



Original research

Injury surveillance of head and neck injuries with a special focus on sport-related concussions: Eight seasons observational study in professional football in Qatar

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ABSTRACT

Objectives: To describe the head and neck injuries with a focus on Sport-Related Concussion (SRC) in professional football in Qatar (PFQ) during eight consecutive seasons.

Design: Prospective observational study.

Methods: Seventeen PFQ teams were included over eight seasons (2013/14–2020/21) study. The injury data were collected by the respective clubs' medical staff using standardized (time-loss injuries) protocols.

Results: Data were obtained from 119 teams' seasons resulting in a total of 87 head and neck injuries (1.8 % of the 4736 time-loss injuries). Head and neck injury rate was of 0.57 injury/squad-season (95%CI: 0.56–0.59), representing 0.12 injury/1000 h (95%CI: 0.09–0.14). Thirty-three concussions were recorded. The concussion rate was 0.25 injury/squad-season (95%CI: 0.23–0.26), representing 0.04 injury/1000 h (95%CI: 0.03–0.06). The concussion proportion of all head injuries was 31.7 % during the four initial seasons and 43.5 % during the following four seasons with a non-significant increase of 11.8 % ($X^2 = 1267$, $p = 0.26$).

Conclusions: Injury rates in this cohort remain lower than comparable leagues elsewhere. Even though the incidence rate of SRC did not change significantly over the eight seasons, seasonal variations' trend may indicate that the medical staff are more aware of diagnosing head and neck injuries, including concussion.

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Practical implications

To have a idea about the incidence rate of head and neck injuries with a focus on sports concussion in professional football in Qatar and to encourage the implementation of concussion education program for medical staff of the professional football teams in order to improve the awareness of diagnosing head and neck injuries, including concussion.

1. Introduction

The purpose of injury surveillance in sports is to set objective data aiming at helping medical staff to improve athletes' risk management, to protect the health of athletes and to allow them to perform at their full potential.¹

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In 2001, a group of experts published the first consensus statements on concussion management in sport based on the best evidence at the time.²

Since then, the consensus statements have been updated approximately every four years. The most recent meeting was held at the 6th International Consensus Conference on Concussion in Sport, Amsterdam, October 2022. The guidelines in the statements have improved the clinical management of concussion, but more accurate knowledge of the epidemiology of such an injury is still needed among other things to monitor the efficacy of evidence-based concussion prevention and management programs. In this regard, a growing number of studies have investigated the incidence of head and neck injuries with a special interest in Sport-Related Concussions (SRC) in professional football.^{3–11}

The incidence rate of total injuries in men's football Qatar Stars League (QSL) from 2008–2012 was 5.2 injuries per 1000 h, with an incidence rate of head and neck injuries of 0.078 and a specific SRC incidence rate of 0.016 per 1000 h of exposure.⁶ This incidence rate is lower than international benchmarks such as professional football in UEFA (2001/02–2009/10) where these rates were of 0.17 head and

neck injuries per 1000 h, and 0.06 concussion per 1000 h, respectively.⁹ The study design in Eirale et al.'s paper cannot ascertain if the low rates could result from an under-awareness and/or any underreporting of head and neck and SRC and/or a real lower incidence of such events in the professional football in Qatar.

The main objective of this study is to report on eight seasons surveillance of head, neck injuries and SRC injuries rates in the professional football leagues in Qatar from 2013/14 to 2020/21. We also wanted to investigate if incidence changed after the introduction of the “Aspetar Sport Concussion Program” in 2017.

2. Materials and methods

We prospectively tracked male professional football player's (> 18 years old) time-loss injuries and individual exposure to training and matches in Qatar. Each of the eight seasons (July 2013–May 2021), including international camps and tournaments, were studied for 17 teams (12 from first and 5 from second-division leagues). Teams that produced data continuously for at least six months and met the minimum requirements for data quality were included.¹² Accumulated data for 119 teams were completed during these seasons. Players who regularly trained with the first team were included. Players that had injuries prior to each season were only included in the study after discharged for return to play. New players were included when signed by a club. The medical team in each club collected the data, using standardized protocols following a practical manual outlining the details of data collection. The surveillance team also presented demonstration sessions to all the new medical staff. Data were recorded using a custom-made Microsoft Office Excel® file with clickable embedded drop-down menus.

