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The study of sport injuries in the national team karate of Iran (kumite field)

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Key words: karate, sport injuries, prevention, sport first aid, rehabilitation

Abstract

The purpose of this study was to describe the incidence, type and mechanism of sport injuries in male karate athletes in the national karate team. The statistical population and samples were karate athletes who reached the final stages and were invited to participate in the World championship held in Turkey (2010). The research instrument was a closed questionnaire which included 3 sections; the first section consisted of personal characteristics, titles, residency province, championship records and experience; the second section was related to karate athletes sport injuries including muscular, articulation, bone and skin and the third section consisted of the probable reasons of injuries occurrence, preparation test, first aids types, port injury measurements, rehabilitation measurements, types of injury in the injured limb. Each sportsman should mark the number of his injuries during a year in the related columns. Descriptive and inferential statistical methods (chi-square test) were used in data analysis. The results indicated that muscular injuries (65.4%) were more significant than other injuries ($\chi^2=158.7$, $p<0.05$). Also, the organic injuries in head and face (32.4%) were statistically more significant than injuries to other body parts ($\chi^2=150.6$, $p<0.05$). Moreover, the results showed that the most injuries included trauma (38.4%), contusion (15.1%), tension (7.5%) and strain ($\chi^2=223.5$, $p<0.05$). High pressure (26.9%), improper warming up (22.4%) injuries inflicted by a partner (14.9%) were the most common injury reasons. Also, the most important mechanism of injury incidence was related to opponent's kick and punch blows (56.9%), athlete's kicks and punches (33.3%) and falling down to the ground (barai) (9.8%). Improving coaches and athletes' awareness of the prevailing injuries in this sport, strict judging and heavy penalties for uncontrolled blows, preventing the athlete from coming back to the exercise and competition before being fully healed along with using protecting instruments in head and face region, and more safety are the ways for decreasing injuries in this sport.

Introduction

Vulnerability to injury is probable in most sports. These injuries in high-contact sports are unavoidable. Although from peoples' point of view, martial arts are known as the sport with most contact and with the highest rate of injuries, studies and statistics show opposite results. Based on the studies, injuries in karate are less frequent than injuries in most sports with less contact. Most injuries in karate are in a form of trauma and contusion and mild local injuries, but serious injuries like fracture, twist, and dislocation of joints is more common in sports such as football, wrestling, weight lifting, ski, track and field, Taekwondo, judo, and even volleyball and basketball [Nouzari 2010].

Injuries in martial arts (like karate) are reported in a lot of research and on their basis scientific advice is offered to prevent them [McLatchie 1994]. Oler *et al.* [1991] questioned the safety of the martial arts at a championship level [Oler *et al.* 1991]. On the other hand, Birrer's [1996] five-year study indicates safety of martial arts. He asserted that it is true that in martial arts, limbs are injured a lot, but most of the injuries are slight [Birrer 1996]. In their study, conducted on five martial arts, Zetaruk *et al.* [2005] reported the least damage in karate after Tai chi, and the probability of several injuries in Taekwondo was three times as much as in Karate. They also introduced head and face, upper limb and soft tissues as the points most likely of being injured Karate [Zetaruk *et al.* 2005]. In his study entitled “Injury

profile in competitive karate" and by analysing three successive world matches, Arriaza and Leyes, the head of the Medical Committee of World Karate Federation (2005) reported punch blows (82.7%) as the main cause of injuries, head and face as the injured areas (72.5%), and contusion as the main type of injury (50.3%) [Oler *et al.* 1991]. Also, the six-year study of Macan *et al.* (2006) demonstrated that new judgement rules have caused reduction of injuries in Karate matches. They asserted that strict judging and heavy penalties for uncontrolled blows, particularly for the youngest competitors, can significantly decrease the risk of injury [Macan *et al.* 2006].

In his report, Arriaza (2003), the head of Medical Committee of WKF said that in world championship of the cadet and junior age group in Bulgaria 1999, Greece 2001, and France 2003, in each turn, the injury rate decreased considerably" [Arriaza 2003]. Pieter [2000], in his study, reported injuries on head and neck of elite male and female Karatekas as the most frequent injury [Pieter 2000]. In the study that Pappas [2007] conducted on three important sports and games- boxing, wrestling, and martial arts – injuries in martial arts were less common than the two other sports [Pappas 2007]. In their extensive study on four popular sports, Tenvergert *et al.* [1992] concluded that the rate of injuries in martial arts is smaller than sports such as football, volleyball and gymnastics [Tenvergert *et al.* 1992]. By extensive research in martial arts, Pieter [2005] reported that injury on head and neck had the highest rate. He introduced punches blow as the highest injury mechanism [Pieter 2005].

