European Journal of Therapeutics
pISSN: 2564-7784
eISSN: 2564-7040

Eur J Ther. 2023.
https://doi.org/10.58600/eurjther1873

Original Research

Retrospective Analysis of Head and Maxillofacial Injuries: FIFA World Cup 2022 Report

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Received: 2023-09-24 / **Accepted**: 2023-10-17 / **Published Online**: 2023-10-17

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ABSTRACT

Objectives: The aim of this study is to analyze the incidence, causes and consequences of head and maxillofacial injuries in the 2022 FIFA World Cup.

Methods: This retrospective study, following the STROBE guideline, conducted an online investigation during the 2022 World Cup, with a specific focus on injuries resulting in player substitutions or absences of at least one match. To mitigate potential injury exaggeration, journalistic reports were prioritized over video analysis. The analysis of injuries involved the utilization of descriptive statistics, the Kolmogorov-Smirnov test, and the Pearson correlation test, with a significance threshold set at $p<0.05$. The analytical tools Microsoft Excel and RStudio were employed. Comparative insights were derived from previous FIFA World Cup data; however, injuries lacking sufficient recovery time were classified as preseason injuries, potentially introducing an element of bias to the analysis.

Results: During the FIFA World Cup 2022, a comprehensive analysis revealed a total of 123 injuries leading to player substitutions or subsequent game absences, of which seven were localized in the head or maxillofacial region. Statistical analysis indicated a departure from normal data distribution, and a robust correlation was observed between the number of players in national leagues and injury incidence. Noteworthy is the participation of 42 distinct national soccer leagues in contributing players to the tournament's national squads, with no specific league demonstrating a predisposition to higher injury rates. Within the dataset, three maxillofacial injuries were identified. It is of interest that five athletes opted for facemasks as protective measures for the maxillofacial region, and remarkably, only one of them experienced an injury during the World Cup but subsequently resumed play in subsequent matches, while the remaining four athletes had sustained injuries prior to the tournament.

Conclusion: The 2022 FIFA World Cup was associated with a low number of head and maxillofacial injuries, with collisions with other players being the most common cause. Despite their limited occurrence, these injuries can have severe implications. In response to the increase in concussions, FIFA implemented an improved safety protocol, which involves immediate game

halts for medical assessment and allows player substitutions without affecting the team's allotted substitutions. This change has been well-received by stakeholders. Furthermore, the use of protective equipment, such as custom-made shields, is growing in popularity and has the potential to reduce injury severity and shorten recovery time. Modern technology enables the creation of comfortable and effective protective gear, enhancing player safety. Overall, the study emphasizes the importance of injury prevention strategies in sports, calling for continued advancements in protective equipment design and increased transparency in injury reporting.

Keywords: Athletic Injuries; Facial bones; Maxillofacial Injuries; Sports Medicine; Soccer; Digital Planning; Virtual Planning; Protective Devices; Digital Technology

INTRODUCTION

Soccer is the most played sport in the world, as the Fédération Internationale de Football Association (FIFA) estimates that there are more than 200 million players worldwide [1,2]. Sports injuries constitute a recognized main cause of maxillofacial injuries. Due to the high number of players worldwide, soccer is among the most common sport associated with injuries worldwide [3,4]. Although incidences of trauma in other anatomical regions are more common, especially lower limbs, facial trauma is very common in soccer, and most frequently involves the nose [5] and middle third of the face [4,6]. There is an incidence of 12.5 head injuries per 1,000h played [7]. A remarkable increase in the number of sports-related injuries has been documented in the past 20 years [8–11].

FIFA World Cup is a soccer tournament that takes place every four years and is responsible for audiences that reach the entire globe [12]. The latest tournament, held in Qatar from November 20 to December 18, 2022, had 32 countries represented by about 830 different players. The increasing numbers show the connection between growing physical vitality and the occurrence of maxillofacial trauma. For this reason, an important question that arises is the need for quick rehabilitation in professional athletes [13].

The purpose of this paper is to discuss the frequency of maxillofacial injuries encountered during the championship, and future implications for the players.

Main Points;

- The article highlights that the frequency of head and maxillofacial injuries during the World Cup and its preseason is very low, with only 5.69% of injuries, mainly related to athlete substitution or absence.
- While the overall number of soccer-related injuries remains relatively stable, the article points out that the severity of these injuries is increasing over time, with concussions and facial fractures being observed more frequently in soccer.
- The article discusses how sports organizations like FIFA and the International Olympic Committee are refining their safety protocols, especially in cases of concussion injuries. They now require immediate medical attention, player substitution, and decisions made by medical staff rather than players themselves.
- The use of protective facial and head shields is on the rise in soccer, particularly among players with a history of previous injuries. Modern technology, such as computer-aided design and manufacture, is allowing for the creation of comfortable and effective protective gear, which can significantly reduce the severity of injuries and allow for shorter recovery times.