Every month the medical staff submitted their data-files by an institutional email exchange. All players were verbally informed about the goals and procedures of the study by the medical staff, obtaining their verbal agreement to include them in the study (IRB-approved research protocol: ADLQ-IRB: E2017000252).

Injury definitions and data collecting techniques were in accordance with the 2006 consensus statement on epidemiological studies in football.¹³ All injuries that prevented a player from taking part in training or match play (i.e. time-loss injuries) were recorded by the Sport Medicine Diagnostic Coding System (SMDCS) injuries and illness classification. Players were considered injured until the team's medical staff cleared them to fully participate in training and be available for match selection. Additionally, individual training and match exposure (in minutes) were recorded. Injuries that (i) did not require time off from training or matches, or (ii) that occurred outside of the teams' football activity were not recorded.

A re-injury was categorized as subsequent injury to the same structure that happened within the same season.

We used descriptive data as the mean with standard deviations or 95 % confidence intervals (CI). We determined the injury incidence as the number of time-loss injuries per 1000 player hours and the injury burden as the total number of days missed for every 1000 player hours of exposure.

Table 1
Demographic data.

	Mean ± SD
Age (years)	26.7 ± 4.9
Body mass (kg)	70.8 ± 21.7
Height (cm)	168.8 ± 28.9
Total players (n)	3762
Total team seasons (n)	119
Number of players per season (n)	470 ± 45.8
Number of teams per season (n)	15 ± 2.9

Table 2
Head trauma count and severity (median days lost) by category.

Categorization	Count	Median time loss (pct25–pct75) ^a
Concussion	33	8 (1–19)
Facial fracture	15	14 (2–15)
Laceration/contusion	23	5 (1–18)
Nasal fracture	5	14 (11–15)
Neck pain/torticollis	11	4 (2–16)

^a Inter quartile range (IQR).

3. Results

We obtained complete data from 119 teams' seasons distributed from 2013/14 to 2020/21 seasons.

Demographic data of the players are shown in Table 1.

Over the eight seasons, 87 (1.8 %) head and neck injuries were recorded out of the 4736 time-loss injuries categorized into: concussion, facial fracture, laceration/contusion, nasal fracture, and neck pain/torticollis (Table 2).

Head and neck injury rate was 0.57 injury/squad-season (95%CI: 0.56–0.59), representing 0.12 injury/1000 h (95%CI: 0.09–0.14).

Over the eight seasons, 33 concussions were recorded. Concussion rate was 0.25 injury/squad-season (95%CI: 0.23–0.26), representing 0.04 injury/1000 h (95%CI: 0.03–0.06).

Concussion injury rate (injury/squad-season) over seasons is shown in Fig. 1. Concussion injury burden over seasons is presented in Table 3.

Twenty-three (70 %) of the concussions occurred during matches and six (18 %) happened during training while information was missing for four cases (12 %). Three concussions (9 %) were reinjuries.

Incidence rates during the four initial seasons (2013/14–2016/17) before integrating the “Aspetar Sport Concussion Program” were not statistically different ($p = 0.35$) from the following four seasons (2017/18–2020/21) with incidences of 0.04 injury/1000 h (95%CI: 0.02–0.06) and 0.05 injury/1000 h (95%CI: 0.03–0.08), respectively. We noticed an increase of the days lost median after integrating the “Aspetar Sport Concussion Program” in 2017 except for season 2019–2020.

The concussion proportion of all head injuries was 31.7 % for the four initial seasons and 43.5 % for the following four seasons with a non-significant increase of 11.8 % ($X^2 = 1267$, $p = 0.26$).

4. Discussion

This study reports on eight seasons surveillance of injuries including head and neck injuries and SRC rates in the professional football leagues in Qatar from 2013/14 to 2020/21. We also investigated if reporting changed after the introduction of the “Aspetar Sport Concussion Program” in 2017.

