

# **Trabalho de Conclusão de Curso**

**Prevalência de injúrias dentofaciais em praticantes de esportes de  
combate: uma revisão sistemática e meta-análise**

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**UNIVERSIDADE FEDERAL DE SANTA CATARINA  
CURSO DE GRADUAÇÃO EM ODONTOLOGIA  
TRABALHO DE CONCLUSÃO DE CURSO**

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**PREVALÊNCIA DE INJÚRIAS DENTOFACIAIS EM PRATICANTES DE  
ESPORTES DE CONTATO: UMA REVISÃO SISTEMÁTICA E META-  
ANÁLISE**

Trabalho apresentado à Universidade Federal de Santa Catarina, como requisito para a conclusão do Curso de Graduação em Odontologia.

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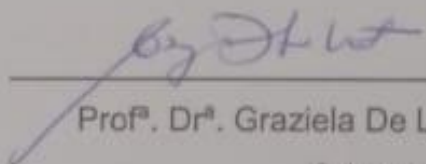
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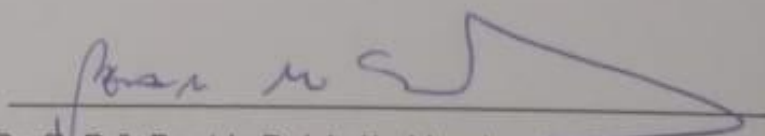
**PREVALÊNCIA DE INJÚRIAS DENTOFACIAIS EM PRATICANTES DE ESPORTES DE COMBATE: UMA REVISÃO SISTEMÁTICA E META-ANÁLISE**

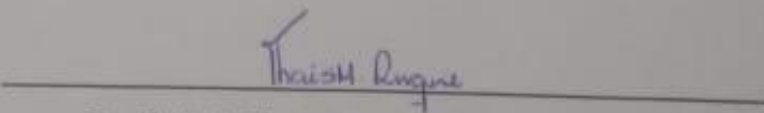
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*Dedico este trabalho à minha família que contribuiu incessantemente para que eu obtivesse êxito em meus estudos. Eles são responsáveis pela maior herança de minha vida: o conhecimento. Dedico também ao meu amor, por estar sempre ao meu lado nos momentos de alegria e de dificuldades.*

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## RESUMO

**Objetivo:** Avaliar a prevalência das diferentes injúrias dentofaciais em praticantes de esportes de combate e identificar a modalidade mais associada. **Métodos:** Uma revisão sistemática foi realizada. Seis bases de dados eletrônicas e três bases de dados de literatura cinzenta foram pesquisadas. Os estudos relevantes foram selecionados de forma independente por dois revisores com base em critérios de elegibilidade pré-definidos. O risco de viés foi avaliado usando a ferramenta *Joanna Briggs Institute Critical Appraisal Checklist for Studies Reporting Prevalence Data*. A confiança na evidência cumulativa foi avaliada de acordo com *Grading of Recommendations Assessment, Development and Evaluation* (GRADE). **Resultados:** Dentre os 2013 artigos encontrados, 24 foram incluídos. Dezenove estudos foram julgados com baixo risco de viés, três com risco moderado e um com alto risco. Estudos incluídos avaliaram injúrias dentofaciais nos seguintes esportes: boxe, capoeira, esgrima, jiu-jitsu, judô, karatê, kendo, kickboxing, kung-fu, muay-thai, taekwondo, wrestling e wushu. Os resultados da meta-análise sugeriram uma prevalência global de 28,7% (95% IC; 16,3%-43,2%) para lesões dentofaciais. A maior prevalência global de lesões dentofaciais foi observada no jiu-jitsu 52,9% (95% IC; 37,9-67,8%). O judô foi o esporte com menor prevalência geral de lesões 25,0% (95% IC; 7,6-48,2%). A confiança na evidência cumulativa foi considerada muito baixa. **Conclusão:** As injúrias dentofaciais relacionadas ao esporte de combate apresentaram uma prevalência geral de aproximadamente 30% entre os praticantes dos países investigados. Dentre as modalidades o Jiu-jitsu foi o esporte com a maior prevalência geral de lesões dentofaciais (52.9%).

**Palavras-chaves:** Lesões maxilofaciais. Esportes. Prevalência. Revisão sistemática.

## ABSTRACT

**Purpose.** To identify the prevalence of the different dentofacial injuries in combat sports practitioners. **Material and methods.** A systematic review was performed. Six electronic and three grey literature databases were searched. Relevant studies were independently selected by two reviewers based on pre-defined eligibility criteria. Risk of bias was assessed using the Joanna Briggs Institute Critical Appraisal Checklist for Studies Reporting Prevalence Data. Confidence in cumulative evidence was evaluated according to the Grading of Recommendations Assessment, Development and Evaluation. **Results.** From 2013 articles, 24 were included. Nineteen studies were judged with low, three with moderate, and one with high risk of bias. Included studies evaluated dentofacial injuries in the following sports: boxing, capoeira, fencing, jiu-jitsu, judo, karate, kendo, kick-boxing, kung-fu, muay-thai, taekwondo, wrestling, and wushu. Results from the meta-analysis suggested an overall prevalence of 28.7% (95% Confidence Interval [CI] 16.3%-43.2%) for dentofacial injuries. The highest overall prevalence of dentofacial injuries was observed in jiu-jitsu (52.9%, 95%CI 37.9-67.8%). Judo was the sport with lowest overall prevalence of injuries (25.0%, 95%CI, 7.6-48.2%). Confidence in cumulative evidence was considered very low. **Conclusions.** Combat sports related dentofacial injuries showed an overall prevalence of approximately 30% among combat sports practitioners. Jiu-jitsu was the sport with the highest overall pooled prevalence rates of dentofacial injuries.

**Keywords:** Maxillofacial injuries. Sports. Prevalence. Systematic review.



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## LISTA DE ABREVIATURAS E SIGLAS

### ***Do inglês***

**CI:** *Confidence interval*

**GRADE:** *The Grading of Recommendations Assessment Development and Evaluation*

**JBI:** *Joanna Briggs Institute*

**MA:** *Meta-analysis*

**RoB:** *Risk of bias*

**PRISMA:** *Preferred Reporting Items for Systematic Reviews*

**PROSPERO:** *Prospective Register of Systematic Reviews*

**SR:** *Systematic Review*

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## 1 INTRODUÇÃO

Injúrias dentofaciais relacionadas aos esportes podem resultar em ferimentos restritos aos tecidos moles, como lacerações, abrasões e contusões. As injúrias podem também afetar os tecidos dentoalveolares, causando deslocamentos da articulação temporomandibular, avulsões, intrusões e extrusões dentais. Além disso, é importante salientar que outros tecidos duros faciais também estão frequentemente envolvidos, como a órbita, a maxila, a mandíbula, o etmoide, o frontal, o nasal e o osso zigomático (1). Logo, as consequências das injúrias dentofaciais podem ser substanciais em grande parte dos casos, já que podem ser consideradas potencialmente dolorosas, causando desequilíbrios emocionais, impactos psicológicos e gerando implicações econômicas (2). Uma análise de custos revelou que a média dos gastos com injúrias maxilofaciais e dentais é maior que o dobro do custo em comparação com as injúrias relacionadas do restante do corpo nos esportes de contato (3).

Os tipos de esportes podem ser divididos em: esportes de contato e esportes sem contato. Esportes como golfe, tênis e natação são considerados esportes sem contato, já que cada participante possui uma vez ou um local específico para sua prática. Tal fato diminui a possibilidade de contato físico entre os jogadores. Por outro lado, basquetebol, handebol, futebol e esportes de combate são considerados esportes de contato, devido à grande interação física que ocorre durante parte considerável do tempo desses jogos (4).

As injúrias dentofaciais têm uma grande variação nos valores de prevalências dentre as modalidades. Porém, nos esportes de contato, o número de ocorrências é relativamente maior. Dentre os esportes de contato, esportes de combate, em particular, são considerados como de alto risco para a ocorrência de injúrias dentofaciais devido à constante presença de movimentos que podem atingir a região facial (5). Em algumas modalidades de esportes de combate, mesmo havendo a recomendação de uso de protetores bucais, as taxas de prevalências de injúrias podem ser de até 80% (6). Por se levar em conta esses dados alarmantes das injúrias dentofaciais nesses tipos de esporte, o uso de protetores bucais tem se tornado fundamental para reduzir a severidade dos traumas. Entretanto muitas pessoas ainda desconhecem sua importância (6).

Os protetores bucais customizados são dispositivos que cobrem os dentes e a mucosa adjacente, prevenindo ou reduzindo os traumas aos elementos dentais, tecidos gengivais, lábios e ossos maxilares. O dispositivo é responsável por absorver ou redistribuir a energia proveniente dos impactos. Sendo assim, pode oferecer proteção considerável contra injúrias dentofaciais relacionadas aos esportes e, conseqüentemente, diminuir os custos associados ao seu tratamento (7). Além disso, existem também protetores bucais de estoque, os quais tem design e efetividade inferiores.

Nesse sentido, é prudente estar atento a prevalência de injúrias dentofaciais em praticantes de esportes de combate e, com base nisso, incentivar o uso de dispositivos de proteção orofacial entre os esportistas (8). Apesar de alguns estudos prévios terem avaliado a prevalência de injúrias dentofaciais em praticantes de esportes de combate (12-35), até o momento nenhuma revisão sistemática foi realizada reportando a quantidade, a qualidade e o risco de viés entre eles. Portanto, a presente revisão sistemática foi realizada para responder a seguinte questão: "Qual a prevalência de injúrias dentofaciais em praticantes de esportes de combate?".

## **2 OBJETIVOS**

### **2.1 Objetivo geral**

Revisar sistematicamente a literatura para avaliar a prevalência de injúrias dentofaciais em praticantes de esportes de combate.

