MAXILLOFACIAL INJURIES IN BULGARIAN STUDENTS PRACTICING CONTACT SPORTS: A PRELIMINARY STUDY

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ABSTRACT
Introduction. The application of certain training and competition routines is associated with the acquisition of various sports injuries, which damage the integrity of the soft tissues of the head, the cranial bones, and the brain tissue itself. They can occur accidentally, as a result of insufficiently well-formed individual skills, or in the case of deliberate violation of sports rules. Sports injuries have a wide range of consequences for athletes, including aesthetic problems, pain, temporary or permanent disability, various neurological disorders, and a number of life-threatening conditions.
Aim. To explore the most common maxillofacial injuries among student-athletes playing contact sports, and the most common complaints.
Methodology. The information was obtained by analyzing data from a 31-question anonymous online survey distributed via Google Forms. The survey was completed by 50 people (80% men and 20% women) with an average age of 24.
Results. Students practicing boxing, judo, and karate predominate. The most common injuries are to the lips, nose, oral mucosa, and tongue from blows. The most common complaints were headaches, dizziness, and vertigo due to blows to the head. More than half of the respondents used dental protectors during training/competition, including other maxillofacial protectors. Nearly 70% of them received adequate and timely "first aid", and in 52.5% of the cases, it was provided by a physician.
Conclusion. Injuries to the cartilaginous parts of the nose and ears, fractures of the nose, and lacerations of the face and scalp are uncommon. Injuries to teeth are also rare, as are fractures of the facial or skull bones, most likely due to the use of dental and maxillofacial protectors. Loss of consciousness, serious neurological problems, and life-threatening accidents can be prevented by using protectors.

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INTRODUCTION

Participation in contact sports such as karate, boxing, MMA, judo, and wrestling involves a specific training and competition regime that can result in various head and neck injuries, damaging the soft tissues, skull bones, and brain tissue itself. Such injuries can be sustained during a fall or through direct impact with a hard object, sports equipment, or other athletes. Injuries can occur accidentally, as a result of insufficiently developed individual skills, or through the deliberate violation of the rules of 'fair play'. Athletes may experience aesthetic disturbances, pain, and temporary or permanent disability, as well as life-threatening conditions such as profuse blood loss, secondary infections, fractures of the facial and skull bones, and brain tissue injuries (e.g., concussion, brain contusion, and haematoma), which can lead to various neurological complaints (Dimitrova, 2018). Sports injuries account for between 3% and 29% of facial injuries and between 10% and 42% of facial fractures. According to Djorov (2006), fractures of the malar bone and zygomatic arch account for approximately 20-25% of all injuries to the maxilofacial area and are second only to mandibular fractures. They occur upon direct contact with an opponent or sports equipment. This is most commonly seen in sports such as hockey, boxing, squash, baseball, football, basketball, and tennis. Tsenovski (2019) summarizes that nasal fractures are the most common type of facial fracture, accounting for approximately half of all cases. These injuries are twice as common in men as in women, causing aesthetic and functional disturbances. Early and adequate diagnosis is crucial for full recovery and prevention of deformities. However, there has been a decline in their frequency due to the use of protective equipment. According to some authors, this downward trend is offset by the emergence of more dangerous sports or the 'diversification' of traditional sports (Viozzi, 2017). This is supported by Park et al.'s (2021) conclusion that the frequency of maxillofacial injuries sustained while playing contact and non-contact sports is increasing. Sports accidents have been found to cause six times more facial injuries than work accidents, and three times more violent or road traffic injuries. High-speed, high-impact sports result in more facial bone fractures, whereas low-speed, low-impact sports lead to more dental injuries (Tuli et al., 2002). Sports dentistry is a modern field of dentistry with great potential for future development. It primarily focuses on the prevention and treatment of injuries and diseases in the maxillofacial region sustained while participating in various sports, by utilizing basic protective equipment such as well-fitting helmets, face masks, and mouthguards. Dentists, therefore, have an important role in educating athletes, coaches, patients, and parents (in the case of child athletes) about the importance of prevention, diagnosis, and treatment of maxillofacial injuries in sports.

