

[Primary Care]

Incidence, Nature, and Causes of Fractures and Dislocations in Olympic Styles of Wrestling in Iran: A 1-Year Prospective Study

Ramin Kordi, MD, MSc, PhD,*† Behzad Heidarpour, MD,‡ Masih Shafiei,†
Mohsen Rostami,† and Mohammad Ali Mansournia, MD, MPH†

Background: Several studies have evaluated the incidence of and risk factors for injuries among wrestlers, but there are limited data in this population. Understanding the incidence and risk factors could provide important information for educational and preventive efforts at the national and international levels.

Purpose: To assess the incidence of and risk factors for fractures and dislocations among Greco-Roman and freestyle wrestlers in Iran.

Study Design: Prospective cohort study.

Methods: Members of 8 randomly selected wrestling clubs in Kermanshah, Iran, were followed for 12 months. Details of their training and the occurrence of fractures and dislocations were recorded. Related data on fractures and dislocations include site of injury, previous history of injury, coach supervision, and wrestling technique that led to the injury.

Results: A total of 495 male wrestlers were included in the study. Seven fractures and 8 dislocations were reported. The incidence of fractures and dislocations was 1.1 per 10 000 athlete exposures, with a fracture rate of 0.5 and a dislocation rate of 0.6. Of the 15 fractures and dislocations, 11 occurred among freestyle wrestlers (0.8 per 10 000 athlete exposures) and 4 occurred among Greco-Roman wrestlers (0.3 per 10 000 athlete exposures). There was a positive correlation between the incidence of wrestlers' fractures and dislocations and their age ($P < 0.01$), years of wrestling experience ($P < 0.01$), previous history of fracture or dislocation ($P < 0.01$), and age of starting to wrestle ($P = 0.03$).

Conclusion: The incidence of fractures and dislocations in this study was lower than that seen in previous studies. The risk of fracture and dislocation was heightened by a wrestler's increased age and years of experience, history of previous fracture or dislocation, and younger age of starting to wrestle.

Keywords: wrestling; injuries; fracture; dislocation; risk factors

Wrestling has remained popular throughout Iran in all levels of competition. The sport has an arduous nature, and injuries always threaten wrestlers' health during training sessions and competitive matches.^{7,9,12,16} Fractures and dislocations can be devastating injuries for wrestlers, necessitating discontinuation of training for a long period, and they may even affect the ability of a wrestler to return to competition at amateur and professional levels.¹⁹ It is

important to understand the epidemiology of these injuries so that prevention strategies can be developed.

Previous studies have found an incidence of 2.7 to 4.2 fractures and 1.6 to 7.2 dislocations per 10 000 wrestler exposures.^{5,11,18} These studies were performed primarily among high school and collegiate wrestlers in the United States.^{3,5,11,14,18} Their differing results might be due to differences in study sample size, diagnosis criteria, and methods of data collection.

From the †Sports Medicine Research Center, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran, and the ‡Sports Medicine Center, Kermanshah University of Medical Sciences, Kermanshah, Iran

*Address correspondence to Ramin Kordi, MD, MSc, PhD, Sports Medicine Research Center, Tehran University of Medical Sciences, No 7, Al-e-Ahmad Highway, Tehran, Iran 14395-578 (e-mail: ramin_kordi@tums.ac.ir).

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Table 1. Demographic data.

Variables	Mean \pm SD	Min-Max
Age, y	18 \pm 4.3	11-33
Weight, kg	65 \pm 13	40-98
Height, cm	167 \pm 6.9	150-188
Experience in wrestling training, y	2.5 \pm 2.6	1-18
Age of starting to wrestle, y	17 \pm 3.4	11-27
Total wrestling training time, h/y	259 \pm 53	156-480

To our knowledge, no previous study has assessed risk factors for fractures and dislocations among wrestlers, although possible risk factors of wrestling injuries have been investigated in some studies.^{2,5,6,10,11,14} Wroble reported a list of risk factors that had a significant correlation with the incidence of wrestling injuries, including type of exposure, training conditions, environment, use of protective equipment, physical factors, motor or fitness factors, and psychosocial factors.¹⁵

Evaluation of the incidence of fractures and dislocations among wrestlers in Iran could be beneficial for educational and preventive efforts at the national level in Iran and at the international level. The current study was performed to find the incidence, causes, and possible risk factors for fractures and dislocations among a sample of Iranian wrestlers.