### **2.2 Objetivos específicos**

- Verificar qual modalidade de esporte de combate apresenta a maior taxa de prevalência de injúrias dentofaciais;
- Avaliar qual o tipo mais frequente de injúria dentofacial;

### 3 CAPÍTULO 1

#### **Prevalence of dentofacial injuries among combat sports practitioners: a systematic review and meta-analysis**

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## ABSTRACT

**Purpose.** To identify the prevalence of the different dentofacial injuries in combat sports practitioners. **Methods.** A systematic review was performed. Six electronic databases and three grey literature databases were searched. Relevant studies were independently selected by two reviewers based on pre-defined eligibility criteria. Risk of bias was assessed using the Joanna Briggs Institute Critical Appraisal Checklist for Studies Reporting Prevalence Data. Confidence in cumulative evidence was evaluated according to the Grading of Recommendations Assessment, Development and Evaluation. **Results.** From 2013 articles, 24 were finally included. Nineteen studies were judged with low, three with moderate, and one with high risk of bias. Included studies evaluated dentofacial injuries in the following sports: boxing, capoeira, fencing, jiu-jitsu, judo, karate, kendo, kick-boxing, kung-fu, muay-thai, taekwondo, wrestling, and wushu. Results from the meta-analysis suggested an overall prevalence of 28.7% (95%CI; 16.3%-43.2%) for dentofacial injuries. The highest overall prevalence of dentofacial injuries was observed in jiu-jitsu (52.9%, 95% Confidence Interval [CI], 37.9-67.8%). Judo was the sport with lowest overall prevalence of injuries (25.0%, 95%CI, 7.6-48.2%). Confidence in cumulative evidence was considered very low. **Conclusion.** Combat sports related dentofacial injuries showed an overall prevalence of approximately 30% among worldwide combat sports practitioners. Jiu-jitsu was the sport with the highest overall pooled prevalence rates (52.9%) of dentofacial injuries.

**Keywords:** Maxillofacial injuries. Sports. Prevalence. Systematic review.

## INTRODUCTION

Sports-related dentofacial injuries may result in wounds restricted to soft tissues, such as lacerations, abrasions, and contusions, and may also affect dentoalveolar tissues, causing temporomandibular joint dislocations, teeth avulsions, intrusions, and extrusions. Furthermore, it is worth mentioning that other facial hard tissues could also be involved, such as the orbit, maxilla, jaws, ethmoid, frontal, nasal, and zygomatic bones (1). However, the consequences of dentofacial injuries may often be more substantial, as it can be potentially painful, cause emotional imbalances, psychological impacts, and economic implications (2). An analysis of the costs showed that the mean cost of maxillofacial and dental injuries was more than double in comparison to all other bodily injuries sustained in contact sports (3).

The sports categories are divided in non-contact sports and contact sports. Sports like golf, tennis and swimming are considered non-contact sports since each player have a turn or lanes to play. This fact decreases the possibility of physical contact between players. In contrast, basketball, handball, soccer and combat sports are considered contact sports due to the continuous physical interaction (4).

Although dentofacial injuries' prevalence varies per modality, its prevalence is higher in contact sports. Among contact sports, combat ones, in particular, are classified as high risk for dentofacial injuries due to the constant presence of body movements which can impact the facial region.(5) In some combat modalities, even though there is a recommendation for the use of mouthguards, prevalence rates of dentofacial injuries could be as high as 80% (6). With this alarming rate of dentofacial injuries in this kind of sports, the use of mouthguards could be fundamental to reduce the severity of trauma; however, many people are unaware of its importance (6).

A custom mouthguard is a device that covers the teeth and surrounding mucosa to prevent or reduce trauma to the teeth, gingival tissue, lips and maxillary bones. The device is responsible for absorbing or redistributing energy from direct impacts. Thus, it may offer considerable protection against sports-related dentofacial injuries, and consequently reduce the high treatment costs associated with this type of incident (7). In addition, there are also stocked mouthguards, which are inferior in design and provide reduced effectiveness.

Accordingly, it is prudent to be aware of the prevalence of dentofacial injuries among combat sports practitioners, since these results could incentivize the usage of orofacial protective devices among them (8). Although some previous studies have

evaluated the prevalence of dentofacial injuries among combat sports practitioners (12-35), to date, no systematic review has been carried out reporting the quantity, quality, and risk of bias (RoB) among them. Therefore, the present systematic review was performed to answer the following focused question: "What is the prevalence of dentofacial injuries among combat sports practitioners?"

## **MATERIAL and METHODS**

### **Protocol and registration**

This systematic review was reported according to the Preferred Reporting Items for Systematic Reviews (SR) and Meta-Analysis (MA) checklist (PRISMA) (9). A systematic review protocol based on PRISMA-p (10) was prepared and registered in the International Prospective Register of Systematic Reviews (PROSPERO) under code CRD42018089255 (11).

### **Eligibility criteria**

Studies that evaluated the prevalence of dentofacial injuries among combat sports practitioners were included. Dentofacial injury was defined as an injury to the teeth, alveolar bone, jaw, lips, and/or cheek bones. Other injuries affecting the nose, orbit, ear, head, and neck were not considered in this SR. No restrictions regarding publication time, participant's age, sex, and sport competition level (competitive or recreational) were performed.

The following exclusion criteria were applied: 1) studies where the sample was composed only by trauma patients attending medical centers or hospitals or including participants with genetic syndromes or neuromuscular diseases; 2) studies that did not investigate dentofacial trauma; 3) studies that did not evaluate injuries related to combat sports; 4) studies that did not provide separate data regarding frequency of dentofacial injuries in combat sports, even after trying to contact corresponding authors; 5) studies reporting only annual incidences of dentofacial trauma; 6) studies not published in Latin Roman alphabet; 7) abstracts, reviews, case-reports, protocols, personal opinions, letters, and posters; and 8) full-text not available.

### **Information sources**

Electronic search strategies were developed and adapted for each of the following bibliographic databases: EMBASE, Latin American and Caribbean Health Sciences (LILACS), LIVIVO, PubMed (including MedLine), Scopus and Web of Science. A partial grey literature search was also performed on Google Scholar, Open

Grey and ProQuest. Moreover, the list of references of included studies was hand-searched to identify additional manuscripts. Experts were also consulted by email to improve search findings. A reference manager (EndNote X7, Thomson Reuters) was used to collect references and remove duplicates.

### **Study selection**

Included articles were selected by two independent reviewers (FLD and GM). Firstly, they reviewed titles and abstracts (phase 1). If papers were considered eligible for inclusion, a full-text read was performed by the same reviewers (phase 2). In case of disagreements, a third reviewer (BDMS) was involved to make the final decision.

### **Data collection process**

Two independent reviewers (FLD and GM) collected data from the selected articles. Subsequently, the retrieved information was crosschecked. Any disagreement was discussed between them; and the third reviewer (BDMS) was involved if necessary.

### **Data items**

The following data were extracted for each included study: study characteristics (author, country, year of publication, design); population characteristics (sample size, age group, mean age); exposition characteristics (type of combat sports, sports level, use of mouthguard); and outcome characteristics (prevalence per type of injury, overall prevalence of combat sports related injuries).

### **Risk of bias in individual studies**

Risk of bias (RoB) was assessed by two reviewers (FLD and GM) using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Prevalence Studies (12). The answers could be "yes", "unclear", "no", or "not applicable". Decisions about scoring were agreed upon by all reviewers before critical appraisal commences and studies were characterized according to the following: 1) low risk of bias, if studies reached more than 70% score "yes"; 2) moderate risk of bias, if "yes" scores were between 50% and 69%; and 3) high risk of bias, if "yes" scores were below 49%. The software RevMan 5.3 (Review Manager 5.3, The Cochrane Collaboration) was used to generate figures.

### **Summary measures**

The prevalence of dentofacial injuries was expressed by means of relative or absolute frequencies and its 95% confidence intervals (95%CI).

### **Synthesis of results**

For proportion estimation regarding overall prevalence of dentofacial injuries in combat sports, a MA was performed. Furthermore, additional MA were conducted regarding specific dentofacial injuries for boxing, judo, karate, taekwondo, and wrestling. Since statistical heterogeneity was considerably high in all analyses, the random-effects model was applied for overall proportion calculation. To perform the meta-analysis, the software R Statistics version 3.4.4 (The R Foundation, Vienna, Austria) was used. In addition, statistical heterogeneity was quantified using the I<sup>2</sup> test and a value greater than 50% was considered as an indicator of substantial heterogeneity.

### **Risk of bias across studies**

The heterogeneity across studies was assessed by comparing variability among sample characteristics (such as age and sport categories), methodological heterogeneity by comparing variability in study design (sport levels, use of mouthguard, and injury classification criteria), and by comparing risk of bias categories of individual studies.

### **Confidence in cumulative evidence**

Overall strength of evidence available was assessed according to the criteria proposed by "The Grading of Recommendations Assessment, Development and Evaluation" (GRADE) (13). A Summary of Findings table was produced by using the online software GRADEpro (McMaster University, Hamilton, Canada).

## **RESULTS**

### **Study selection**

During phase-1, 2013 articles were found through searches in six databases. Sequentially, duplicate citations were excluded, and 954 studies remained. A comprehensive evaluation of the abstracts followed and 854 additional articles were excluded, resulting in 70 articles to be fully assessed (phase-2). No studies were selected from the hand-search in the reference list of the included studies and none from Google Scholar. Thus, 70 articles remained to be part of phase-2. During this phase, 46 studies were later excluded. Appendix 2 shows the reason for exclusion for each study. At the end of process, 24 articles were included in the qualitative and quantitative synthesis. The overall selection process is shown in Figure 1.