According to the American Society for Testing and Materials, there are three types of mouth guards: custom-made, mouth-formed, and standard. Various materials are currently used to manufacture mouth guards, most commonly polyethylene copolymer with polyvinyl acetate or vinyl copolymer with ethyl acetate and polyvinyl chloride. Such mouth guards are important for athletes, and dentists play a key role in their design and application in clinical practice (Tuna & Özcan, 2014).

The ***aim*** of our study is to investigate the most common maxillofacial injuries among National Sports Academy students who practice contact sports, the predominant complaints, and the use of protective equipment (such as face and jaw guards, and mouth guards) during training and competitions.

METHODOLOGY

The information was obtained by analyzing data from an indirect, anonymous online survey comprising 31 questions, distributed via Google Forms. The survey was conducted by National Sports Academy students who participated in contact sports in March 2025, over a period of 22 days. The form was completed by 50 people (80% men (*n*=40) and 20% women (*n*=10)) with an average age of 24 ± 6,81. The criteria for inclusion of respondents are to have been actively involved in sports for more than two years, with regular weekly training, predominantly in contact sports and martial arts, as well as other sports. Of these, 96% reported regularly exercising, with the responses distributed in three groups:

a) Group 1, Combative sports (*n* = 14, 28% of total) – of which Wrestling (*n* = 2), Judo (*n* = 7) and Sambo (*n* = 5).

b) Group 2, Martial arts (*n* = 30, 60% of total) – of which Karate (*n* = 7), MMA (*n* = 3), Boxing (*n* = 6), Kickboxing (*n* = 4), CAPT (**Combat-applied physical training*) (*n*=1), Taekwondo (*n* = 5), Muay Thai (*n* = 3), Brazilian jiu-jitsu (*n* = 1);

Group 3, other sports (*n* = 6, 12% of total) such as: Cycling (*n* = 1), Swimming (*n* = 1), Rugby (*n* = 1), Handball (*n* = 2), Field hockey (*n* = 1).

Statistical analysis of the data was performed using IBM SPSS Statistics 23. Descriptive statistics were used to evaluate the individual variables. Pearson's χ^2-test was used to establish statistical significance for hypothesis testing.

RESULTS

The survey questions covered gender and age, as well as the sports they played and whether they had suffered injuries/wounds to the lips, nose (including cartilage and bone), scalp, or bruising around the ears or eyelids. They were also asked whether they had bitten their lip or tongue or suffered injuries to their teeth or fractures of the upper and/or lower jaw and other facial and skull bones. The questions also inquired about loss of consciousness, its duration, any subsequent complaints, whether they were left under medical supervision, the use of dental or other facial-jaw protectors during training or competition, and whether they received adequate and prompt first aid, as well as from whom.

The survey data show that respondents were more likely to suffer soft tissue injuries (to the upper and/or lower lip) during training (54%):

Have you ever suffered injuries or wounds in the area of your upper and/or lower lip?

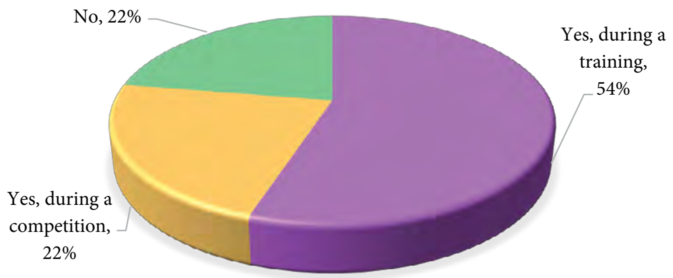

Figure 1. *Distribution of soft tissue injuries to the upper and/or lower lips*

Examining the correlation dependencies revealed that athletes are more likely to sustain lip injuries during training. In the wrestling/judo/sambo group, 69.2% of respondents reported such injuries, compared to 60.7% in group 2 ($p < .05$).
Our participants also suffered nose injuries more frequently during training than in competition, as shown in Figure 2.

Have you ever suffered injuries/wounds in the nose area?