MATERIALS AND METHODS

This is a retrospective study and has followed the STROBE guideline [14]. Online research was conducted from the start of the World Cup on 20th November until December 20, 2022 (Table 1). The data is publicly available and does not require a separate ethical approval or written consent. Only injuries which resulted in player substitution during a match or absence for at least one game were considered. Literature review with the following strategies were used: 1. (FIFA World Cup) AND (maxillofacial OR face OR facial OR head) AND (injury OR fracture OR damage), 2. (soccer[title] maxillofacial injuries). Data were sorted in Microsoft Excel ® (Microsoft, Redmond, WA, USA). When available, data from previous FIFA World Cups were used as a comparison. The authors opted for journalistic reports rather than video analysis because some athletes might tend to dramatize and magnify the injury suffered. Any injury with not enough recovery time was considered in the preseason. This could impair the analysis of injuries [15].

Statistical Analysis

Injuries were calculated and summarized using descriptive statistics. For relevant data, the Kolmogorov-Smirnov test and the Pearson correlation test were used to comparison. Results with a $p<0.05$ were considered statistically significant. The analyses were performed with Microsoft Excel ® and RStudio ® (RStudio, GNU GPL).

RESULTS

A total of 123 injuries that resulted in player substitution or absence from a subsequent game were retrieved during the FIFA World Cup 2022. Seven of these injuries were in the head or maxillofacial region. Figure 1 shows the anatomical location of the injuries. Data were considered non-normally distributed ($d = 0.78193$, $p < 2.2e\text{-}16$). There was a strong correlation between the number of players in the national leagues and the number of injuries ($\rho=0.966037$, $p=0.001008$). Forty-two different national soccer leagues have contributed to the national squads participating in the tournament. None of these leagues have been identified as being particularly more dangerous to causing injuries. There were three maxillofacial injuries in 2022 FIFA World Cup (Table 2).

Five athletes used facemasks to protect the maxillofacial region during FIFA Soccer World CUP 2022 (Table 3). Only one of them was injured during the World Cup and returned to play in the following matches (Alireza Beiranvand, from Iran). The remaining four were injured previously to the World Cup.

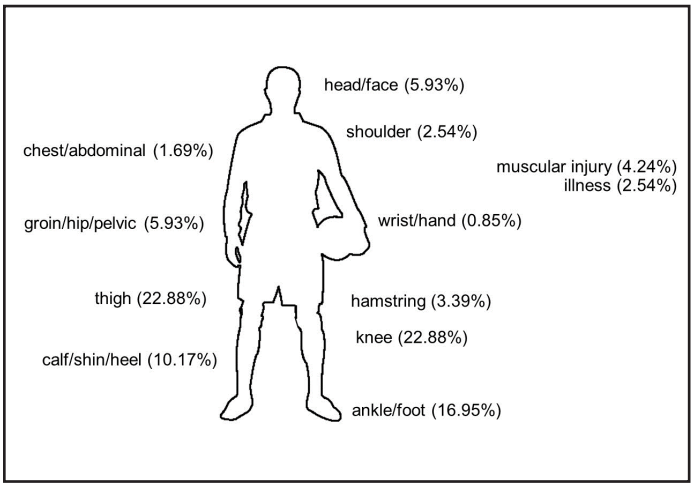

Figure 1. The anatomical location of the injuries.

Table 1. Websites used in online search.

Yahoo Sports	https://sports.yahoo.com/
International Olympics Committee	https://olympics.com
FIFA	https://fifa.com
Premier League Injuries	https://www.premierinjuries.com
Sporting News	https://www.sportingnews.com
NBC Sports	https://www.nbcsports.com

Table 2. Athletes with head or maxillofacial injuries during 2022 FIFA World Cup in order of occurrence.

Name	Country	Position	Type of collision	Against	Outcome
Alireza Beiranvand	Iran	goalkeeper	Head-to-head	Teammate	Concussion
Yasser Al-Shahrani	Saudi Arabia	defender	Knee-to-head	Teammate	Mandible, Midface fracture
Adrien Rabiot	France	midfielder	Head-to-head	Opposite team	Concussion

Table 3. Athletes played 2022 FIFA World Cup with protective face masks (alphabetic order).