### **Study characteristics**

The majority of included articles were cross-sectional studies; and two studies were prospective-cohort studies. The studies were conducted in 13 different countries: Brazil (14-21), Croatia (22), Turkey (23-25), Switzerland (26, 27), Nigeria (28), Saudi Arabia (29), United States of America (30), Poland (31), Iran (32), Israel (33), Japan (34), Germany (35), and India (36, 37). Sample sizes regarding combat sports ranged from 4 (15) to 41886 participants (34).

### **Risk of bias within studies**

Most included studies were considered as low RoB (14, 15, 17-27, 29-32, 34, 36). Moreover, four studies were judged with moderate risk of bias (28, 33, 35, 37) and one as high RoB (16). More information regarding RoB within studies was provided in Figure 2.

### **Results of individual studies**

Sports' level was reported by 14 studies; however, several studies did not provide separate data regarding amateur, semi-professional, or professional level (17, 18, 25, 26, 29). Only one study reported prevalence rates for amateur levels (31) and dentofacial injuries were observed in 35.9% of participants. Similarly, semi-professional level was evaluated by a single study (27) and a prevalence of 26.7% of dentofacial injuries was reported. Considering professional and elite level (14, 15, 24) prevalence of dentofacial injuries ranged from 24.0% (24) to 75.0% (15). Furthermore, five studies reported data regarding the competitive level (19, 20, 35, 37), of which the prevalence of dentofacial injuries ranged from 39.1% (37) to 61.5% (20).

Information regarding use of mouthguard was not available in 8 included studies (15, 19-21, 28, 30, 34, 36). However, it was observed that in some sports more than 80.0% of participants worn mouthguards (14, 22, 25-27, 32). In addition, four studies were restricted to young populations (less than 18 years old) (23, 30, 34, 36) and prevalence of dentofacial injuries ranged from 0.0% (23) to 35.4% (36).

Considering sports categories, included studies investigated injuries in Boxing (14, 16, 20, 25, 26, 31, 32, 35-37); capoeira (16); fencing (20, 37), judo (14-16, 18-20, 28, 30, 34, 36, 37); karate (14, 16, 19, 20, 27, 28, 32, 36, 37); kendo (34); kick Boxing (32); kung fu (16, 32); martial arts (23, 33, 36); muay thai (17); sumo (34); taekwondo (14, 17, 20, 22, 25, 32, 36, 37); wrestling (14, 28, 30, 36, 37); wushu (32, 37). Sports in individual studies with the highest prevalence ranges of dentofacial injuries were wrestling (83.3%) (14) followed by judo (75.0%) (15) and boxing (73.3%) (14, 20).

### **Synthesis of results**

The overall prevalence rate was approximately 28.7% (95%CI; 16.3% to 42.2%). Additional meta-analysis were performed for several individuals sports, and overall, prevalence of dentofacial injuries for boxing were 46.2% (95%CI; 23.7% to 69.5%), 52.9% for jiu-jitsu (95%CI, 37.9% to 67.8%), 25.0% for judo (95%CI, 7.6% to 48.2%), 47.0% for karate (95%CI, 30.0% to 64.4%), 40.8% for taekwondo (95%CI, 22.4% to 60.6%), and 45.9% for wrestling (95%CI, 2.0% to 95.1%).

Considering only studies from Pan American Games (14, 20), the overall prevalence rate of dentofacial injuries was 62.2% (95%CI, 53.6% to 70.4). In separated modalities the prevalence rates were 73.3% (95%CI, 58.7 to 86.3%) for boxing, 52.6% (95%CI, 36.9 to 68.1%) for judo, 60.0% (95%CI, 29.7% to 86.6%) for karate and 28.6% (95%CI, 8.8% to 54.0%) for taekwondo.

### **Risk of bias across studies**

The studies were considered heterogeneous in their methods regarding differences in sports categories and level, sample size, participants' age, different questionnaires about trauma experience applied, criteria for injury classification, and use of mouthguard.

### **Confidence in cumulative evidence**

The confidence in cumulative evidence was considered very low. From the characteristics evaluated, type of studies, risk of bias, and inconsistency seriously impacted on the overall quality of evidence. Further explanations with regard to evidence appraisal are available in Table 2.

### **Additional analyses**

Studies were clinically and statistically heterogeneous, therefore a funnel plot to assess possible publication bias was not considered appropriate (38).

## **DISCUSSION**

### **Summary of Evidence**

This SR investigated the prevalence of dentofacial injuries among practitioners of several combat sports and results from the meta-analysis showed that the overall prevalence of dentofacial injuries was about 30%. However, in some sports such as boxing and wrestling, the prevalence of dentofacial injuries was notably higher, reaching up to 80% in the studies' populations. Thus, dental clinicians should be aware of the relatively high rate of dentofacial injuries that occur during combat sports. By discussing this with their patients, adequate strategies to minimize the risk of

occurrence and severity, such as the use of mouthguard in patients practicing this type of sport, may be considered.

In some studies, mouthguard use was not clearly reported which could have influenced prevalence rates of dentofacial injuries. Thus, caution should be exercised regarding the external validity limitation of some of our results. Ifkovitz et al (26) showed that mouthguard adherence among boxing practitioners was considerably high, reaching up to 82% of the study's population, which might explain the low prevalence of dentofacial injuries observed (3.7%). However, in other studies in which mouthguard use was reported by boxers (14, 25, 31, 32), the effect of mouthguard use was not clearly noticed, since higher frequencies of mouthguard use were not consistently related to lower injury rates. It must be pointed out that this SR did not focus on assessing the effectiveness of mouthguards on preventing dentofacial injuries and, therefore, no recommendation regarding its use could be provided based on our findings.

Regarding overall prevalence of dentofacial injuries in individual sports, it was observed that judo was the sport with the lowest rates of trauma (25.0%), while jiu-jitsu showed the highest frequencies of injuries (52.9%). Considering individual studies, wrestling was the sport with the highest prevalence rate. In addition, some included studies presented considerably broad confidence intervals regarding dentofacial injuries prevalence rates (14), which could be explained by the limited sample size observed.

Furthermore, the majority of included articles reported sports' practice level (14, 15, 17-20, 24-27, 29, 31, 35, 37), including amateurs, semi-professionals, competitiveness, professionals, and elite athletes. However, in 10 studies, no further analyses were possible since sports' level was not reported. Nonetheless, it was possible to observe that in professional and competitive levels the prevalence rates of dentofacial injuries were higher compared to other practice levels. This finding could be associated with the intensity of fights and trainings during competitions and tournaments since competitive levels athletes have greater responsibility due to the involvement of sponsors and awards on competitions which could lead to an increase occurrence of dentofacial injuries (39). In addition, studies have shown that differences in hormone concentrations such as cortisol and testosterone occur in athletes of different modalities during competitions, which may also be related to a supposed increase in the prevalence of injuries among practitioners of elite categories (40).



Some limitations regarding sports categories were observed, in some included articles the type of combat sport was not reported and generic terms like "martial arts" or "fight sports" were used (20, 23, 33, 36). Since separated data was not provided, it was not possible to assess prevalence rates regarding each sport in these studies. In addition, although two studies (16, 37) presented data from different modalities of combat sports, prevalence of dentofacial injuries was summarized combining all sports, and thus it was not possible to assess individual prevalence rates regarding each sport in these studies.

Most of the included articles did not present separate data regarding the type of dentofacial injuries. Thirteen studies presented data regarding dental injuries alone, from which 4 further explored types of dental traumas (24, 27, 29, 31). In addition, considering facial traumas, only the study of Siewe et al (35) have provided detailed data about the type of injury. Nevertheless, the type of injury most frequently observed among dental injuries was tooth fracture (6.2%-50%) (27, 29), while for facial injuries, cheek bone contusion (0.71-11.4%) (27, 35) and lip laceration (11.4-15%) (27, 35) were the most common injuries observed.

In addition, age groups were highly heterogeneous within included studies (20, 30, 32, 34), which could influence in the prevalence of dentofacial injuries since younger populations have a different level of bone maturation compared to adults, which may increase the risk of some types of injuries (41). It is worth mentioning that in two studies (16, 33), athletes could have participated in more than one combat sport at the same time, which may hinder a clear analysis of prevalence rates regarding overall prevalence rate and also for each sport individually.

It is also necessary to point out that some studies assessed prevalence of dentofacial injuries considering Pan American (14, 20) and Para-Pan American (15) athletes, which can somehow influence their behavior during combat sports' fights.

### **Limitations**

The estimation of prevalence was hindered by the high heterogeneity on the classification of types of injuries from each study. Some studies presented data only from young populations, which could have affected the results of this SR. In some studies the sports level was not reported, making it impossible to assess if there are significant differences regarding dentofacial injuries among amateur or professional athletes. Moreover, the lack of data on mouthguard use was another limitation

observed in several included studies. Since these can be made by dentists, thermoplastics or stock, they might have differences in effectiveness.

In addition, the included studies did not report the prevalence of trauma separately for mouthguards users, which did not allow us to perform a separate meta-analysis for this outcome. Hence the effectiveness of the use of mouthguards cannot be assessed.

## **CONCLUSIONS**

Very low level evidence suggests that combat sports related dentofacial injuries showed an overall worldwide prevalence of approximately 30%. Jiu-jitsu (52.9%) was the sport with the highest overall prevalence rates of dentofacial injuries.