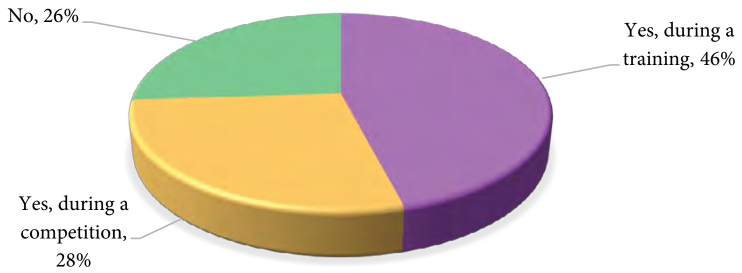

Figure 2. *Percentage distribution of injuries in the nose area*

However, this is not the case with cartilage injuries to the nose: 20% ($n = 10$) of respondents sustained such injuries during training and 26% ($n = 13$) during competition. The proportion of nasal bone fractures is low, at 26%, during both training and competition. A total of 40% of respondents reported lacerations and contusions in the eyebrow area, and 48% reported bruises in the upper and/or lower eyelid area during training and competition. A comparison of the survey data revealed that 42.9% of respondents in the wrestling/judo/sambo group had bruises (hematomas) in the upper and/or lower eyelid area during competitions, whereas this occurred in 32.1% of respondents in the karate/MMA/boxing/CAPT/taekwondo group during training ($p < .05$).
Of the respondents in the wrestling/judo/sambo group, 35.7% had suffered hematomas (bruising) in the cartilage area of the ears during training. The same injuries were reported by 14.3% of those practicing karate/MMA/boxing/CAPT/taekwondo during training ($p < .005$).
Our survey data indicates that injuries to the oral mucosa, such as bites and abrasions sustained during training or competition, are the most common, as presented in Figure 3.

Have you ever suffered injuries to the oral mucosa (biting, abrasion)?

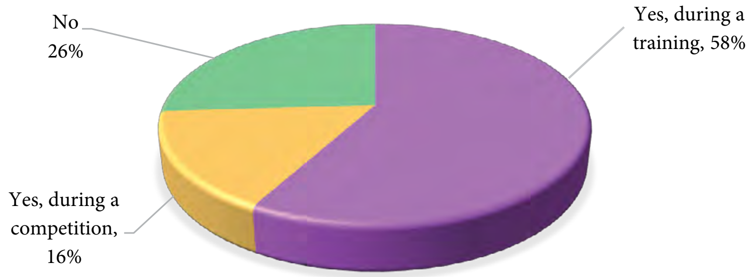

Figure 3. *Percentage distribution of oral mucosa injuries*

When we compare data on similar injuries, we find that they are mainly observed during training in both groups of contact sports – 71.4% in wrestling, judo, and sambo, and 64.3% in karate, MMA, boxing, CAPT, taekwondo ($p < .05$).
The percentage of tongue bites resulting from blows during training or competition is also high among soft tissue injuries, as shown in Figure 4.

