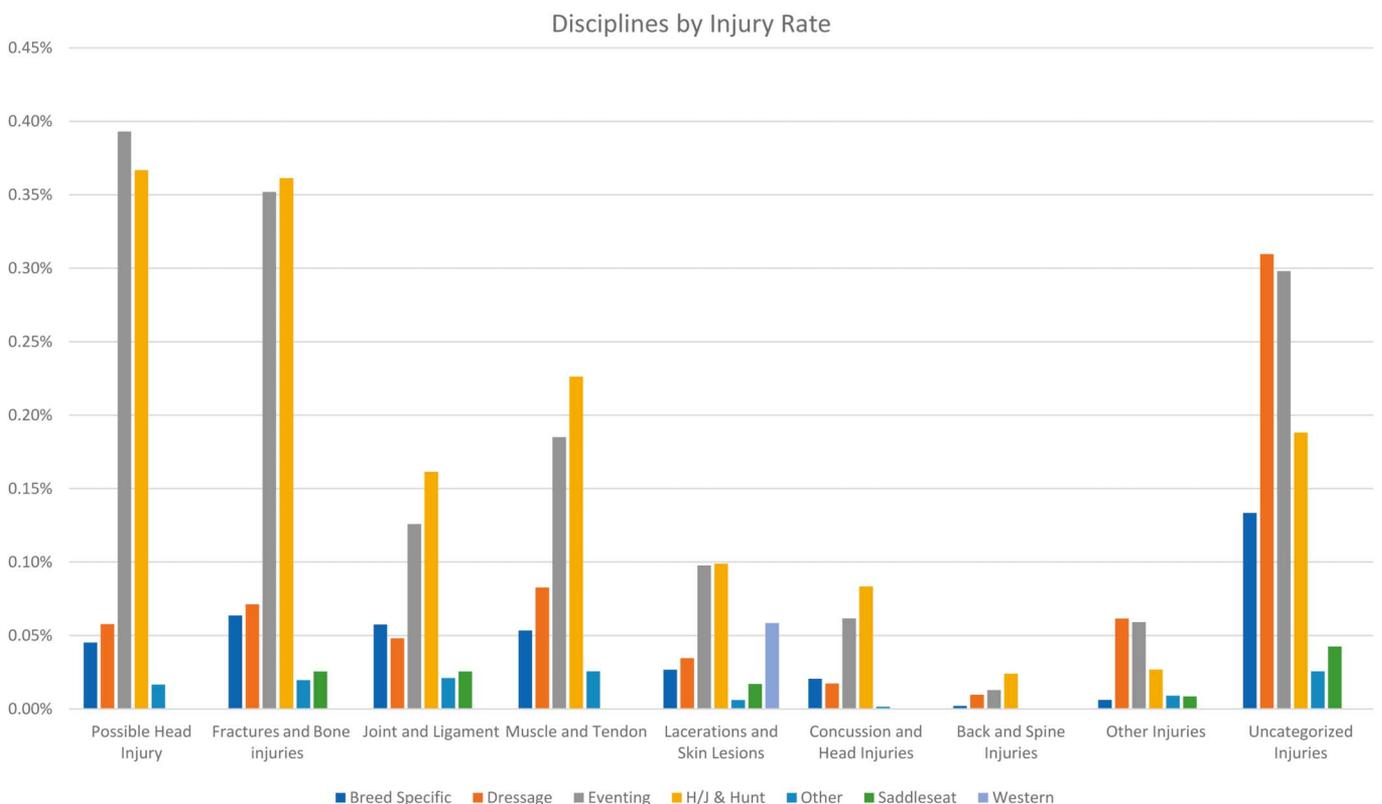


Figure 1. Proportions of types of injury stratified by discipline categories.