## **ACKNOWLEDGEMENTS**

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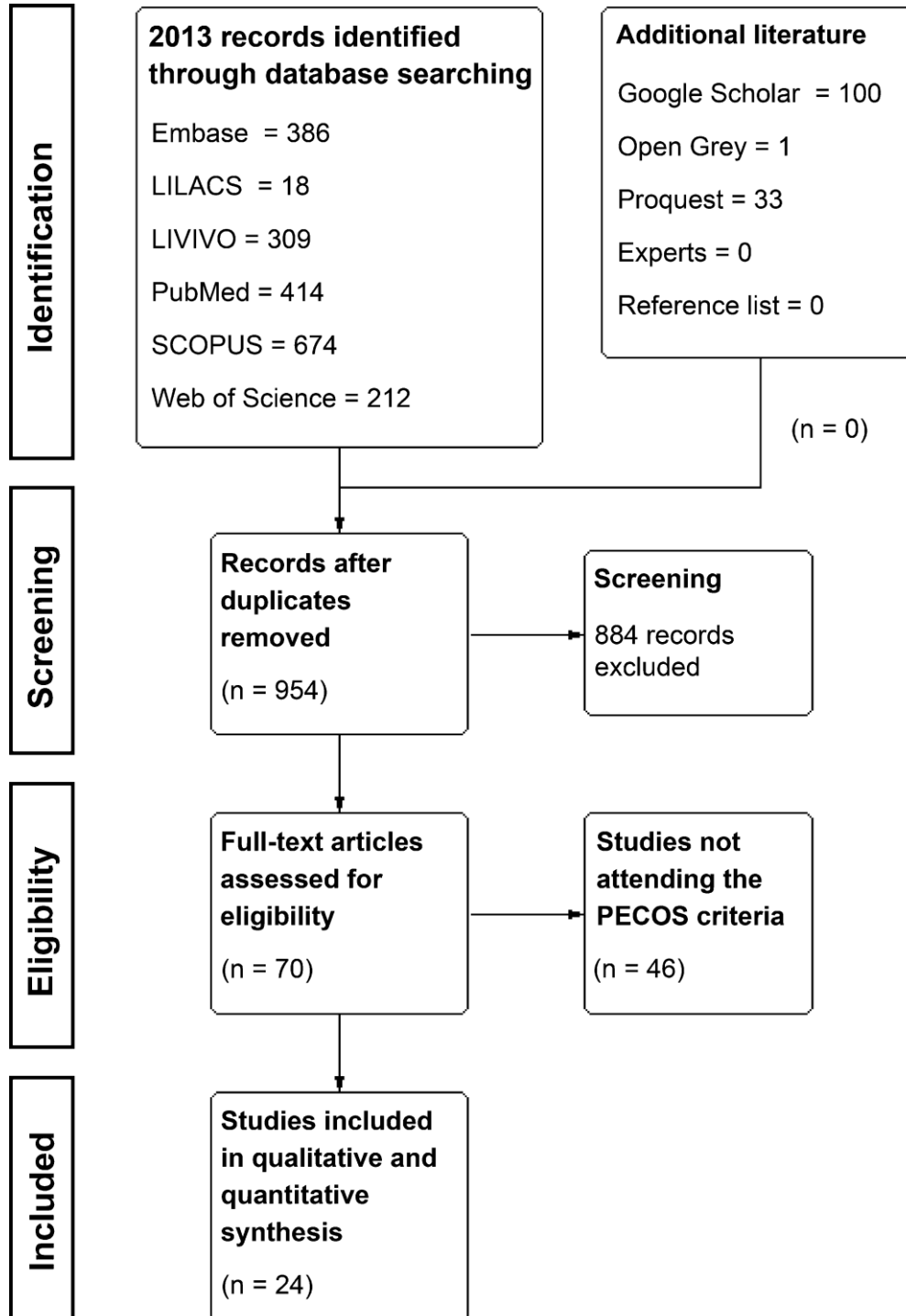
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**Figure 1.** Flow diagram of literature search and selection criteria (adapted from Preferred Reporting Items for Systematic Reviews and Meta-Analysis [21] and generated using the software Review Manager 5.3, The Cochrane Collaboration).





**Figure 3. Overall meta-analyses**

**(a) Dentofacial traumas**

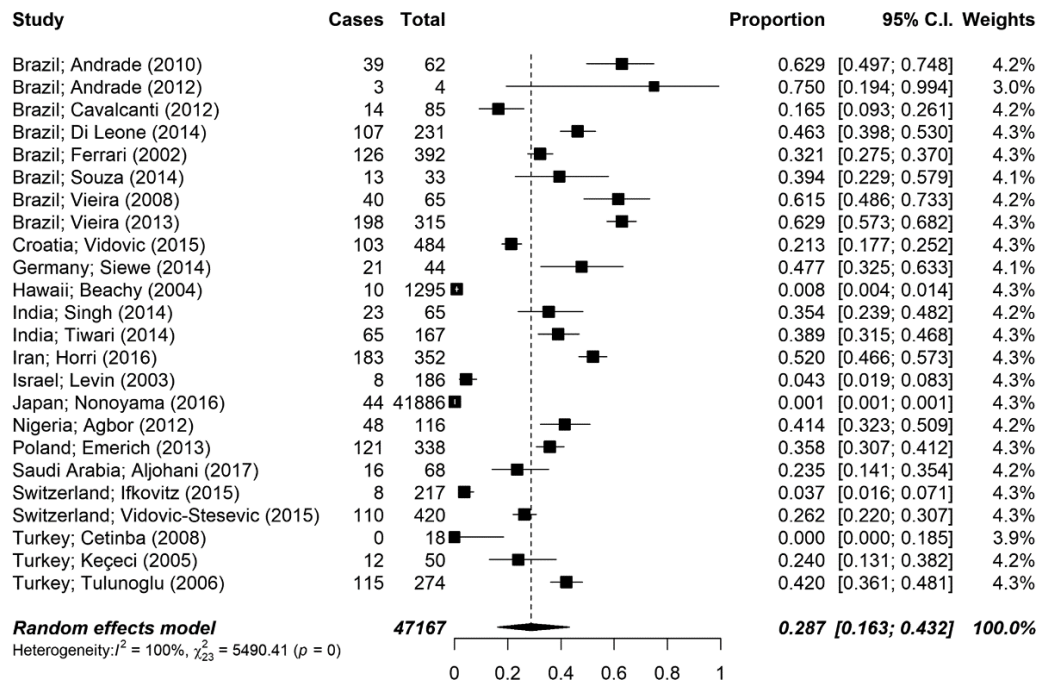
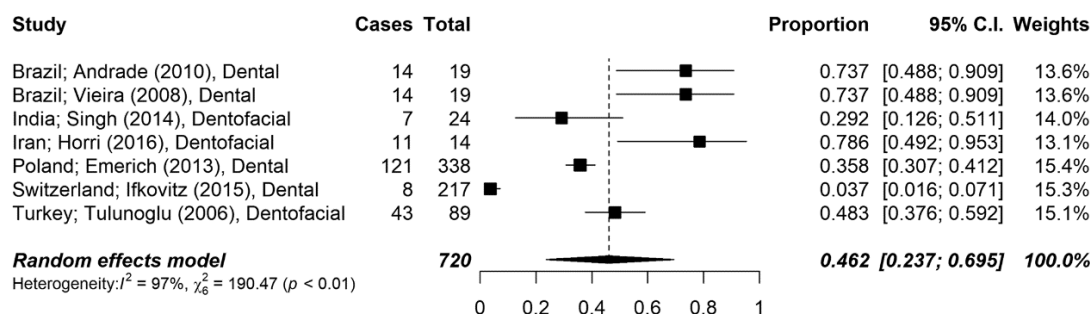


