Maxillofacial Trauma and Sports-Related Concussions among National Collegiate Athletic Association Athletes: 2009-2014

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Abstract

Objective: With increased focus on sports-related concussions, the association with maxillofacial injuries remains unknown. We looked to correlate rates of maxillofacial trauma and concussions among collegiate athletes.
Study Design: Retrospective analysis of the National Collegiate Athletic Association Injury Surveillance System (NCAA-ISS).
Methods: The NCAA-ISS was queried from 2009 through 2014 for 7 men's and 8 women's sports across Divisions 1, 2, and 3. An injury to the head or face, including concussion, was included. Further details included injury rate, fracture rates, time to return, duration of concussion, and concussion symptoms.
Results: From 2009-2014, an estimated 23,325 maxillofacial injuries occurred during 106,725,778 athlete-events, a rate of 2.87 per 10,000 athlete-events (95% CI: 2.05-3.70). Total injuries were significantly higher in male athletes, 3.92 (95% CI: 2.44-5.41), than female athletes, 1.95 (95% CI: 1.15- 2.76) (p=0.016). There were an estimated 50,146 concussions, a rate of 5.32 (95% CI: 4.16-6.48), with men sustaining 5.31 (95% CI: 3.98-6.64) and women sustaining 5.33 (95% CI: 3.43-7.23) per 10,000 athlete-events (p=0.991). Concussion rate significantly correlated with total maxillofacial injuries (r=0.641, p<0.01) and mandible/oral fractures (r=0.766, p<0.01). Women's field hockey had the highest correlation between mandible/oral fractures and concussions (r=0.996, p<0.01). There was no association between maxillofacial injuries and duration of concussion symptoms, return to competition time, balance symptoms, or post-traumatic amnesia.
Conclusions: Maxillofacial injuries among collegiate athletes correlated significantly with sports-related concussions. Mandible and oral fractures, particularly in women's field hockey, were correlated with increased concussions. Efforts should reduce maxillofacial injuries and adequately screen these athletes for concussions.

Introduction

- In 2014, there were over 489,000 men and women student athletes competing in National Collegiate Athletic Association (NCAA) championship sports[1].
- There has been little research on the association between maxillofacial injuries and sports-related concussion[2].
- We looked at maxillofacial injuries across NCAA men's and women's athletics from 2009-2014 and correlated with the concussion rates in each sport.

	All Sports	Men's Sports	Women's Sports	P value
Facial Injuries (95% CI)	2.87 (2.05-3.70)	3.92 (2.44-5.41)	1.95 (1.15-2.76)	0.016
Concussions (95% CI)	5.32 (4.16-6.48)	5.31 (3.98-6.64)	5.33 (3.43-7.23)	0.991

Table 1. Rate of facial injuries and concussions among NCAA athletes from 2009 to 2014 per 10,000 athlete-events.

Methods and Materials

- The NCAA Injury Surveillance System (ISS) collects injury data based on athletic trainer reporting.
- From 2009 to 2014, we determined the rate of maxillofacial injuries across 7 men's and 8 women's core sports in Divisions 1, 2 and 3.
- Injuries included soft tissue trauma and fractures to the head, face, eye, nose, mouth, ear, and neck.
- Rates of concussions along with symptoms and outcomes were calculated per sport based from the ISS.
- Correlation coefficients were determined for each sport.

	Estimated Mandible Fractures	Concussion Correlation	P Value
Men's Basketball	673.25	r=-0.314	0.608
Men's Soccer	239.23	r=-0.528	0.360
Men's Football	206.6	r=-0.099	0.875
Women's Field Hockey	203.8	r=0.996	**<0.01**
Men's Wrestling	176.68	r=0.430	0.470
Men's Lacrosse	163.82	r=0.044	0.944
Women's Basketball	154.59	r=-0.292	0.633
Women's Soccer	105.66	r=-0.184	0.767
Men's Ice Hockey	87.5	r=0.462	0.433
Women's Softball	54.8	r=-0.089	0.887
Men's Baseball	52.86	r=0.339	0.577
Women's Volleyball	28	r=0.686	0.201
Women's Gymnastics	8.5	r=-0.192	0.757
Women's Ice Hockey	5.51	r=0.671	0.215
Women's Lacrosse	0	Null	Null

Table 2. Estimated number of mandible fractures from 2009-2014 by sport. Included are the correlation coefficients with the rates of these fractures and sports related concussion.