Sport champions are the national capital and can play a crucial role in development of sport in the country. Therefore, the present study aims at investigation of incidence, type and mechanism of sport injuries among Iranian elite Karatekas.

Method

Based on the general goals of the study which addressed incidence, type and mechanism of sport injuries in Karate at national level, a closed questionnaire was used in the study.

Statistical population

Statistical population of the current research were 40 elite Karatekas at a national level, present at the camp of senior karate national team (Kumite field), who were in Turkey in 2010 to be dispatched to Asian championship as members of high rank.

Statistical Sample

Statistical sample is comprised of the total statistical population and all qualified Karatekas at a national level (Karate field) were studied as a sample.

Data collection procedure

Questionnaire for sports injuries, especially martial arts by the Bebary (2009) prepared and has been developed was used. The questionnaire is comprised of three parts. The first part involves personal information of each athlete including duration of sports activity, the highest rank and place, height, weight, age and so on, and other personal properties; the second part involved the presented tables classified under four types as: articulation, muscular, bone and skin injury in head and face, torso and spine, and upper and lower limb. Each athlete should check the number of his injuries throughout the year in related columns: the third part included 11 questions about test preparation, causes of injury, type of first aid, after-injury and rehabilitation measures, trouble type in the injured limb and so on.

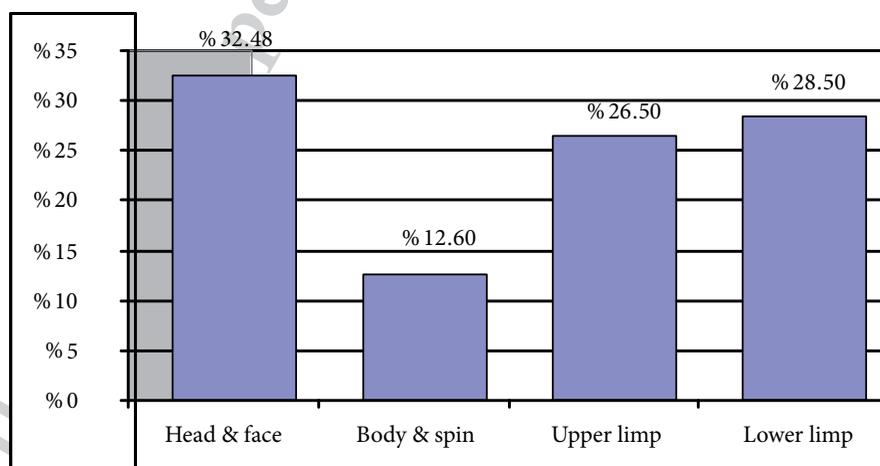


Chart 1. Occurrence of different types of injuries in different body parts of Iran's elite Karatekas in senior national team's camp

Tab. 1. Scattering distribution of injured body parts of Iran's elite Karatekas in senior national team's camp

Total percentage of each organ	Percent	Frequency	Injured organ	
			Limb	
32.4	0.7	1	Cranium (Head)	Head & Face
	7.9	12	Cheek (Face)	
	4.6	7	Jaw	
	1.3	2	Tooth	
	6	9	Nose	
	6.6	10	Gob	
	3.3	5	Eye	
2	3	Ear		
12.6	2	3	Neck	Body & Spine
	1.3	2	Back region	
	4.6	7	Loin	
	3.3	5	Ribs	
	0	0	Chest	
	0.7	1	Abdominal muscles	
	0.7	1	Sides	
26.5	4.6	7	Shoulder	Upper limb
	2	3	Arm	
	2.7	4	Elbow	
	1.3	2	Forearm	
	4.6	7	Wrist	
	11.3	17	Fingers	
28.5	0.7	1	Pelvis	Lower limb
	4.6	7	Leg	
	9.3	14	Knee & Kneecap	
	2.7	4	Foreleg	
	3.3	5	Ankle	
	7.9	12	Toes	
100	100	151	Total	

By presenting at the camp site of the national team and offering related explanation, the researcher distributed the questionnaires among the subjects (champions of Iran's karate national team), collected the data, and the evaluated it.

Data analysis procedures

To analyse the data, descriptive statistics methods (tables, charts, mean and percentage frequency) and inferential statistics (chi- square) were used.

