

## [ Primary Care ]

# Indirect Catastrophic Injuries in Olympic Styles of Wrestling in Iran

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**Background:** Data on indirect catastrophic injuries in wrestling are scarce.

**Objectives:** To develop a profile of indirect catastrophic injuries in international styles of wrestling and to describe possible risk factors.

**Study Design:** Retrospective case series; Level of evidence, 3.

**Methods:** Indirect catastrophic injuries that occurred in wrestling clubs in Iran from July 1998 to June 2005 were identified by contacting several sources. The cases were retrospectively reviewed.

**Results:** The injuries included 9 indirect catastrophic injuries. The injury rate was 0.62 injuries per 100 000 wrestlers per year. The majority of indirect injuries were cardiovascular events in veteran groups of wrestlers.

**Conclusions:** Indirect catastrophic wrestling injuries are rare and present most commonly in older athletes. Coronary artery disease was the main cause.

**Keywords:** catastrophic injuries; wrestling; death; veteran athletes

Indirect catastrophic wrestling injuries are rare (Table 1).<sup>7</sup> In 1997, 3 previously healthy US collegiate wrestlers died as a result of hyperthermia caused by wrestling-associated rapid weight loss.<sup>2</sup> Because of these deaths, much attention has been paid to weight reduction as a cause of indirect injuries. However, no other reports have been published examining other causes of indirect injuries in wrestling.

The National Center for Catastrophic Sport Injury Research defined *indirect catastrophic injuries* as “those injuries which were caused by systemic failure as a result of exertion while participating in a sport activity or by a complication which was secondary to a non-fatal injury.”<sup>7</sup>

Prospective cohort studies of wrestling injuries typically fail to identify catastrophic injuries because of their infrequency.<sup>8,12</sup> For example, Jarret et al<sup>3</sup> evaluated the data of the National Collegiate Athletic Association Injury Surveillance System on collegiate wrestling from 1985 to 1996. They found only 1 direct catastrophic nonfatal injury, equivalent to 0.1 injuries per 100 000 exposures. Therefore, data on wrestling catastrophic injuries are scarce and mainly limited

to case reports, such as those from the National Center for Catastrophic Sport Injury research.<sup>1,6,7,9,13</sup>

There is limited information on the mechanism and prevention of catastrophic wrestling injuries.<sup>1</sup> Furthermore, no data have been published on the indirect catastrophic injuries among Olympic-style wrestlers. The purpose of this study was to examine the details of indirect catastrophic injuries among Olympic styles of wrestling (Greco-Roman and freestyle) in Iran and to identify risk factors that predispose wrestlers to these injuries.

## METHODS

Based on the National Center for Catastrophic Sport Injury Research's definitions for catastrophic injuries, those that occurred during wrestling or training in any of the wrestling clubs in Iran from July 1998 to June 2005 were included in this study. To identify possible catastrophic injured cases, several sources were contacted every 6 months from January 2004 to June 2005 for possible cases for inclusion before July 2005 (Table 2).

Once cases were identified, further information was collected on each case via contact with the injured wrestler, the coach,

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No potential conflict of interest declared.

DOI: 10.1177/1941738110379104

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Table 1. Injury rates of indirect catastrophic injuries among high school and collegiate male athletes in the United States: fall 1982 to spring 2006.<sup>7</sup>

High School	Rate <sup>a</sup>	College	Rate <sup>a</sup>
Basketball	0.78	Basketball	7.04
Ice hockey	0.62	Skiing	6.32
Lacrosse	0.57	Swimming	2.68
American football	0.50	American football	2.19
Football	0.39	Ice hockey	2.18
Cross-country	0.37	Wrestling	1.84
Wrestling	0.36	Football	0.78
Track	0.21	Lacrosse	0.75
Baseball	0.14	Tennis	0.54
Tennis	0.09	Cross-country	0.4
Swimming	0.05	Baseball	0.36
Gymnastics	0.00	Track	0.12
		Gymnastics	0.00

<sup>a</sup>Injuries per 100 000 participants.

the athletic director, or family members of the injured athlete. Information was collected by telephone and by face-to-face interviews. A standardized questionnaire was completed for each case, which covered the personal data and sports history of the injured wrestler, the characteristics and mechanism of the injury, and the risk factors for the injury.

Table 2. Source of information for finding catastrophic wrestling injuries in Iran.

The National Wrestling Federation
Wrestling Committee of each province
The National Sports Medicine Federation
The National Sports Insurance Database <sup>a</sup>
The Sports Medicine Committee of each province
News agencies and sports newspapers and magazines
Well-known coaches, referees, and wrestlers in different provinces

<sup>a</sup>Sports insurance is obligatory for any person who wants to practice a sport in any club in Iran.