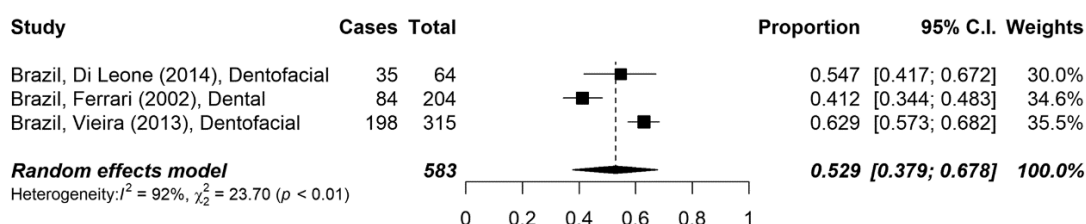


Figure 4. Specific meta-analyses

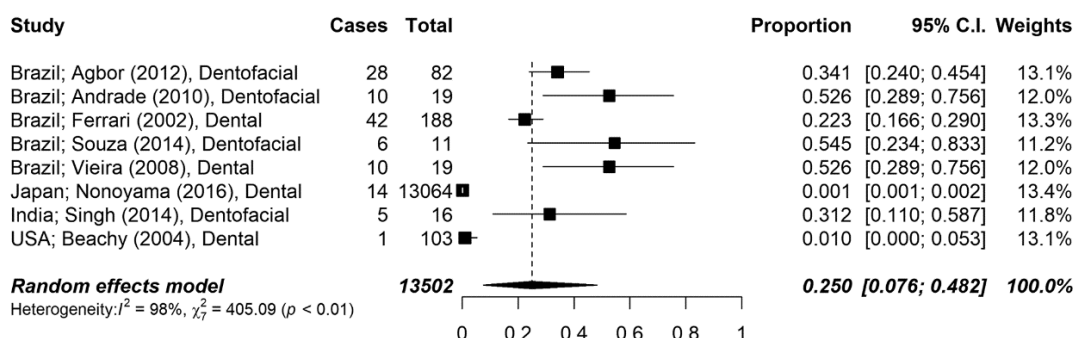
## (a) Boxing



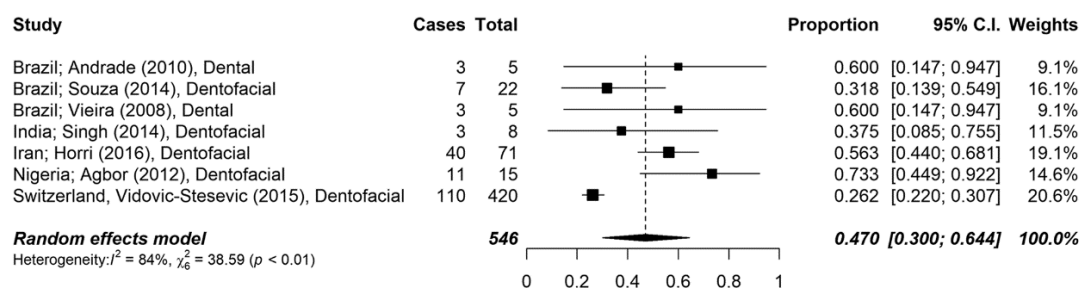
## (b) Jiu-Jitsu



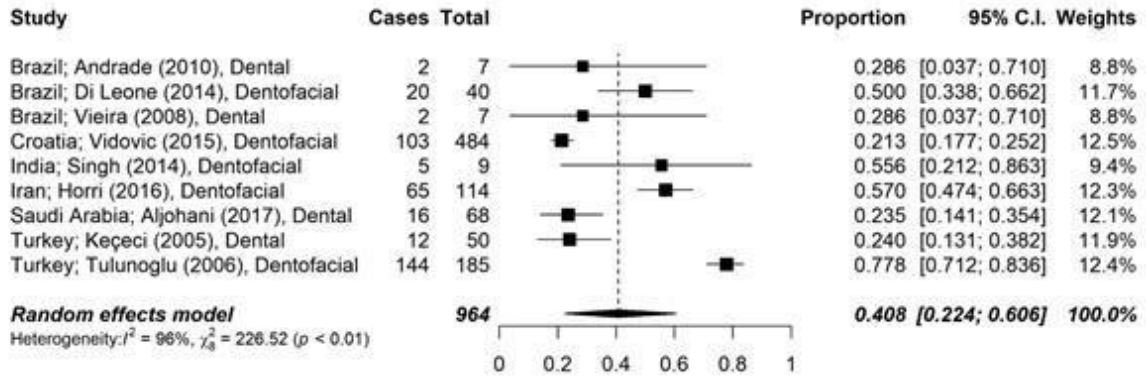
## (c) Judo



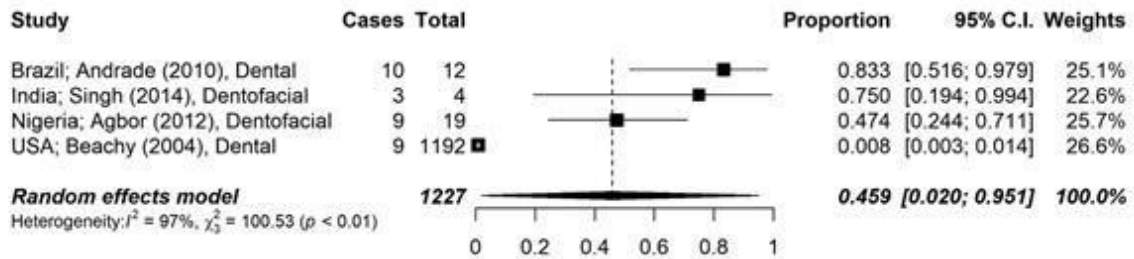
## (d) Karate



(e) Taekwondo



(f) Wrestling



**Table 1** - Summary of descriptive characteristics of included articles (n=24).

STUDY CHARACTERISTICS		POPULATION			EXPOSITION CHARACTERISTICS			OUTCOME CHARACTERISTICS	
Author (Year); Country	Study design	Sample size (women)	Age group	Mean age (years ± SD) or age range (years)	Type of combat sport (n)	Sports level	Use of mouthguard (n/%)	Prevalence per type of injury (n/%)	Overall prevalence of combat sports related injuries (n/%)
Agbor et al. (2012); Nigeria	Cross-sectional	Total	Adolescents Adults	11-50	Judo (82)	NR	NR	Dentofacial injuries (28/34.1%)	Dentofacial injuries 48 (41.3%)*
		240† (46/19.2%)			Karate (15)	NR	NR	Dentofacial injuries (11/73.3%)	
		Combat sports 116 (NR)			Wrestling (19)	NR	NR	Dentofacial injuries (9/50.0%)	
Aljohani et al. (2017); Saudi Arabia	Cross-sectional	68 (2/3.0%)	Adults	29.3±9.1	Taekwondo (68)	Amateur and Semi-professional	38 (56.0%)	Tooth avulsion (1/6.2%) Tooth displacement (7/43.8%) Tooth fracture (8/50%)	Dental injuries 16 (23.5%)
Andrade et al. (2010); Brazil	Cross-sectional	Total	Adults	24.4±5.3	Boxing (19)	Professional	13 (68.4%)*	Dental injuries (14/73.7%)	Dental injuries 39 (62.9%)*
		409† (184/45.0%)			Judo (19)	Professional	0 (0.0%)*	Dental injuries (10/52.6%)	
		Combat sports			Karate (5)	Professional	4 (80.0%)*	Dental injuries (3/60.0%)	

		62 (NR)				Taekwondo (7)	Professiona 	2 (28.6%)*	Dental injuries (2/28.6%)	
						Wrestling (12)	Professiona 	2 (16.7%)*	Dental injuries (10/83.3%)	
Andrade et al. (2012); Brazil	Cross-sectional	120† (25/20.8%)  Combat sports 4 (NR)	Adolescent s Adults	13 to 58		Judo (4)	Professiona 	NR	NR	Dental injuries 3 (75.0%)
Beachy (2004); USA	Prospective cohort	Total 29590†(NR)  Combat sports 1295 (NR)	Children Adolescent s	7 to 12		Judo (103)	NR	NR	Dental injuries (1/1.20%)*	Dental injuries 10 (0.52%)*
						Wrestling (1192)	NR	NR	Dental injuries (9/0.75%)*	
Cavaicanti et al. (2012); Brazil	Cross-sectional	85‡ (20/76.5%)	Adults	27.4±8.7		Boxing (43)	NR	25 (58.1%)		Dental injuries 14 (16.5%)
						Capoeira (6)	NR	3 (50.0%)		
						Karate (4)	NR	2 (50.0%)	NR	
						Kung Fu (6)	NR	0 (0.0%)		
						Jiu-Jitsu (24)	NR	7 (29.3%)		
						Judo (10)	NR	5 (50.0%)		
Cetinba et al. (2008); Turkey	Cross-sectional	Total 2570† (1300/50.6%) )  Combat sports	Children Adolescent s	7 to 13		Martial arts (18)	NR	0 (0.0%)	NR	Dental injuries 0 (0.0%)

18 (NR)									
Di Leone et al. (2014); Brazil	Cross-sectional	231 (53/22.9%)*	Adults	Nova Friburgo (23.4±6.9)	Amateur or Professional	100 (78.7%)	Dentofacial injuries (52/40.9%)	Dentofacial injuries 107 (46.3%)	
					Muay Thai (127)	Amateur or Professional	39 (60.9%)		Dentofacial injuries (35/54.7%)
					Macaé (24.83±7.22)	Amateur or Professional	19 (47.5%)		Dentofacial injuries (20/50.0%)
Emerich et al. (2013); Poland	Cross-sectional	338 (0/0.0%)	Adolescents Adults	13 to 32	Boxing (338)	Amateur	145 (43.3%) <sup>cr</sup>	Crown fractures (137/40.7%)* Avulsions (74/21.9%)* Other dental injuries (126/37.4%)*	Dental injuries 121 (35.9%)
Ferrari et al. (2002); Brazil	Cross-sectional	Total 1029† (0/0.0%)	Adults	27.4±8.7 18 to 30	Jiu-Jitsu (204)	Professional and semi-professional	40 (19.6%)	Dental injuries (84/41.2%)	Dental injuries 126 (32.1%)
		Combat sports 392 (0/0.0%)			Judo (188)	Professional and semi-professional	14 (7.4%)	Dental injuries (42/22.3%)	
Horri et al. (2016); Iran	Cross-sectional	352 (97/27.5%)	Adolescents	11 to 18	Boxing (14)	NR	14 (100.0%)*	Dental injuries (7/50.0%)* Facial injuries (11/78.6%)*	Dental injuries 133 (37.8%)* Facial injuries 183 (52.0%)*
					Karate (71)	NR	28 (39.4%)*	Dental injuries (36/50.7%)* Facial injuries (40/56.3%)*	
					Kickboxing (65)	NR	58 (89.2%)*	Dental injuries (28/43.1%)* Facial injuries (43/66.1%)*	
					KungFu (35)	NR	20 (57.1%)*	Dental injuries (8/22.9%)*	

								Facial injuries (12/34.3%*)	
								Dental injuries (23/20.2%*) Facial injuries (42/36.8%*)	
								Dental injuries(31/59.6%*) Facial injuries (35/67.3%*)	
Ifkoyitz et al. (2015); Switzerland	Cross-sectional	217 (42/19.4%)	Adults	23.7±8.98	Boxing (217)	Amateur or Professional	178 (82.0%)	NR	Dental injuries 8 (3.68%)
Keçeci et al. (2005); Turkey	Cross-sectional	Total 162† (NR) Combat sports 50 (NR)	Adults	24.4±5.34	Taekwondo (50)	Elite	10 (20.0%)	Avulsion (1/2.0%) Crown fracture (10/20.0%) Dislocation(1/2.0%)	Dental injuries 12 (24.0%)
Levin et al. (2003); Israel	Cross-sectional	Total 943†† (47/5.0%) Combat sports 186 (NR)	Adults	6 to 19	Martial arts (186)	NR	14 (7.5%)	NR	Dental injuries 8 (4.3%)*
Nonoyama et al. (2016); Japan	Cross-sectional	Total 1009102† (496437/49.2%)* Combat sports 41886 (12937/30.9%)*	Children Adolescents	NR	Judo (13064)* Kendo(28448)* Sumo (374)*	NR	NR	Dental injuries (14/0.1%) Dental injuries (27/0.1%) Dental injuries (3/0.8%)	Dental injuries 44 (0.1%)*