METHODS AND MATERIALS

We conducted a prospective study on male wrestlers who were members of different wrestling clubs in the city of Kermanshah, Iran. There were 15 wrestling clubs, of which 8 clubs were randomly selected. At the beginning of the study, all wrestlers belonging to these clubs were interviewed, and their demographic data and history of wrestling training and injuries were recorded. The weight and height of all wrestlers were also recorded. These wrestlers were followed from April 2008 to April 2009. All fractures and dislocations sustained during wrestling training sessions were recorded. Wrestling training exposures were recorded as well.

Any fracture or dislocation that was sustained during wrestling training and confirmed by a physician was included. After the fracture or dislocation was confirmed, an injury report form was filled out by a general practitioner. This form covered injury-related information, such as date and site of injury, previous history of injury, history of weight loss, presence of coach supervision at the time of injury, and the wrestling technique that led to the injury.

The incidence of injury was indicated as the number of injuries per 1 hour of wrestling training per wrestler.

Poisson regression was used to assess the relationships between risk factors and injury rate. The incidence rate ratio and 95% confidence interval were calculated. Data were analyzed using STATA 8 (StataCorp LP, College Station, Texas).

This study was approved by the Ethics Committee of the Tehran University of Medical Sciences.

RESULTS

A total of 495 male wrestlers (392 freestyle and 103 Greco-Roman) were followed during the study period. Demographic data collected at the beginning of the study are presented in Table 1. We found that 4.2% (21 of 495) of our participants had a history of fracture or dislocation during wrestling training sessions or matches. A total of 7 fractures and 8 dislocations were recorded during the study. The incidence of fractures and dislocations was 1.1 per 10 000 athlete exposures, with a fracture rate of 0.5 and a dislocation rate of 0.6. Fractures and dislocations were most common in the upper limbs (most frequently in the shoulder), followed by the thorax (3 rib fractures) and the head (1 nose fracture). Four glenohumeral dislocations were found during the study, which represented an injury rate of 0.29 shoulder dislocations per 10 000 athlete exposures among the wrestlers. No fractures or dislocations were reported in the lower limbs during the study period (Figure 1, Table 2).

Of the 15 fractures and dislocations reported during the study, 11 occurred among freestyle wrestlers (0.8 per 10 000 athlete exposures), and 4 occurred among Greco-Roman wrestlers (0.3 per 10 000 athlete exposures) (Table 2).

We found that the incidence of fractures and dislocations among our participants was heightened by a wrestler's increased age ($P < 0.01$) and years of wrestling experience ($P < 0.01$), history of injury ($P < 0.01$), and younger age of starting to wrestle ($P = 0.03$) (Table 3). Other possible risk factors and the number of reported fractures and dislocations associated with them are shown in Table 4.

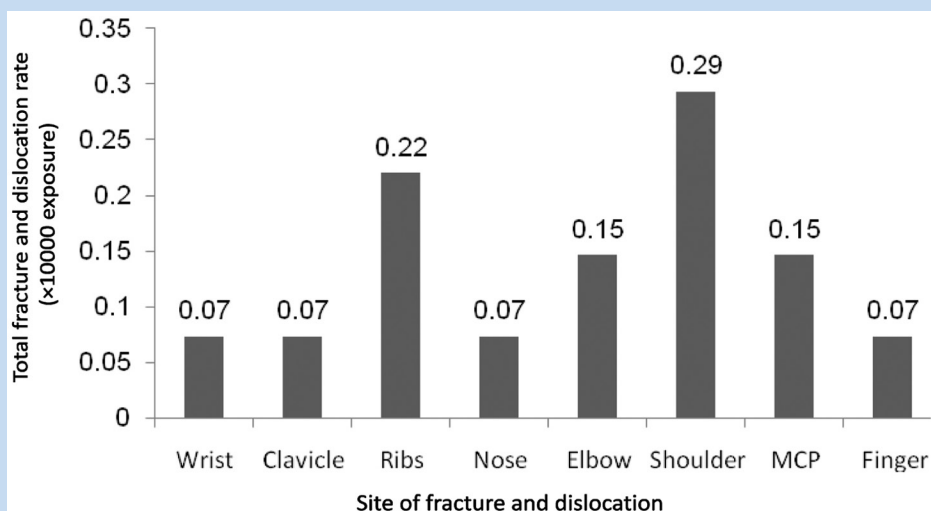


Figure 1. Total rate of fracture and dislocation by site of injury. MCP, metacarpophalangeal.

Table 2. Fractures and dislocations.