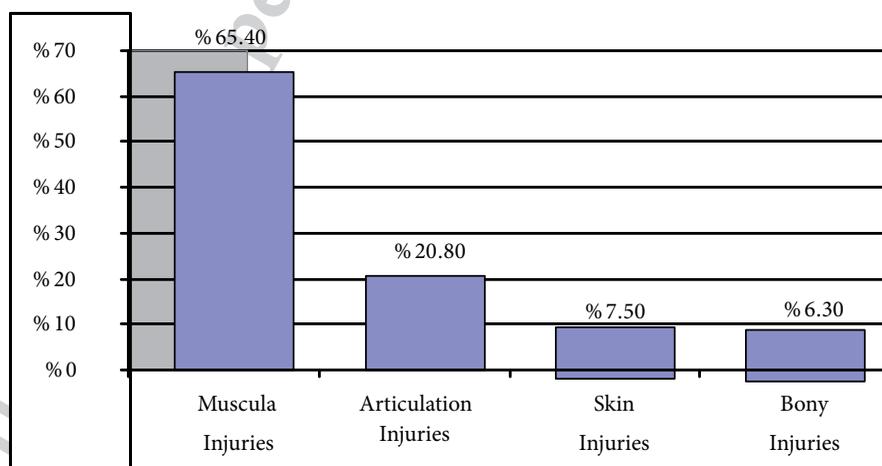


Chart 2. Occurrence of four fold injury type among Iran's elite Karatekas in senior national team's camp

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Tab. 2. Occurrence rate of four fold injury types in people classified under the entire body

<i>Injury types</i>		<i>Frequency</i>	<i>Percent</i>	<i>Total percentage of each organ</i>
Articulation injuries	dislocation	12	7.5	20.8
	sprain (twist)	10	6.3	
	meniscal injury	11	7	
Muscular injuries	trauma	61	38.4	65.4
	tear	7	4.4	
	contusion	24	15.1	
	strain	12	7.5	
Bone injuries	open fracture	1	0.6	6.3
	closed fracture	7	4.4	
	partial fracture	2	1.3	
Skin injuries	wound	7	4.4	7.5
	ulcer	5	3.1	
Total		159	100	100

Results

Results of the study showed that in general 82.5% of the elite Karatekas had been injured in their trainings and matches during the last year and only 17.5% did not have any injury.

Chart 1 shows the percentage frequency of the injury spread in different parts of the body. According to the charts, head and face (32.4%) comprise the highest rate in injury significantly ($\chi^2=150.6$, $p<0.05$) and torso and vertebral column has the least rate injury (12.6%), and lower limbs' and upper limbs' injuries were 28.5% and 26.5% , respectively.

The information presented in Table 1 shows the percentage of injuries in different body parts of Iran's elite Karatekas in senior national team's camp that is illustrated with classification of each limb. According to the Table, torso and spine injury in karatekas was 12.6% and in head and face was 32.4%. The most injured part in head and face is cheek, in torso and spine is loin, in upper limb are fingers, and in lower limb are knee and kneecap. In chart 2, four fold injury rates are shown in the samples. According to this chart, bone injuries

with the least percentage (6.3%) and muscular injuries with the highest percentage (65.4%) comprise the highest rate of injuries significantly ($\chi^2=158.7$, $p<0.05$), and skin and articulation injuries comprise 20.8% and 7.5% of the total percentage of injuries.

In table 2, four fold injury types are divided into different parts and percentage of each injured part is observed. According the table, the most frequent types of injuries are trauma (N=61 and 38.4%), contusion (N=24 and 15.1%), and strain and dislocation (each case N=12 and 7.5%) ($\chi^2=223.5$, $p<0.05$), respectively. In articulation injuries, dislocation (7.5%) comprises the highest and sprain (twist) (6.3%) comprises the lowest percentage of the injuries. In muscular injuries, trauma (38.4%) and tear (4.4%) comprise the highest and the lowest percentage of the injuries, respectively; In bone injuries, closed fracture (4.4%) and open fracture (0.6%) were the most and the least frequent injuries; in skin injuries wound and ulcer comprise 4.4% and 3.1% of the total percentage of injury.