Over the eight seasons, 87 head and neck time-loss injuries (1.8 % of the 4736 time-loss injuries) were recorded. The incidence of head and neck injuries rate was 0.57 injury/squad-season (95%CI: 0.56–0.59), representing 0.12 injury/1000 h (95%CI: 0.09–0.14). In a previous study from 2008/09 to 2011/12 QSL seasons,⁶ the total incidence rate of head and neck injuries and SRC was 0.078 per 1000 h of exposure. While we report a higher rate than previously, we do not know if this is due to more events and/or a higher reporting from the clinicians. Over the eight seasons, 33 concussions were recorded, with a concussion incidence of 0.25 injury/squad-season (95%CI: 0.23–0.26) representing 0.04 injury/1000 h (95%CI: 0.03–0.06). For the 2008/09–2011/12 QSL seasons, Eirale et al.⁶ reported a concussion incidence of 0.016 Injury/1000 h. This indicates that the overall reported concussion incidence has doubled since. However, with the relative low number of concussions, it is important to take seasonal variation into account. Notably, from 2013/14 to 2015/16, the average incidence of concussions (0.33 ± 0.06 injury/squad season) decreased by 23 % without any reported concussion cases in 2015/16 (Table 3). As a strategic injury prevention intervention, a concussion educational program for the football medical

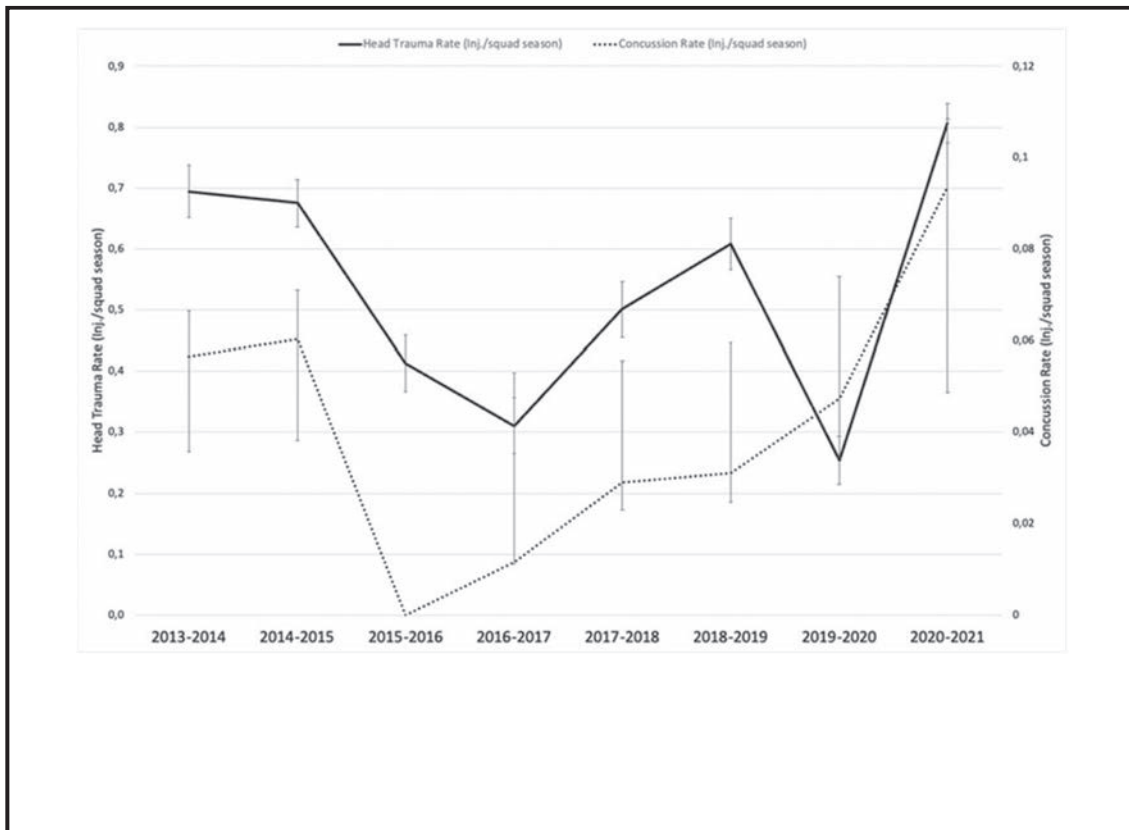


Fig. 1. Head-and-neck and concussion injury rates (injury/squad-season) over the 8 seasons.