Injury: Site	No. of Injury		
	Freestyle	Greco-Roman	Total
Fracture			
Wrist	1	0	1
Clavicle	1	0	1
Ribs	2	1	3
Nose	1	0	1
Elbow	0	1	1
Dislocation			
Shoulder	3	1	4
Metacarpophalangeal	1	0	2
Finger	1	1	1
Elbow	1	0	1
Total	11	4	15
Injury rate (10 000 exposures)	0.8	0.3	1.1

The patterns of wrestling techniques that led to the fractures and dislocations are shown in Table 5. The most common wrestling techniques that resulted in fractures and dislocations were takedown techniques.

DISCUSSION

Our data revealed a considerably lower incidence of fractures and dislocations compared with previously reported rates

Table 3.
Incidence rate ratio for risk factors of fracture and dislocation.

Risk Factor	Ratio ^a	95% Confidence Interval	P
Age, 5 y	2.19	1.32, 3.75	0.01*
Wrestling experience, y	1.25	1.124, 1.398	0.01*
History of injury	19.7	6.280, 36.59	0.01*
Age of starting to wrestle, y	0.56	0.337, 0.932	0.03*
Weight, kg	1.01	0.981, 1.060	0.35

^aIncidence rate ratio: the increase in fracture and dislocation incidence rate with any increase in risk factor unit (eg, by each 5-year increase in wrestler's age, the fracture and dislocation incidence rate increases 2.19 times).

* $P < 0.05$.

Table 4. Possible risk factors of fracture and dislocation.^a

Possible Risk Factors	No. of Cases
High weight differences between the wrestlers ^b	3
Coach supervision	3
Technique	2
Nonstandard training dresses ^c	2
Weight loss and fatigue	1
Unstable platform ^d	1
Crowded wrestling conditions ^e	1

^aTotal no. of fractures and dislocations = 15.

^bAt least 2 weight classes of difference between the wrestlers.

^cNonstandard wrestling uniform may cause hanging of fingers to cloth during performing wrestling techniques, which increases the risk of injury.

^dUnstable mat might move during performing wrestling techniques and lead to wrestlers falling on nonpadded ground.

^eThis increases the possibility of sudden contacts between the wrestlers.

(2.7 to 4.2 and 1.6 to 7.2 per 10 000 wrestler exposures, respectively).^{5,11,18} This could be due to a variety of factors. The inclusion of injuries that occurred only during training sessions (and not competitive matches) would have reduced the number of injuries. Previous studies were conducted primarily among high school and college athletes in the United

States, while selection of wrestlers for participation in our study was done irrespective of age. Therefore, wrestlers with a wide range of age (11 to 33 years) were included. This is a significant difference between this study and those performed in the United States.^{3,5,11,14,18} Furthermore, the number of Iranian wrestlers who practice freestyle wrestling is at least 3 times more than those who practice Greco-Roman style.⁸ This is reflected in the unequal recruitment of wrestlers in our study and could also have accounted for some of the differences in injury rates seen.

As reported in previous studies, the most common techniques that led to injuries in this study were takedown maneuvers.^{1,4-6,11,17} These techniques lead to out-of-control landings and cause injuries such as acromioclavicular subluxation and dislocation.¹³

In this study, several potential risk factors for fractures and dislocations were identified. Previous history of fracture or dislocation may increase the risk of further fracture or dislocation. In addition to endorsing complete rehabilitation, wrestling coaches and trainers should make additional efforts to recommend safe wrestling techniques to these wrestlers to prevent injury recurrence. The incidence of fracture and dislocation is higher in wrestlers with more years of wrestling experience. It is possible that these wrestlers use more advanced and high-risk wrestling techniques, but they are also older.¹¹ The age of starting to wrestle is another possible risk factor for fractures and dislocations; those who start younger have a higher risk.

We found no significant relationship between weight class and the incidence of fractures and dislocations. This finding is comparable with published studies that found no relation between weight classes and injury rates among high school and collegiate wrestlers in the United States.^{2,3,5,6,14}

Table 5. Injury-producing techniques.

Wrestling Technique	Fracture (n = 7)	Dislocation (n = 8)	Total (n = 15)
Flying mare and buttocks	2	3	5
Rear throw	2	1	3
Single-leg takedown	0	2	2
Break stance	1	1	2
Double-leg takedown	1	0	1
Double leg scissors	0	1	1
Overarm hook	1	0	1

CONCLUSION

Increased age and years of experience, history of previous fracture or dislocation, and younger age of starting to wrestle are risk factors for fractures and dislocations among wrestlers.

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