The finding points to involvement of some factors in occurrence of injuries. By surveying elite karate champions, it was found that 24.2% of

Tab. 3. Effect rate of factors involved in injury occurrences

<i>Reasons of injury occurrences</i>	<i>Frequency</i>	<i>Percent</i>
Not having primary physical preparation	4	6
Not having the body build related to karate	6	8.9
Inappropriate warm up	15	22.4
Not being skilful enough in performing the techniques	0	0
Not using protective equipment	6	8.9
Not having suitable clothing	0	0
Injury by training partner	13	19.4
Not observing immunity factors while training	3	4.5
Unfamiliarity with performing method of techniques	2	3
Training over-extension	18	26.9
Total	67	100

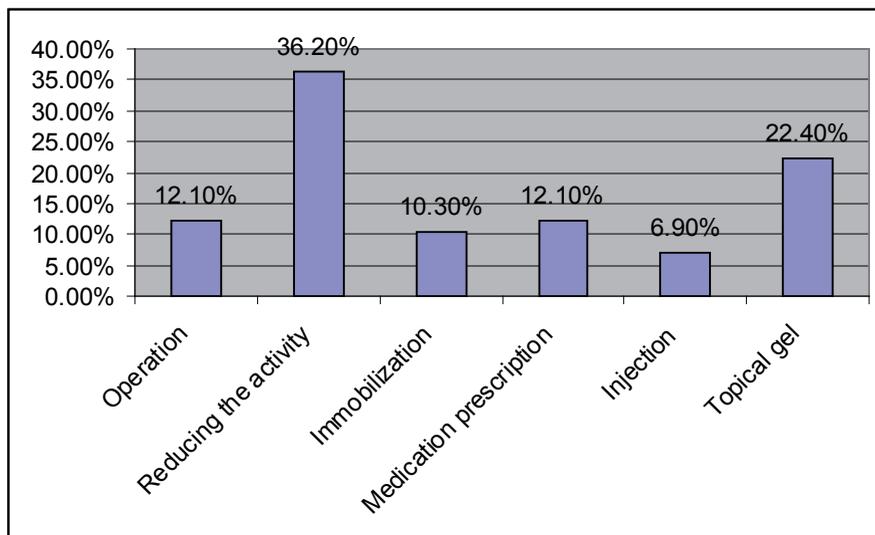


Chart 3. Offered measures after injury occurrence

the champions have taken part in the preparation test while 75.8% of them had not taken part in it. To them, 26.9% of the injuries have occurred as a result of high pressure while training, 22.4% of the injuries have occurred when the body had not been warm enough, and 19.4% have occurred because of the training partner ($\chi^2=179.7$, $p<0.05$). The information presented in table 3 shows the influence rate of factors involved in occurrence of injuries in elite karate champions.

The survey on the role of having or not having time for a match (training) on injury occurrence showed that 57.5% of the injuries occurred while training and out of match time, since 42.5% of them occurred in a match time.

Results obtained from the survey on the type of first aid offered when an injury occurs demonstrate that in 48.9% of the injuries ice is used, in 26.7% the injured limb is an immobilized organ, in 11.1% the injured limb is bandaged, and in 13.3% the injured athlete is transferred to therapeutic centres.

The survey on the issue that who has offered the first aid illustrated that the first aid is offered by the doctor (21.6%), the coach (27.4%), the athlete himself (45.1%), and other people (5.9%), respectively.

A survey was also carried out to ask the subjects about the offered measures after the injury occurrence that showed, reducing the activity (36.2%) and injecting (6.9%) has the highest and lowest percentage of the measures, respectively (chart 3).

The results obtained from the survey on the offered measures at the rehabilitation period shows that measures offered involved heat therapy (7.9%), physiotherapy (27%), therapeutic massage (9.5%), therapeutic exercise (25.4%), aquatic therapy (15.9%), and sauna (14.3%) (chart 4).

Another survey was also carried out to ask the subjects if they immediately continued their match or training after being injured during the match or training. 54.5% of the athletes' responses were positive and 45.5% were negative. Moreover, 87.9% of these national champions started their sport activity before being improved fully and just 12.1% of them continued their sport activity after complete healing of their injuries. In addition, the finding of the study demonstrated that 42.5% of the elite karate athletes in senior karate national team's camp still felt pain, 6.4% experienced swelling, 27.7% had motion limit in the injured limbs and only 23.4% had not trouble in the injured limb.

Finally, the results obtained from a survey on the issue of what kind of movement caused the injury showed that the injuries occurred by the competitors' kick (25.5%), the competitor's punch (31.4%), falling on the ground (9.8%) (barai¹), the injuries due to the athlete's punch blow (11.8%), and the injuries due to the athlete's kick blow (21.5%).