Siewe et al. (2014); Germany	Prospective cohort	44 (2/4.5%)	Adolescents Adults	20.2±7.86 10 to 40	Boxing (44)	Competitive	NR	Cheek bone contusion (5/11.4%) Lip laceration (5/11.4%) Lower jaw contusion (4/9.1%) Maxillary tooth contusion (3/6.8%) Gingival bleeding (2/4.5%) Tooth subluxation (1/2.3%) Forehead contusion (1/2.3%)	Dentofacial injuries 21 (47.7%)*
Singh et al. (2014); India	Cross-sectional	1105† (391/35.4%) Combat sports 65 (NR)	Children Adolescents	12.4±3.5 8 to 16	Boxing (24)	NR	NR	Dentofacial injuries (7/29.2%)*	Dentofacial injuries 23 (35.38%)*
					Judo (16)	NR	NR	Dentofacial injuries (5/31.2%)*	
					Karate (8)	NR	NR	Dentofacial injuries (3/37.5%)*	
					Martial arts (4)	NR	NR	Dentofacial injuries (0/0.0%)*	
					Taekwondo (9)	NR	NR	Dentofacial injuries (5/55.5%)*	
					Wrestling (4)	NR	NR	Dentofacial injuries (3/75.0%)*	
Souza et al. (2014); Brazil	Cross-sectional	Total 416† (252/60.6%) Combat sports 33 (NR)	NR	10 to 20	Judo (11)	Competitive	NR	Dentofacial injuries (6/54.5%)	Dentofacial injuries 13 (39.4%)
		Total		12 to 22	Boxing (29)		68 (41.0%)	NR	

Tiwarietal. (2014); India	Cross-sectional	320† (107/33.4%)	Adolescents Adults		Fencing (21) Judo (29) Karate (29) Taekwondo (19) Wrestling (19) Wushu (21)	Competitive			Dentofacial injuries (65/39.1%)
Tulunoglu et al. (2006); Turkey	Cross-sectional	274 (100/36.5%)	Adolescents Adults	17 to 27	Boxing (89) Taekwondo (185)	Amateur/Professional Amateur/Professional	87 (97.7%) 66 (35.7%)	Dental injuries (29/32.6%*) Soft tissue injuries (14/15.7%*) Dentofacial injuries (43/48.3%) Dental injuries (32/17.3%*) Soft tissue injuries (40/21.6%*) Dentofacial injuries (72/38.9%)	Dental injuries 61 (22.3%) Soft tissue injuries 54 (19.7%) Dentofacial trauma 115 (41.9%)
Vidovic et al. (2015); Croatia	Cross-sectional	404 (213/44.0%)	Children Adolescents Adults	15.0±3.1 8 to 28	Taekwondo (484)	NR	464 (96.1%)	Dental injuries (25/5.2%*) Dental and soft tissue injuries (73/15.1%*) Jaw fracture (5/1.0%)	Dentofacial injuries 103 (21.3%)*
Vidovic-Stesevic et al. (2015); Switzerland	Cross-sectional	420 (180/42.9%)	Adolescents Adults	19.5	Karate (420)	Semi-professional	412 (98.1%)	Facial injuries Cheekbone (3/0.71%) Lip (63/15%) Mouth (3/0.71%) Dental injuries Avulsions (4/0.9%) Concussions (14/3.5%) Crown fractures (26/6.2%)	Facial injuries 66 (15.7%*) Dental injuries 44 (10.5%*) Dentofacial injuries 110 (26.7%*)



Vieira, R. A. A. (2008); Brazil	Cross-sectional	Total 294† (125/42.5%)  Combat sports 65(NR)	Adolescents	12.0±2.38	Boxing (19)	Competitive	NR	Dental injuries (14/73.7%)*	Dental injuries 40 (61.5%)*
					Fencing (3)	Competitive	NR	Dental injuries (1/33.3%)*	
					Fight sports (12)	Competitive	NR	Dental injuries (10/83.3%)*	
					Judo (19)	Competitive	NR	Dental injuries(10/52.6%)*	
					Karate (5)	Competitive	NR	Dentalinjuries (3/60.0%)*	
					Taekwondo (7)	Competitive	NR	Dentalinjuries (2/28.6%)*	
Vieira, R. A. A. (2013); Brazil	Cross-sectional	315 (NR)	Adults	27.3±8.65	Jiu-Jitsu (315)	NR	NR	Dental injuries(93/29.5%)* Facial injuries (105/33.3%)*	Dentofacial injuries 198 (62.9%)

(\* ) data estimated by the SR reviewers; (†) Total sample size is larger than number of combat sports practitioners due to inclusion of other sport categories; (‡) Sample encompassed practitioners of multiple sports.

**Table 2 - Grading of Recommendations Assessment, Development and Evaluation summary of findings table.**

**Research question:** What is the prevalence of dentofacial injuries among combat sports practitioners?

Certainty assessment							Sample	Pooled data (Prevalence)	Certainty
No of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
<b>Prevalence of dentofacial injuries</b>									
	24 observational studies	serious <sup>a</sup>	very serious <sup>d</sup>	not serious	serious <sup>e</sup>	none	47167	28.7% 95% CI [16.3%; 42.2%]	⊕○○○ VERY LOW

**CI:** Confidence interval

*Explanations*

- a. Approximately half of included studies presented risk of bias regarding three domains of the JBI checklist.
- b. Studies were considerably heterogeneous. In addition, the I-squared test was 99.6%.
- c. Since confidence intervals were considerably broad, pooled data for prevalence of dental injuries resulted in a prevalence of 22.5%, ranging from 10.8 to 37.0%.
- d. Studies were considerably heterogeneous. In addition, the I-squared test was 99.5%.
- e. Since confidence intervals were considerably broad, pooled data for prevalence of dentofacial injuries resulted in a prevalence of 29.2%, ranging from 16.6% to 43.7%.

## APÊNDICE A

### Supplementary Online Data

#### Appendix 1: Database search strategy

Database	Search query
<b>EMBASE</b>	<p data-bbox="804 512 1082 544">2018, February 20<sup>th</sup></p> <p data-bbox="453 555 1430 734">#1 = ('prevalence'/exp OR prevalence OR prevalences OR occurrence OR 'frequency'/exp OR frequency OR frequencies OR 'epidemiology'/exp OR epidemiology OR epidemiologic OR 'incidence'/exp OR incidence OR incidences) AND ([article]/lim OR [article in press]/lim)</p> <p data-bbox="453 741 1430 1464">#2 = ('maxillofacial trauma' OR 'maxillofacial injury' OR 'maxillofacial fracture' OR 'maxillo-facial trauma' OR 'maxillo-facial injury' OR 'maxillo-facial fracture' OR 'maxillofacial traumas' OR 'maxillofacial injuries' OR 'maxillofacial fractures' OR 'maxillo-facial traumas' OR 'maxillo-facial injuries' OR 'maxillo-facial fractures' OR 'orofacial trauma' OR 'orofacial injury' OR 'orofacial fracture' OR 'orofacial traumas' OR 'orofacial injuries' OR 'orofacial fractures' OR 'oro-facial traumas' OR 'oro-facial injuries' OR 'oro-facial fractures' OR 'dental trauma' OR 'dental injury' OR 'dental fracture' OR 'dental traumas' OR 'dental injuries' OR 'dental fractures' OR 'dentofacial trauma' OR 'dentofacial injury' OR 'dentofacial fracture' OR 'dentofacial traumas' OR 'dentofacial injuries' OR 'dentofacial fractures' OR 'dento-facial trauma' OR 'dento-facial injury' OR 'dento-facial fracture' OR 'dento-facial traumas' OR 'dento-facial injuries' OR 'dento-facial fractures' OR 'dentoalveolar trauma' OR 'dentoalveolar injury' OR 'dentoalveolar fracture' OR 'dentoalveolar traumas' OR 'dentoalveolar injuries' OR 'dentoalveolar fractures' OR 'dento-alveolar trauma' OR 'dento-alveolar injury' OR 'dento-alveolar fracture' OR 'dento-alveolar traumas' OR 'dento-alveolar injuries' OR 'dento-alveolar fractures') AND ([article]/lim OR [article in press]/lim)</p> <p data-bbox="453 1471 1430 1650">#3 = (sport OR sports OR 'combat sport' OR 'combat sports' OR 'fighting sport' OR 'martial art' OR 'martial arts' OR aikido OR boxing OR capoeira OR karate OR kickboxing OR 'krav maga' OR 'muay thai' OR 'jiu-jitsu' OR judo OR 'tai chi' OR taekwondo OR wrestling) AND ([article]/lim OR [article in press]/lim)</p> <p data-bbox="453 1657 810 1688">#4 = #1 AND #2 AND #3</p>
<b>LILACS</b>	<p data-bbox="453 1697 1430 2056">(tw:((prevalência OR prevalências OR ocorrência OR frequência OR frequências OR incidência OR epidemiologia OR epidemiológico OR incidências OR prevalencia OR ocorrência OR frecuencia OR frecuencias OR incidência OR epidemiología))) AND (tw:("trauma maxilofacial" OR "injúria maxilofacial" OR "fratura maxilofacial" OR "trauma maxilo-facial" OR "injúria maxilofacial" OR "fratura maxilo-facial" OR "traumas maxilofacial" OR "injúrias maxilofaciais" OR "fraturas maxilofaciais" OR "traumas maxilo-faciais" OR "injúrias maxilo-faciais" OR "fraturas maxilo-faciais" OR "trauma orofacial" OR "injúria orofacial" OR "fratura orofacial" OR "traumas orofaciais" OR</p>