staff was launched by “Aspetar Orthopedic and Sports Medicine Hospital” in 2017, with all medical teams' staff involved with the professional football teams in Qatar. Since then, we observed a rise in concussion incidence with a peak occurring in the season 2021–2022 with 10 concussions. The concussion proportion of all head and neck injuries was 31.7 % for the first four seasons (2013/14–2016/17) and increased to 43.5 % for the following four seasons (2017/18–2020/21). Although, no overall increase in incidence was noticed before and after the launch of the “Aspetar Sport Concussion Program”, the seasonal variations may indicate that the medical staff in the professional football teams in Qatar are henceforth more aware of diagnosing concussions in case of head and neck injuries. In practice, in case of serious head or neck injuries, the medical management priority is for the more serious injury such as face fractures, or cervical spine injuries, and the likelihood of eventually missing an associated concussion event may increase.¹⁴

According to Keenan et al., case control study,¹⁵ in certain sports such as cycling, the adjusted odd ratio (OR) for the risk of intracranial injury associated with facial fracture was 9.9. The effect was weakened when all traumatic brain injuries including concussions, were considered. When only concussions were considered, no association was found.

The “Aspetar Sport Concussion Program” includes several educational aspects, including specific attention to eventual concussions

that could be hidden by a serious and often attention attracting head and neck injury.

In contrast to our results, a study conducted in UEFA over multiple seasons (from 2001/02 to 2009/10) found that the head and neck injury rate was 0.17, while the injury rate of concussions was 0.06 concussions per 1000 h.⁹ However, studies done after 2012, reported a higher incidence of concussions in other soccer leagues such as in the United States (US), Sweden, as well as in international tournaments like the UEFA European Football Championships.^{5,16} The men's and women's soccer teams in the US National Collegiate Athletic Association (NCAA) had SRC rates of 5.2 % and 8.27 %, respectively.^{5,16} Additionally, the SRC incidence rate during matches was 1.19 per 1000 h of gameplay among 959 Swedish football players in the 2017 season, with similar SRC rates in men (1.18 per 1000 h of gameplay) and women (1.22/1000 h of gameplay).¹¹ In the 51 matches of the 2016 UEFA European Football Championships, a video analysis used to describe potential concussive events (PCEs), found a PCE of 1.35 per match. Although all players remained on the field following the incidents, only 27.5 % were assessed by sideline medical staff.³ According to a more recent systematic review and meta-analysis¹⁷ on the epidemiology of head injuries with a focusing on concussions in team contact sports, men's football training had

Table 3
Concussion burden over seasons

Seasons	2013–2014	2014–2015	2015–2016	2016–2017	2017–2018	2018–2019	2019–2020	2020–2021
Number	6	6	0	1	3	3	4	10
Days loss								
Median	5.5	6.5	0	1	12	11	3.5	10
(pct25–pct75)*	(3–8)	(5.2–8.5)		(1–1)	(9–31.5)	(6–12.5)	(2.7–6.2)	(7.2–13.5)

the lowest concussion incidence expressed as 0.08 per 1000 h athletic exposures (AEs). In contrast, rugby match play is characterized by the highest concussion incidences in team sports with 3.00 concussions per 1000 h AE.¹⁷ A recent systematic review on Men's Rugby Union revealed a match concussions rate of 12 concussions per 1000 h (95%CI 9–15) over the period 2012–2020.¹⁸

Therefore, continuously collecting data on concussion injuries in professional football in Qatar is still needed to identify patterns related to injury incidence and outcomes. Also, in comparison to data from other aforementioned football leagues and tournaments, concussions are less common in professional football in Qatar, which may indicate (i) a real reflection of a different concussion incidence in this league and/or (ii) that concussion is still a hidden injury that goes relatively underreported.

However, there are no data from the Asian continent and geographical differences cannot be excluded as per the size and variation of environment of this continent. Eirale et al.¹⁹ have launched a call for regional standardized epidemiological studies to assess differences between continents.