Discussion and conclusion

Injuries in sport occur and are one of the common difficulties in championship sports. Analysing the results of sport injuries in the present study demonstrates that 82.5% of Iran's male Karatekas in senior national team's camp that were to be sent to Turkey's World championship in kumite field (fight) during last year had been injured and just 17.5% had no injury.

In this study, results of the investigation on different vulnerable body parts of Iran's karate

¹ Barai: Sweep, or a sweeping action. Deviating and sweeping the competitions' feet to knock him on the floor.

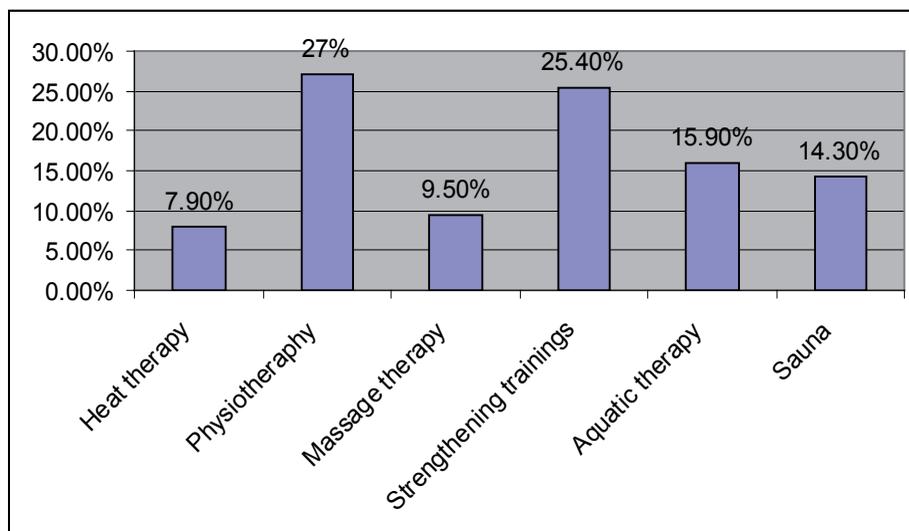


Chart 4. Offered measures in rehabilitation period

national champions show that rate of occurred injuries in head and face is significantly bigger than to other parts of the body. These results are consistent with those of Halabchi *et al.* [2007], and Pieter [2005], Zetaruk *et al.* [2005], Arriaza and Leyes [2005], Arriaza [2003], Pieter [2000], Critchley *et al.* [1999], Hillman *et al.* [1993]. Based on the results of this research many injuries are reduced in karate and Taekwondo, Kung fu, Wushu and similar martial arts, when protective equipment is used in head and face areas in this field; the same way that the use of mouth guard in matches has become compulsory since 1994 and caused a reduction in serious tooth injuries.

In the offered charts of the study and their obtained results, a comparison was made between different types of injuries classified as muscular, articulation, skin and bone. Rate of muscular injuries is significantly higher than other types of injury and trauma (58.7%) and tear (6.7%) comprised the most and the least frequent type of muscular injuries. This finding is consistent with the results of the previous research. As such, high percentage of muscular injuries suggest that muscular system plays a main and crucial role in all sports particularly karate in which muscular system is in danger of being injured more than the other parts since karate involves regular contacts, clash of punch and kick, using pressure to take *barai* in order to deviate and knock each other on the ground (tatami) during exercise and match. Therefore, the important role of a desired and systematic physical preparation in muscular system should be particularly addressed.

Results of this research deal with some factors that influence the occurrence of injuries in elite karatekas in this field. The obtained results show that 26.9% of the injuries occurred under training over-exertion, so over-exertion is an effect factor

and coach's attention should be attracted to this issue thus they should try their best to stop training in case of excessive fatigue. Research conducted by Routley and Valuri [1993], Heiss [1998], and Charles *et al.* [2000] showed that training over-exertion and excessive fatigue is the most important cause of sport injuries.

Inappropriate warm up and injury by a training partner are other reasons involved in occurrence of injuries in karate national champions that comprise 22.4% and 19.4% of the injuries. As a result, coaches' and athletes' attention and care should be attracted to this important point that athletes should warm their whole bodies up systematically before exercise and match. In this regard, Alter [1996] asserted that warm up along with stretch movement before sport activities cause reduction of many injuries while performing the technique [Alter 1996]. Hergenroeder [1998] offered strategies to reduce sport injuries that warming up and cooling down body by using PNF stretch movements can cause 75% reduction in occurrence of sport injuries and even reduce 80% of medical expenses [Hergenroeder 1998]. Therefore, teaching true methods of warm up to athletes and increased attention of coaches to this issue play a crucial role in reduction and prevention of sport injuries [Nouzari 2010]. Also, athletes should try to make the best use of a technical and appropriate training partner during training condition, because the findings of research show that 57.5% of the injuries occurred not during a match (training). And this result is consistent with the results of Nouzari [2008] and Charles *et al.* [2000] study. Thus, during performance of training, technical and tactical programmes, coaches should have more care and supervision on athletes' training procedure and engage in offering strategies that reduce injuries while training.