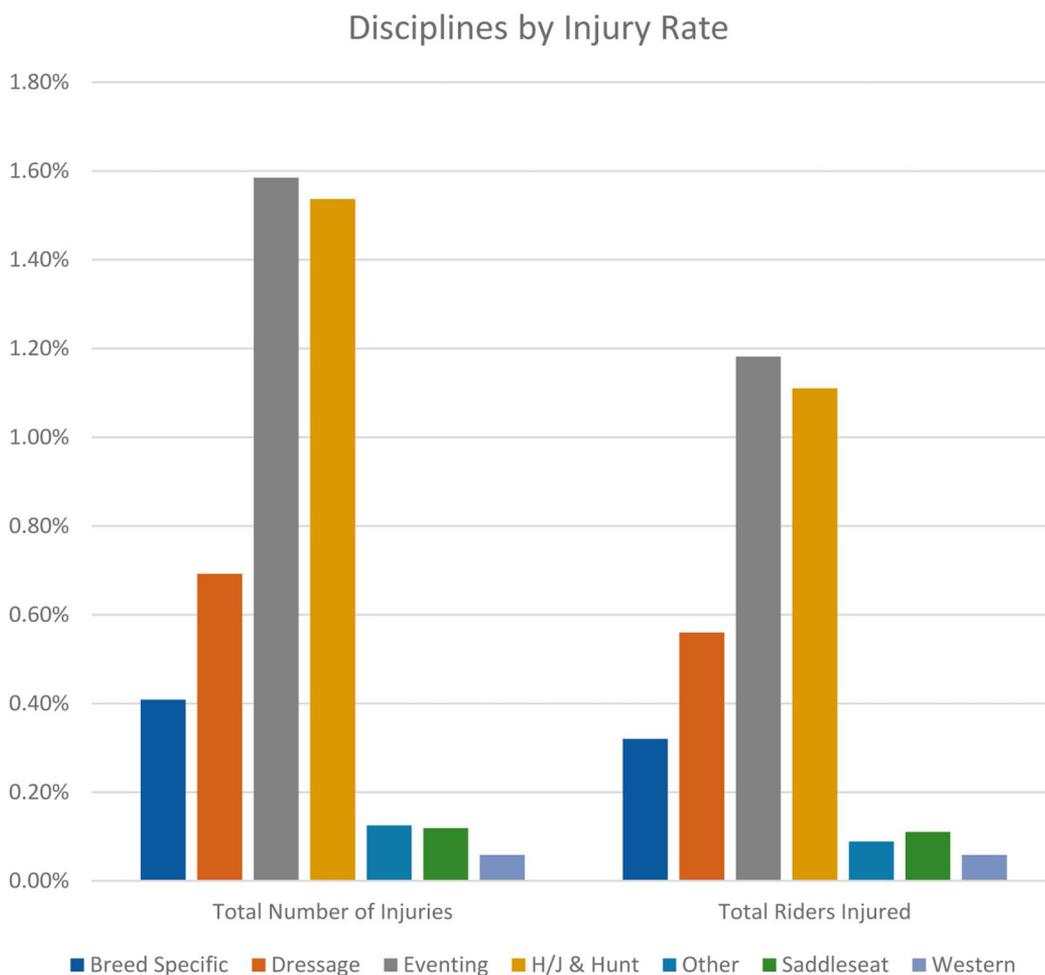


Figure 2. Total injuries stratified into the discipline categories.

Several reports have evaluated the use of helmets in equestrian sports for reduction of traumatic brain injuries and concussions, with an overall finding of a protective benefit and reduced concussions with helmet use.^{11,12} The decrease in injury severity and mortality with approved helmet use should encourage physicians and participants to promote helmet use in any equestrian activities.

Compared with previous research, these data provide an in-depth look at equestrian-related injuries at the scene of injury, providing a broader scope than only those injuries that present to an ED. Categorizing injuries by discipline provides insights into varying risks of different equestrian activities.

Although we were able to get a far better understanding and more granular view of equestrian athlete injuries and demographics of the sport overall, some limitations do exist in this study. First, the missing sex data for some participants and the unspecified injury on the accident report forms required us to calculate the results without a comprehensive data set.

Second, the USEF injury report form filled out at the USEF competitions can be filled out by a physician, emergency medical services, or event official, so those documenting injuries have varying degrees of medical knowledge. These forms are usually filled out on the scene shortly after the incident, so the injury reports are generally a best guess diagnosis in the field before a full diagnostic workup. These forms are also only required at USEF-sanctioned events;

therefore, it may not reflect the injury profile of other non-USEF events or of riders training and riding at their home stables. Based on the National High School Sports-Related Injury Surveillance Study by the University of Colorado, high school sports injuries tend to be at a higher incidence at competitive games than at home practice, with a similar trend in college athletes.¹³ Further studies need to be performed to determine whether this is true of equestrian sports.

This study provides a broader look at injuries in equestrian events than previous research conducted only in EDs; however, this research is only looking at acute traumatic events, not long-term or repetitive use injuries. These insidious and repetitive use injuries are likely going to be the bulk complaints from equestrian athletes presenting to an outpatient physician. Further research into these types of injuries in equestrian athletes needs to be performed.

Using this information, we hope that physicians have a better understanding of the risk profile and injuries that can be expected in equestrian sports. Sideline physicians planning on attending equestrian events should be aware of the types of injuries to expect for each equestrian discipline. Sports medicine physicians doing return-to-play or preparticipation counseling for equestrian athletes should be aware of the risks and may counsel patients toward or away from certain activities or disciplines, especially in patients with a history of TBIs or concussions. Most importantly, all physicians can and

should contribute to the safety of equestrian sports by counseling every patient that rides—whether competitively or not—to use a helmet because it reduces injury rate, severity, and mortality.^{11,12,14,15}

CONCLUSION

The overall injury rate during equestrian competitions between 2015 and 2019 was 780 per 100 000 athlete exposures. An increased injury rate in 3-day eventing and hunter–jumper disciplines (between 1.1% and 1.2%) may be related to the activity of jumping horses over obstacles. Although adult women predominate the sport, there was no clinical significance between injury rates in males versus females or senior versus junior riders, with all rates just under 1%. Further studies need to be completed on repetitive use injuries in equestrian athletes because this study only covers acute traumatic injuries.

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