To improve concussion awareness and underreporting of cases, medical staff, coaches, and players should be consistently involved in the care of concussed players. Concussion is different from other injuries as it often does not have any obvious signs and symptoms, which may be fleeting and disappear after a few seconds. Therefore, concussion diagnosis often relies on the first symptoms reported by the player. This can be conflicting for the player due to the risk of being taken off the field if admitting to having symptoms. In other cases, the players might be mentally incapacitated and not be able to make a rational decision for their own safety.²⁰

According to Gouttebauge et al.,²¹ the majority (95 %) of the European Professional teams' physicians are in favor of informational sessions about concussion for the players or technical staff, but only 39 % reported that these sessions occurred at their clubs. The participants to the latter study highlighted the importance of the Football Association and the clubs' responsibility to offer such educational programs.

To ensure a successful implementation of a widespread concussion program, a potential answer to the implementation has been proposed by the "Aspetar Sport Concussion Program", which is a collaboration with the Qatar Football Association and the Qatar Stars League, the main bodies managing the professional football in the country.

Moreover, this program relies on three-step process of adopting and applying policy, known as the "OCAsion", underpinned by widespread awareness and education among stakeholders.²² The model offers a shared decision-making approach to resolve the common discrepancies of the management of concussed players.

The context of the Qatar football league, specifically the cultural and environmental-related factors, plays a role in successfully implementing injury prevention strategies. Such factors need to be acknowledged and considered in any approach.²³

Injury surveillance on concussion requires rigorous awareness and education processes at all levels. FIFA have taken initiative for the World Cup 2022, Qatar, and launched education and awareness programs for administrators, coaches, medical staff, players, and referees, building on the experiences gained in the FIFA Arab Cup 2021.¹⁰

In the latter tournament, FIFA introduced concussion spotters who identified dangerous mechanism and suspected concussion by direct observation and video footage review. Furthermore, FIFA have implemented a three-minute rule if concussion was suspected, where the referees have the option to allow up to 3 min for the medical staff to perform an on-field concussion assessment.¹⁰ In addition, FIFA have appointed an independent concussion and rehabilitation service (CARS) for the first time in the 2022 FWC in Qatar. This is an independent consultation service by concussion specialists who can advise the medical team on establishing a final diagnosis, further management and return to play. These measures can be regarded as future perspectives in the broader football community and can potentially be lessons

learned on identifying the number of SRC and improve awareness on the concussion management to protect the health of the players in professional football.

Despite a large number of 17 teams followed over a long period of eight years, the number of head and neck injuries and concussions reported over eight consecutive seasons is relatively small compared to other leagues. This could potentially mean that concussion is still underreported in professional football in Qatar. Also, the "Aspetar Sport Concussion Program" was not in place when the data collection started, which may have resulted in underreporting and inaccurate diagnosis compared to after its' implementation.

The comparatively small number of injuries reported that there may reflect reporting bias. In addition, we are unable to distinguish between the initial episode and a subsequent concussion event. In this situation, it is important to adhere to international standards for injury surveillance to compare incidence rates across nations and sports as well as the burden of each injury time lost and mechanism. Future research may identify potential factors and barriers to the success of the "Aspetar Sport Concussion Program" that can help to understand incidence changes in concussion rates as well as measure factors of acceptability and adaptability from the medical staff.

Moreover, this study was only conducted on adult male professional football players from professional football in Qatar and therefore not to be generalized to other leagues, female soccer players, mixed populations, or other age categories. In that regard, recent research has revealed that female soccer players are more likely to sustain concussions than male players,²⁴ warranting further research in the field.

5. Conclusions

This study assessed long-term data for head and neck injuries and SRC rates in professional football in Qatar over eight seasons. Even though the incidence rate of SRC did not significantly change over time, the concussion proportion of head injuries increased by 11.8 % after the implementation of the "Aspetar Sport Concussion Program" in 2017. This may indicate increased awareness of concussion by the medical staff in professional football teams in Qatar leading to better and early recognition and management of concussed players and warrants further investigation.

Future studies should continue to establish long-term datasets for head and neck injuries and SRC rates with the purpose of protecting the health of players and allowing them to perform at their full potential.

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Confirmation of ethical compliance

- All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.
- Informed consent was obtained from all players involved in the study.

Declaration of interest statement

The authors of the present study declare no conflict of interest related to the content of the study.

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