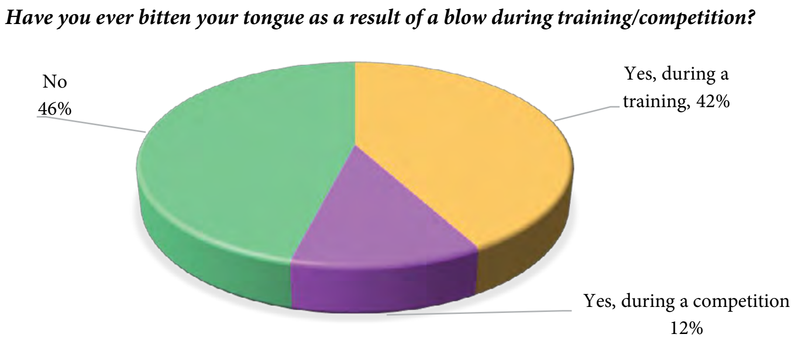

Figure 4. *Percentage ratio of tongue injuries*

Almost a quarter (24%) of all respondents reported dental injuries during training and competition, with 22% of cases involving a fractured tooth crown. When comparing data from different groups of contact sports, it was found that respondents reported dental injuries more frequently during training: 28.6% in wrestling, judo, and sambo, and 17.9% in karate, MMA, boxing, and combat-applied physical training (with an extremely high level of significance, $p < .001$).
Participants reported that 20% of them (n = 10) had briefly lost consciousness (for 20–30 seconds) as a result of a blow to the head during a competition. The most common complaints were headaches (52%, n = 26), dizziness (24%, n = 12), and staggering (12%, n = 6).
Only 6% of participants reported losing consciousness for longer than 30 minutes as a result of blows to the head during training and competition. The most common complaints *were prolonged amnesia (6%), severe headaches (4%), and reduced tactile sensitivity (2%).* Following a blow or trauma to the head, participants most often reported suffering dizziness or vertigo (22%, n = 11), bleeding from the ears or nose (12%, n = 6), and impaired gait (8%, n = 4). Only *6% were kept under medical observation or hospitalized for at least 24 hours after sustaining a maxillofacial injury.*
A significant percentage of athletes – 76% of those surveyed – use mouth guards during training and competition, with the distribution of this group as shown in Figure 5:

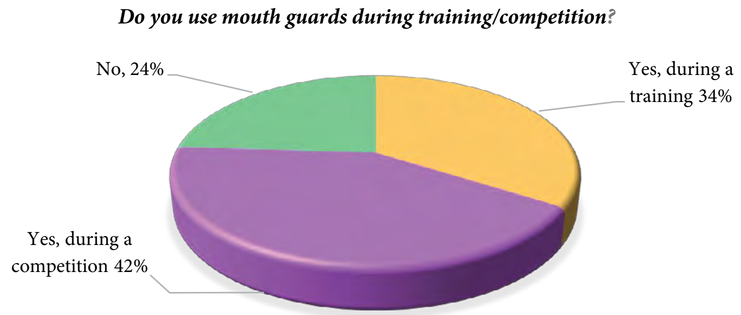

Figure 5. *Percentage of athletes using mouthguards.*

The following results of the comparative analysis are also highly statistically significant: 21.4% of respondents in the wrestling/judo/sambo group reported wearing mouthguards during both *training and competition*. In the karate/MMA/boxing/CAPT group, 50% wear them during *training and competition* ($p < .001$).
Additionally, 50% of all respondents reported using other face and jaw protectors during training or competition.
Over half of respondents (58%) believe they received adequate and prompt “first aid” after sustaining head and jaw injuries during training or competition. Of these, 42% received “first aid”

from a doctor, 32% from a coach, and 6% from someone else.

DISCUSSION

Our survey results showed that injuries to the cartilage of the nose and ears, as well as nasal fractures, lacerations, and contusions of the face (including the brow ridges) and scalp, are rare among our students. Injuries to the teeth and fractures of the upper and lower jaw, zygomatic bones and arches, or skull bones are also uncommon, most likely due to the use of dental and other facial and jaw protectors.

In this regard, a study by Lee et al. (2013) recommended raising awareness of the benefits of wearing dental protectors. In this research, 51.2% of elite Korean taekwondo competitors expressed a positive opinion about utilizing dental protectors if they were provided with more information about the benefits of preventing sports injuries.

This is also confirmed by a study by Vidović et al. (2015) among taekwondo practitioners: while 95% of them are aware of the importance of using mouth guards, only 5% use custom-made ones. According to the authors, this is insufficient to prevent dental injuries, and they emphasize the crucial role of dental practitioners in educating and encouraging athletes to use custom-made mouthguards.

Similar are the results and recommendations of Stanbouly et al. (2021), who found that athletes in contact sports were more likely to be affected by dental injuries (14.3% vs 0.0%; $p < .01$), facial injuries (35.0% vs 6.2%; $p < .01$) and concussions (32.6% vs 2.4%; $p < .01$) than athletes in non-contact sports. They highlight the importance of providing information to athletes participating in contact sports on how mouth guards can help reduce dental injuries and increase awareness of dental first aid.

In 2024, Biagi et al. reported that the incidence of traumatic dental injuries ranges from 0.71% to 60%. According to them, kickboxing is a combat sport that carries a high risk of facial injury. They observed that only 13% of athletes suffered such injuries during training or competition, attributing this to the widespread use of mouth guards (94%). The authors recommend increasing awareness among coaches and athletes of the importance of using such protective devices, the types available, and how to respond in emergency situations involving knocked-out teeth. In this regard, they emphasize the importance of teamwork with dental professionals. Our findings are similar. In our study, 24% of respondents reported dental injuries, with 18% occurring during training and 6% during a competition. Of these injuries, 91.7% presented with a fractured tooth crown. We also attribute the relatively low incidence of dental injuries to the fact that 76% of our respondents use mouth guards (34% during training and 42% during competition). Additionally, 50% of participants reported using other types of face and jaw protectors during training and competition. In their study, de Lima et al. (2024) found that the prevalence of dental trauma was 11.38% in contact sports and 5.24% in non-contact sports. They concluded that athletes are at risk of such injuries regardless of the type of sport, with a higher prevalence rate observed in contact sports. The authors recommend utilizing protective mouthguards as a preventive measure in both contact and non-contact sports.