Country	Name	Anatomic area injured
Iran	Alireza Beiranvand	Facial and nose injury
Tunisia	Ellyes Skhiri	Facial middle third
South Korea	Heung-Min Son	Orbit
Croatia	Josko Gvardiol	Nose
Belgium	Thomas Meunier	Facial middle third

DISCUSSION

The frequency of head and maxillofacial injuries during the World Cup and its preseason can be considered very low (5.69%) as stated before in the literature [1,12,15]. Approximately 9% to 18% [1,12,15] decreases to about 6%, but this can be explained since only injuries associated to athlete substitution or absence were included in the present report. Although few in number [1], these injuries may be severe and have significant implications for the players involved as well as the national squads and club teams [16]. Images showing maxillofacial injuries sustained by the Saudi Arabian player Mr. Yasser Al-Shahrani appeared quite remarkable and took the social media by storm. Although the overall number of soccer-related injuries remain relatively stable, the severity is increasing over time [5]. Concussions and facial fractures are not uncommon in contact sports and are observed more frequently in soccer [3]. Most of injuries involving the head and maxillofacial region tend to be associated with collision of heads involving a player of the opposite team [5]. This may be different to some other sports in which injuries may result from to falls to the ground or direct trauma from the ball as in cricket or hockey [3,4].

In the 2014 FIFA World Cup, an Argentinian player, Javier Mascherano suffered a concussion as did the Uruguayan player Alvaro Pereira in another match. These incidences prompted FIFA to refine their safety protocol for concussion injuries necessitating the game to be stopped immediately and seek medical attention [1]. If during the assessment, the concussion injury is considered a cause of concern, the involved player is substituted, and this substitution does not count towards the allocated quota of substitutions permitted for the team. This change has been viewed positively by the relevant stakeholders including player, coaching staff and the fans at large. The concussion injury suffered by the French national midfielder Adrien Rabiot was the first one to be dealt under this new protocol. The final decision regarding the fitness of the player is determined by the medical staff and not by the player. Not only FIFA, but other sports bodies such as the International Olympic Committee (IOC) are also amending their legislation to promote fair play, and improve player safety [1,17]. Other measures as harder penalties for the offending players and additional training of referees have been implemented and have demonstrated potential benefits in preventing injuries [12].

Sports are becoming increasingly more competitive, and players face higher expectations from their sports bodies and fans for a more consistent and predictable performance [3]. Such demands can potentially increase the risk of injuries in contact sports. In case of soccer, this is reflected in a greater number by players that used protective facial and head shields in 2022 FIFA World Cup. Similar trends are being observed in other football competitions especially amongst players who have experienced facial/head injuries [1]. The trend of using protective equipment with a history of previous injuries not only indicates a preventive approach but also an intention to protect further impact on previously injured sites. The use of protective equipment attenuates the impact force and load dispersion to reduce the occurrence and severity of facial fractures and brain damage [4].

Over the years, prevention of sports injuries has been recognized widely by sports bodies across the board with an increasing emphasis on use of protective gear. The use of custom-made protective shields is growing in popularity, as modern technology using computer aided design and manufacture allows manufacture of devices which are comfortable and do not interfere with player performance [13,18,19]. Regular use can significantly reduce the severity of injuries and thereby allow shorter recovery [4,18]. Although some improvised facial / head shields can be made using conventional techniques [4,20], digital planning is becoming more and more usual in sports face shield customization [21,22]. New materials allow the construction of protective shields which are not only lighter and more comfortable to use, but at the same time offer better mechanical protection [23,24]. Some qualities of digitally manufactured protective shields include comfort, better adaptation to individual head and face anatomy and improved fit [18] and minimal interference with the peripheral vision of the users [4].

A limitation of this study is that it did not use official data made available by FIFA or the national football bodies. However, such entities do not provide detailed information on the subject, which perhaps could be improved for better transparency.

CONCLUSION

Rules and protocols to minimize and manage sports injuries need close monitoring for strict implementation and updated regularly in the light of medical advice and research. The use of facial protective equipment has the potential to decrease the severity of maxillofacial injuries and reduce the athletes' time away from the game. Digital design and manufacture of protective equipment may make such equipment more comfortable for the players and encourage more frequent use.

Funding: This article was not supported by any grant.

Conflict of Interests: The authors declare no conflicts of interest to disclose.

Ethical Approval: Not required since data are available in public sources.

Author's Contributions: All authors contributed equally to this manuscript. All authors read and approved the final manuscript.

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How to Cite;

Grillo R, Meireles Borba A, Aparecida Brozoski M, Ali K, Samieirad S, Al-Moraissi EA, da Graça Naclério-Homem, M (2023) Retrospective Analysis of Head and Maxillofacial Injuries: FIFA World Cup 2022 Report. Eur J Ther. https://doi.org/10.58600/eurjther1873