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"injúrias orofaciais" OR "fraturas orofaciais" OR "traumas oro-faciais" OR "injúrias oro-faciais" OR "fraturas oro-faciais" OR "traumas orofaciais" OR "injúrias oro-faciais" OR "fraturas oro-faciais" OR "trauma dental" OR "injúria dental" OR "fratura dental" OR "traumas dentais" OR "injúrias dentais" OR "fraturas dentais" OR "trauma dentofacial" OR "injúria dentofacial" OR "fratura dentofacial" OR "traumas dentofaciais" OR "injúrias dentofaciais" OR "fraturas dentofaciais" OR "trauma dento-facial" OR "injúria dento-facial" OR "fratura dento-facial" OR "traumas dento-faciais" OR "injúrias dento-faciais" OR "fraturas dento-faciais" OR "trauma dentoalveolar" OR "injúria dentoalveolar" OR "fratura dentoalveolar" OR "traumas dentoalveolares" OR "injúrias dentoalveolares" OR "fraturas dentoalveolares" OR "trauma dento-alveolar" OR "injúria dento-alveolar" OR "fratura dento-alveolar" OR "traumas dento-alveolares" OR "injúrias dento-alveolares" OR "fraturas dento-alveolares" OR "injuria maxilofacial" OR "fractura maxilofacial" OR "fractura maxilofacial" OR "injurias maxilofaciales" OR "fracturas maxilofaciales" OR "traumas maxilo-faciales" OR "injurias maxilo-faciales" OR "fracturas maxilo-faciales" OR "fractura orofacial" OR "traumas orofaciales" OR "injurias orofaciales" OR "fracturas orofaciales" OR "traumas orofaciales" OR "fracturas oro-faciales" OR "fracturas oro-faciales" OR "fracturas oro-faciales" OR "fracturas oro-faciales" OR "fracturas oro-faciales" OR "fracturas oro-faciales" OR "fracturas oro-faciales" OR "fracturas oro-faciales" OR "fracturas oro-faciales" OR "fracturas doradas" OR "fractura dental" OR "traumas dentales" OR "fracturas dentales" OR "fracturas dentales" OR "injuria dentofacial" OR "fractura dentofacial" OR "traumas dentofaciales" OR "injurias dentofaciales" OR "fracturas dentofaciales" OR "injuria dento-facial" OR "fractura dento-facial" OR "fracturas dentoalveolar" OR "molestia dentoalveolar" OR "molestias dentoalveolares" OR "molestia dentoalveolar" OR "fracturas dentoalveolares")) AND (tw:(( Esportes OR Esporte OR "esportes de combate" OR "esporte de combate" OR "esportes de luta" OR "artes marciais" OR aikido OR Boxe OR Capoeira OR Karate OR "kick boxe" OR "Krav Maga" OR "muay thai" OR "jiu-jitsu" OR judo OR "tai chi" OR taekwondo OR wrestling)))

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**LIVIVO**  
(Article)

(prevalence OR prevalences OR occurrence OR frequency OR frequencies OR incidence OR epidemiology OR epidemiologic OR incidence OR incidences) AND ("maxillofacial trauma" OR "maxillofacial injury" OR "maxillofacial fracture" OR "maxillo-facial trauma" OR "maxillo-facial injury" OR "maxillo-facial fracture" OR "maxillofacial traumas" OR "maxillofacial injuries" OR "maxillofacial fractures" OR "maxillo-facial traumas" OR "maxillo-facial injuries" OR "maxillo-facial fractures" OR "orofacial trauma" OR "orofacial injury" OR "orofacial fracture" OR "orofacial traumas" OR "orofacial injuries" OR "orofacial fractures" OR "oro-facial traumas" OR "oro-facial injuries" OR "oro-facial fractures" OR "oro-facial traumas" OR "oro-facial injuries" OR "oro-facial fractures" OR "dental trauma" OR "dental injury" OR "dental fracture" OR "dental traumas" OR "dental injuries" OR "dental fractures" OR "dentofacial trauma" OR

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"dentofacial injury" OR "dentofacial fracture" OR "dentofacial traumas" OR "dentofacial injuries" OR "dentofacial fractures" OR "dento-facial trauma" OR "dento-facial injury" OR "dento-facial fracture" OR "dento-facial traumas" OR "dento-facial injuries" OR "dento-facial fractures" OR "dentoalveolar trauma" OR "dentoalveolar injury" OR "dentoalveolar fracture" OR "dentoalveolar traumas" OR "dentoalveolar injuries" OR "dentoalveolar fractures" OR "dento-alveolar trauma" OR "dento-alveolar injury" OR "dento-alveolar fracture" OR "dento-alveolar traumas" OR "dento-alveolar injuries" OR "dento-alveolar fractures") AND (sport OR sports OR "combat sport" OR "combat sports" OR "fighting sport" OR "martial art" OR "martial arts" OR aikido OR boxing OR capoeira OR karate OR kickboxing OR "krav maga" OR "muay thai" OR "jiu-jitsu" OR judo OR "tai chi" OR taekwondo OR wrestling)

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**PubMed #1** = (prevalence[MeSH Terms] OR prevalence OR prevalences OR occurrence OR frequency OR frequencies OR incidence OR epidemiology OR epidemiologic OR incidence OR incidences)  
**#2** = ("maxillofacial trauma" OR "maxillofacial injury" OR "maxillofacial fracture" OR "maxillo-facial trauma" OR "maxillo-facial injury" OR "maxillo-facial fracture" OR "maxillofacial traumas" OR "maxillofacial injuries" OR "maxillofacial fractures" OR "maxillo-facial traumas" OR "maxillo-facial injuries" OR "maxillo-facial fractures" OR "orofacial trauma" OR "orofacial injury" OR "orofacial fracture" OR "orofacial traumas" OR "orofacial injuries" OR "orofacial fractures" OR "oro-facial traumas" OR "oro-facial injuries" OR "oro-facial fractures" OR "oro-facial traumas" OR "oro-facial injuries" OR "oro-facial fractures" OR "dental trauma" OR "dental injury" OR "dental fracture" OR "dental traumas" OR "dental injuries" OR "dental fractures" OR "dentofacial trauma" OR "dentofacial injury" OR "dentofacial fracture" OR "dentofacial traumas" OR "dentofacial injuries" OR "dentofacial fractures" OR "dento-facial trauma" OR "dento-facial injury" OR "dento-facial fracture" OR "dento-facial traumas" OR "dento-facial injuries" OR "dento-facial fractures" OR "dentoalveolar trauma" OR "dentoalveolar injury" OR "dentoalveolar fracture" OR "dentoalveolar traumas" OR "dentoalveolar injuries" OR "dentoalveolar fractures" OR "dento-alveolar trauma" OR "dento-alveolar injury" OR "dento-alveolar fracture" OR "dento-alveolar traumas" OR "dento-alveolar injuries" OR "dento-alveolar fractures")  
**#3** = (sports[MeSH Terms] OR sport OR sports OR "combat sport" OR "combat sports" OR "fighting sport" OR "martial art" OR "martial arts" OR aikido OR boxing OR capoeira OR karate OR kickboxing OR "krav maga" OR "muay thai" OR "jiu-jitsu" OR judo OR "tai chi" OR taekwondo OR wrestling)  
**#4** = #1 AND #2 AND #3

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**SCOPUS TITLE-ABS-KEY**(prevalence OR prevalences OR occurrence OR frequency OR frequencies OR incidence OR epidemiology OR epidemiologic OR incidence OR incidences) AND ALL("maxillofacial trauma" OR "maxillofacial injury" OR "maxillofacial fracture" OR "maxillo-facial trauma" OR "maxillo-facial injury" OR "maxillo-facial fracture" OR "maxillofacial traumas" OR "maxillofacial injuries" OR

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"maxillofacial fractures" OR "maxillo-facial traumas" OR "maxillo-facial injuries" OR "maxillo-facial fractures" OR "orofacial trauma" OR "orofacial injury" OR "orofacial fracture" OR "orofacial traumas" OR "orofacial injuries" OR "orofacial fractures" OR "oro-facial traumas" OR "oro-facial injuries" OR "oro-facial fractures" OR "oro-facial traumas" OR "oro-facial injuries" OR "oro-facial fractures" OR "dental trauma" OR "dental injury" OR "dental fracture" OR "dental traumas" OR "dental injuries" OR "dental fractures" OR "dentofacial trauma" OR "dentofacial injury" OR "dentofacial fracture" OR "dentofacial traumas" OR "dentofacial injuries" OR "dentofacial fractures" OR "dento-facial trauma" OR "dento-facial injury" OR "dento-facial fracture" OR "dento-facial traumas" OR "dento-facial injuries" OR "dento-facial fractures" OR "dentoalveolar trauma" OR "dentoalveolar injury" OR "dentoalveolar fracture" OR "dentoalveolar traumas" OR "dentoalveolar injuries" OR "dentoalveolar fractures" OR "dento-alveolar trauma" OR "dento-alveolar injury" OR "dento-alveolar fracture" OR "dento-alveolar traumas" OR "dento-alveolar injuries" OR "dento-alveolar fractures") AND ALL(sport OR sports OR "combat sport" OR "combat sports" OR "fighting sport" OR "martial art" OR "martial arts" OR aikido OR boxing OR capoeira OR karate OR kickboxing OR "krav maga" OR "muay thai" OR "jiu-jitsu" OR judo OR "tai chi" OR taekwondo OR wrestling) AND (LIMIT-TO(DOCTYPE,"ar") OR LIMIT-TO(DOCTYPE,"ip"))