Hacquin et al. (2021) report that the main types of orofacial sports injuries are to the lips, cheeks, and tongue (reported by 18.6% of handball players), dental injuries (affecting 9.9% of athletes), and temporomandibular joint injuries (reported by 4.9% of athletes). While most participants are familiar with mouthguards (97.3%) and consider them effective in preventing dental injuries in handball (95.3%), only 3% actually use them. The authors attribute the high prevalence of orofacial injuries among the athletes studied to the very low use of mouthguards. They recommend providing handball teams with information on mouth guard utilization and dental injury management.

The importance of conducting such awareness campaigns is emphasized in the recommendations of many researchers. Elareibi et al. (2022) conducted a study on ways to prevent and manage orofacial injuries among contact sports coaches in Libya. They report that, although 89.4% of coaches are aware of mouthguards, only 53.6% consider them effective and would recommend their use by athletes, primarily due to their own prior experience with them. The authors recommend implementing training for coaches on the prevention and timely treatment of dental injuries as a prerequisite for obtaining a coaching license and working in the field.

Park et al. (2022) also studied the frequency of sports injuries in the maxillofacial region. Only 11 of the 95 patients underwent a thorough examination in the neurology and neurosurgery department; most were diagnosed with contusions and concussions and were monitored without receiving further treatment. In our survey, 28% of athletes reported sustaining a concussion during training or competition, and 6% reported a brain contusion. Of these athletes, 6% remained under medical observation or hospitalization for at least 24 hours. We agree with Park HK et al. (2022) that, although the incidence of traumatic brain injury (TBI) is not high, the use of protective equipment should not be underestimated, as serious injuries result in permanent damage. Neurological signs and symptoms in patients with head injuries must be recognized and thoroughly assessed.

Polmann et al. (2020) report that the overall prevalence of dental and facial injuries in combat sports is 30.3%. According to their findings, jiu-jitsu has the highest rate of facial and jaw injuries (52.9%), whereas judo has the lowest overall prevalence (25%). The authors recommend raising awareness of the frequency of these injuries and encouraging the use of protective equipment to minimize associated complications. As in their study, we adhere to the recommendations for the use of dental and other facial protectors in order to minimize potential serious injuries to the maxillofacial region, as do other researchers.

Čierna et al. (2018) found that, among karate competition athletes, facial injuries accounted for 69.6% of all injuries, most of which were minor (minor abrasions: 24.5%; epistaxis: 24.1%; contusions: 16.7%).

Only 10% of injuries resulted in loss of consciousness. In our study, 20% of respondents reported a brief loss of consciousness during competition, and only 4% reported a prolonged loss of consciousness during competition.

CONCLUSION

The results of our survey indicate that the predominant complaints are soft tissue injuries to the lips and nose, biting and abrasions to the oral mucosa and tongue, and eyelid bruising. Such injuries are most prevalent among students training in karate, MMA, and boxing. Injuries to the teeth and fractures of the facial or skull bones are rare, which we attribute to the use of dental and maxillofacial protectors. Protective equipment prevents brief or prolonged loss of consciousness, as well as serious neurological complaints characterized by general cerebral or focal symptoms, and life-threatening incidents. We recommend conducting further similar studies among our students. It would be beneficial to conduct training events on the essential role of using dental and maxillofacial protectors, as this would contribute to reducing severe and disabling injuries in the maxillofacial area, while also increasing knowledge and skills for rapid response in emergency situations. Nevertheless, the high frequency of injuries reported in the survey suggests that, despite significant sample limitations, such as small size and lack of uniformity, the results still provide some helpful information. However, much more would be desirable for a robust study.

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