Results

- From 2009-2014, an estimated 23,325 maxillofacial injuries occurred during 106,725,778 athlete-events
  - 2.87 per 10,000 athlete-events (95% CI: 2.05-3.70)
  - Total injuries significantly higher in male athletes (p=0.016) **(Table 1)**.
- There were an estimated 50,146 concussions, a rate of 5.32 (95% CI: 4.16-6.48)
  - Men similar to women athletes (p=0.991) **(Table 1)**.
- Concussion rate correlated with total maxillofacial injuries (r=0.641, p<0.01) **(Figure 1)**.
  - Mandible/oral fractures (r=0.766, p<0.01).
  - Nasal bone fractures (r=0.016, p=0.893)
  - Orbital fractures (r=-0.087, p=0.456)
- Women's field hockey had the highest correlation between mandible/oral fractures and concussions (r=0.996, p<0.01) **(Table 2)**.
- No association between maxillofacial injuries and duration of concussion symptoms, return to competition time, balance symptoms, or post-traumatic amnesia.

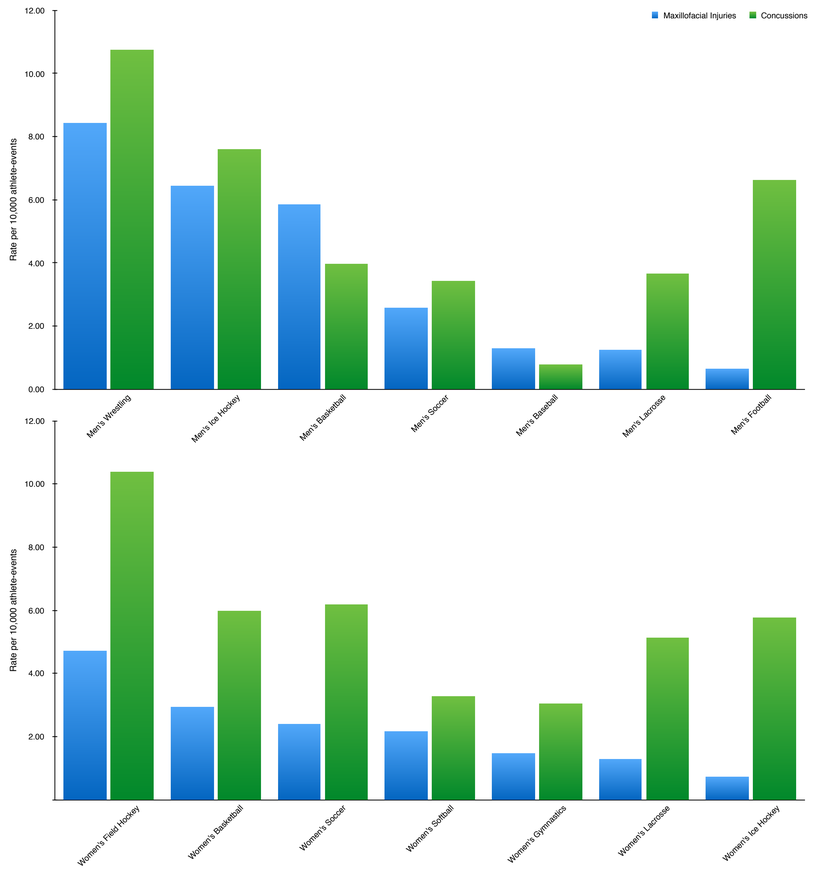

Figure 1. Total maxillofacial injuries and concussion rates per sport from 2009-2014 per 10,000 athlete-events. Strong correlation between concussion rate and total maxillofacial injuries (r=0.641, p<0.01).

Discussion

- Historically, among patients with maxillofacial trauma, 23% had a closed head injury, commonly a concussion[3].
- Estimates suggest that 75% of isolated mandible fractures have an associated concussion[2].
- Women's field hockey, without mandatory facial protection, has high facial injuries. Although not required, the NCAA does allow full facemask or goggles for these athletes[4].
- Overall, sports with higher maxillofacial injuries correlated with higher rates of concussion.
- Our results are consistent with a higher rate of sports injuries in the male athlete[5], yet we show similar rates of concussion.

Conclusions

- Maxillofacial injuries among collegiate athletes correlated significantly with sports-related concussions.
- Mandible and oral fractures, particularly in women's field hockey, were correlated with increased concussions.
- Efforts should reduce maxillofacial injuries and adequately screen these athletes for concussions.

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