Another noticeable point of this research was offering 45.1% of first aid by the injured athlete and 5.9% by people other than coaches or doctors that can be involved in their further injury. And this rate corresponds to the almost the same rate presented in Nouzari [2008] research.

Lack of involvement of 75.8% of the athletes in preparation test and return of 87.9% of them to training and match before complete improvement is very effective on occurrence of further injuries and 42.5% of them still felt pain, 27.7% influenced by motion limit and 6.4% had their injured limbs swollen. Moreover, the results illustrated that competitor's kick and punch blow, and falling on the ground comprised 66.7% of the injuries.

Unlike people's idea that view karate as a violent, contact sport with lots of injuries, the comparison made between this sport and other sports such as football, handball, hockey, gymnastic and wrestling shows lower percentage and intensity of injuries in karate. Hence, it seems that issue of injury in karate that is among important and popular sports should be addressed by supervisors, people responsible, technical managers, coaches and athletes more carefully.

To sum up, it can be concluded from the results of the study that more awareness of coaches and athletes regarding common injuries in this sport, preventing the athlete from returning to training and match before being fully healed, as well as using protective equipment in head and face areas and more safety can reduce the occurrence of many injuries in this sport.

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Studium urazów sportowych w narodowej reprezentacji karate Iranu (kumite)

Słowa kluczowe: karate, kontuzje i urazy sportowe, prewencja, pierwsza pomoc, rehabilitacja

Streszczenie

Celem pracy był opis częstotliwości występowania, typów i mechanizmów urazów sportowych wśród zawodników z narodowej drużyny karate Iranu. Populację statystyczną stanowili zawodnicy karate, którzy doszli do fazy końcowej eliminacji i zostali zaproszeni do uczestnictwa w mistrzostwach Azji odbywających się w Malezji w 2007 roku. Instrumentem badawczym była zamknięta ankieta podzielona na 3 części: pierwsza obejmowała dane osobowe, tytuły, miejsce zamieszkania, rekordy zawodnicze i doświadczenie. Część druga odnosiła się do kontuzji sportowych obejmujących urazy mięśni, stawów, kości i skóry, a trzecia składała się

z prawdopodobnych przyczyn występowania urazów, testów przygotowawczych, typów pierwszej pomocy, pomiarów urazów, sposobów rehabilitacji oraz typy urazów kończyn. Zadaniem każdego ze sportowców było zanotowanie odniesionych w ciągu roku kontuzji w odpowiednich kolumnach. Do analizy danych zastosowano opisową i dedukcyjną metodę statystyczną (test chi-kwadrat). Rezultaty wskazywały, iż urazy mięśni (65.4%) występowały statystycznie częściej niż inne ($\chi^2=158.7$, $p<0.05$), a także urazy głowy i twarzy (32.4%) pojawiały się częściej niż w przypadku innych części ciała ($\chi^2=150.6$, $p<0.05$). Ponadto wykazano, że większość kontuzji wiązała się z traumą (38.4%), stłuczeniem (15.1%), napięciem (7.5%) i nadwyrężeniem ($\chi^2=223.5$,

$p<0.05$). Najczęstszymi przyczynami kontuzji było także: przetrenowanie (26.9%), nieodpowiednia rozgrzewka (22.4%), urazy spowodowane przez przeciwnika (14.9%). Najczęstszymi przyczynami występowania kontuzji były kopnięcia i uderzenia przeciwnika (56.9%), kopnięcia i uderzenia zawodnika (33.3%) oraz rzuty na ziemię (9.8%).

Autorzy proponują następujące sposoby na zmniejszenie kontuzji w sporcie: poprawa świadomości trenerów i sportowców dotycząca kontuzji sportowych, ostre oceny sędziowskie i kary za niekontrolowane uderzenia, powstrzymywanie sportowców przed powrotem do ćwiczeń i zawodów przed zakończeniem pełnej rekonwalescencji oraz używanie sprzętu ochronnego w okolicach głowy i twarzy.