## RESULTS

Nine cases of indirect catastrophic injuries were identified in this period (Table 3, Figure 1). The rate was 0.62 indirect catastrophic injuries per 100 000 wrestlers per year in Iran.

All but one injury occurred in the course of wrestling training; the remaining injury occurred during physical fitness training. Each wrestler had a history of regular wrestling training before the injury. Wrestlers had an average of 25 years of wrestling experience (range, 11-32 years).

The majority of wrestlers (67%, 6 of 9) had a history of heart disease, including one who was recommended for coronary angiography and one for coronary bypass surgery. Physicians banned one athlete from wrestling, and two wrestlers had chest pain several weeks before the injury.

Table 3. Indirect catastrophic injuries among wrestlers in Iran during 7-year period: July 1998 to June 2005.

No.	Age, Years	Weight, kg	Wrestling Experience, Years	Injury
1	27	126	11	Sudden death
2	32	90	15	Cardiac arrest <sup>a</sup>
3	36	84	20	Cardiac arrest
4	40	87	30	Sudden death
5	48	62	31	Cerebral vascular accident (intracranial hemorrhage)
6	50	130	30	Myocardial infarction → death <sup>b</sup>
7	51	68	30	Cardiac arrest
8	58	93	28	Cardiac arrest
9	67	75	32	Cardiac arrest

<sup>a</sup>All cardiac arrest diagnoses based on clinical signs and symptoms.

<sup>b</sup>The wrestler was hospitalized with a myocardial infarction, then died 4 months later as a result of a second one.

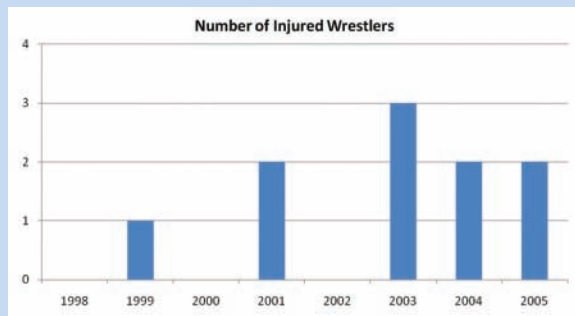


Figure 1. Number of indirect catastrophic injuries sustained by wrestlers in Iran during a 7-year period: July 1998 to June 2005.

## DISCUSSION

As calculated in this study, the indirect catastrophic injury rate in Iranian wrestlers, 0.62 injuries per 100 000 participants, was about twice the rate of high school wrestlers in the United States (0.36) but 3 times less than the rate reported for US collegiate wrestlers (1.84). The high indirect injury rate of collegiate wrestlers is exaggerated because of 3 cases, all of which resulted in death as a result of heat stroke associated with weight loss practice for matches in 1997.<sup>7</sup> The number of students participating in collegiate wrestling in the United States is relatively low—about 15 000 over a period of 21 years, from the 1982-1983 to 2002-2003 seasons.<sup>7</sup> These 3 deaths led to a high rate of indirect injury in this group of wrestlers in the United States (1.84 per 100 000 participants). In this study, no catastrophic injuries were related to the weight reduction side effects. The indirect injury rate experienced by Iranian wrestlers in this study was higher than that reported for high school wrestlers in the United States, likely because of the age difference between the 2 populations. The age in the Iranian cases (mean, 45.4 years; range, 27-67 years) is much higher than that of the US high school students (range, 12-17 years). Death rates during sports activities increase considerably with age because the incidence of coronary heart disease increases.<sup>11</sup>

Cardiac arrest was the most commonly reported reason for death in this series. Of 9 cases, 7 were in the veteran age group ( $\geq 35$ ). Atherosclerotic coronary artery disease is the

most common cause of sudden death in sports in this age group of athletes.<sup>4,5</sup>

This study has some limitations, including recall bias. In addition, some of the catastrophic injuries may have been missed and potentially underreported because of legal or ethical issues.

The risk of cardiovascular events in elderly athletes might be reduced by education, proper screening, and preparticipation physical evaluation.<sup>4</sup> However, the evaluation and screening of veteran athletes might have some limitations. Such an evaluation would be expensive, especially in developing countries, and it might have a rather poor predictive value.<sup>10</sup> Yet the education of veteran wrestlers regarding cardiovascular disease and associated conditions (hypertension, hypercholesterolemia, etc), along with the treatment of these conditions, could decrease the risk of indirect catastrophic injury.

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