**Web of Science**  
(Articles)

(TS=("maxillofacial trauma" OR "maxillofacial injury" OR "maxillofacial fracture" OR "maxillo-facial trauma" OR "maxillo-facial injury" OR "maxillo-facial fracture" OR "maxillofacial traumas" OR "maxillofacial injuries" OR "maxillofacial fractures" OR "maxillo-facial traumas" OR "maxillo-facial injuries" OR "maxillo-facial fractures" OR "orofacial trauma" OR "orofacial injury" OR "orofacial fracture" OR "orofacial traumas" OR "orofacial injuries" OR "orofacial fractures" OR "oro-facial traumas" OR "oro-facial injuries" OR "oro-facial fractures" OR "oro-facial traumas" OR "oro-facial injuries" OR "oro-facial fractures" OR "dental trauma" OR "dental injury" OR "dental fracture" OR "dental traumas" OR "dental injuries" OR "dental fractures" OR "dentofacial trauma" OR "dentofacial injury" OR "dentofacial fracture" OR "dentofacial traumas" OR "dentofacial injuries" OR "dentofacial fractures" OR "dento-facial trauma" OR "dento-facial injury" OR "dento-facial fracture" OR "dento-facial traumas" OR "dento-facial injuries" OR "dento-facial fractures" OR "dentoalveolar trauma" OR "dentoalveolar injury" OR "dentoalveolar fracture" OR "dentoalveolar traumas" OR "dentoalveolar injuries" OR "dentoalveolar fractures" OR "dento-alveolar trauma" OR "dento-alveolar injury" OR "dento-alveolar fracture" OR "dento-alveolar traumas" OR "dento-alveolar injuries" OR "dento-alveolar fractures") AND TS=(sport OR sports OR "combat sport" OR "combat sports" OR "fighting sport" OR "martial art" OR "martial arts" OR aikido OR boxing OR capoeira OR karate OR kickboxing OR "krav maga" OR "muay thai" OR "jiu-jitsu" OR judo OR "tai chi" OR taekwondo OR wrestling) AND TS=(prevalence OR prevalences OR occurrence OR frequency OR frequencies OR incidence OR epidemiology OR

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epidemiologic OR incidence OR incidences)) AND DOCUMENT  
TYPES: (Article)

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### Grey Literature

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**Google Scholar** (prevalence OR occurrence OR frequency) AND ("combat sports" OR "fighting sports" OR "martial arts") AND (maxillofacial OR dentoalveolar OR dentofacial OR orofacial)  
(First 100 references)

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**Open Grey** (prevalence OR occurrence OR frequency) AND ("combat sports" OR "fighting sports" OR "martial arts") AND (maxillofacial OR dentoalveolar OR dentofacial OR orofacial)

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**Proquest** all(prevalence OR prevalences OR occurrence OR frequency OR frequencies OR incidence OR epidemiology OR epidemiologic OR incidence OR incidences) AND all("maxillofacial trauma" OR "maxillofacial injury" OR "maxillofacial fracture" OR "maxillo-facial trauma" OR "maxillo-facial injury" OR "maxillo-facial fracture" OR "maxillofacial traumas" OR "maxillofacial injuries" OR "maxillofacial fractures" OR "maxillo-facial traumas" OR "maxillo-facial injuries" OR "maxillo-facial fractures" OR "orofacial trauma" OR "orofacial injury" OR "orofacial fracture" OR "orofacial traumas" OR "orofacial injuries" OR "orofacial fractures" OR "oro-facial traumas" OR "oro-facial injuries" OR "oro-facial fractures" OR "oro-facial traumas" OR "oro-facial injuries" OR "oro-facial fractures" OR "dental trauma" OR "dental injury" OR "dental fracture" OR "dental traumas" OR "dental injuries" OR "dental fractures" OR "dentofacial trauma" OR "dentofacial injury" OR "dentofacial fracture" OR "dentofacial traumas" OR "dentofacial injuries" OR "dentofacial fractures" OR "dento-facial trauma" OR "dento-facial injury" OR "dento-facial fracture" OR "dento-facial traumas" OR "dento-facial injuries" OR "dento-facial fractures" OR "dentoalveolar trauma" OR "dentoalveolar injury" OR "dentoalveolar fracture" OR "dentoalveolar traumas" OR "dentoalveolar injuries" OR "dentoalveolar fractures" OR "dento-alveolar trauma" OR "dento-alveolar injury" OR "dento-alveolar fracture" OR "dento-alveolar traumas" OR "dento-alveolar injuries" OR "dento-alveolar fractures") AND all(sport OR sports OR "combat sport" OR "combat sports" OR "fighting sport" OR "martial art" OR "martial arts" OR aikido OR boxing OR capoeira OR karate OR kickboxing OR "krav maga" OR "muay thai" OR "jiu-jitsu" OR judo OR "tai chi" OR taekwondo OR wrestling)

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## APÉNDICE B

### **Supplementary Online Data**

*Appendix 1: Articles excluded and the reasons for exclusion (n=46).*

<b>Reference</b>	<b>Authors</b>	<b>Reasons for Exclusion*</b>
1.	Aitken et al. (2014)	2
2.	Al-Arfaj et al. (2016)	3
3.	Amy et al. (2005)	1
4.	Badel et al. (2014)	6
5.	Barberini et al. (2002)	3
6.	Behelmanns et al. (2000)	3
7.	Biagi et al. (2014)	3
8.	Biazec et al. (2010)	3
9.	Borgogna et al. (1984)	7
10.	Elhammali et al. (2010)	1
11.	Emshoff et al. (1997)	1
12.	Exadaktylos et al. (2004)	1
13.	Faye et al. (2008)	7
14.	Hasehmi et al. (2003)	5
15.	Hill et al. (1998)	1
16.	Hojjat et al. (2016)	1
17.	Huffman et al. (2008)	3
18.	Kujala et al. (1995)	3
19.	Macintosh et al. (1971)	7
20.	Macisaac et al. (2013)	1
21.	Maeda et al. (2006)	5
22.	Maladiere et al. (2001)	1
23.	Mori et al. (2009)	3
24.	Mourouzis et al. (2005)	1
25.	Murphy et al. (2015)	1
26.	Nemutandani et al. (2012)	7
27.	Quiñones Ybarría et al. (2014)	3
28.	Onyeaso et al. (2003)	3



29.	Onyeaso et al. (2004)	3
30.	Prabhu et al. (2013)	3
31.	Shirani et al. (2010)	1
32.	Souza, E. R. (2010)	3
33.	Quintana Díaz et al. (1998)	1
34.	Roccia et al. (2008)	1
35.	Rodd et al (1997)	7
36.	Ruslin et al. (2016)	1
37.	Sane et al. (1988)	1
38.	Saravi et al. (2013)	1
39.	Solanki et al. (2016)	3
40.	Spinas et al. (2007)	2
41.	Suggs et al. (2012)	1
42.	Tanaka et al. (1996)	1
43.	Tanaka et al. (1992)	5
44.	Tschan et al. (2003)	2
45.	Welch et al. (2010)	4
46.	Yang et al. (2005)	3

Legend: 1) ) studies that the sample was composed only by trauma patients attending medical centers or hospitals or including participants with genetic syndromes or neuromuscular diseases; 2) Studies that did not investigate dentofacial trauma; Studies that did not evaluate injuries related to combat sports; 3) Studies that did not provide separate data regarding frequency of dentofacial injuries in combat sports, even after trying to contact corresponding authors; 4) Studies reporting only annual incidences of dentofacial trauma; 5) Studies not published in Latin Roman alphabet; 6) Abstracts, reviews, case-reports, protocols, personal opinions, letters, and posters; 7) Full-text not available.

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#### **4 CONCLUSÃO**

Evidências de nível muito baixo sugerem que as lesões dentofaciais relacionadas a esportes de combate apresentaram uma prevalência geral de aproximadamente 30%. O jiu-jitsu (52,9%) foi o esporte com maior prevalência geral de lesões dentofaciais.

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**ANEXO 1: Ata de apresentação do trabalho de conclusão de curso.**



UNIVERSIDADE FEDERAL DE SANTA CATARINA  
CENTRO DE CIÊNCIAS DA SAÚDE  
CURSO DE ODONTOLOGIA  
DISCIPLINA DE TRABALHO DE CONCLUSÃO DE CURSO DE ODONTOLOGIA

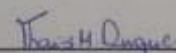
**ATA DE APRESENTAÇÃO DO TRABALHO DE CONCLUSÃO DE CURSO**

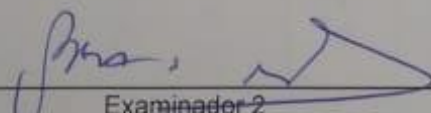
Ao 1º dia do mês de outubro de 2018, às 08:50 horas, em sessão pública no (a) Centro de Ciências da Saúde desta Universidade, na presença da Banca Examinadora presidida pela Professora Graziela De Luca Canto e pelos examinadores:

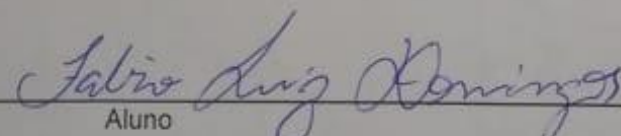
- 1 – Thais Mageste Duque,
  - 2 – Beatriz Dulcinéia Mendes De Souza,
- o aluno Fabio Luiz Domingos

apresentou o Trabalho de Conclusão de Curso de Graduação intitulado: Prevalência de injúrias dentofaciais em praticantes de esportes de combate: uma revisão sistemática e meta-análise, como requisito curricular indispensável à aprovação na Disciplina de Defesa do TCC e a integralização do Curso de Graduação em Odontologia. A Banca Examinadora, após reunião em sessão reservada, deliberou e decidiu pela aprovação do referido Trabalho de Conclusão do Curso, divulgando o resultado formalmente ao aluno e aos demais presentes, e eu, na qualidade de presidente da Banca, lavrei a presente ata que será assinada por mim, pelos demais componentes da Banca Examinadora e pelo aluno orientando.

  
\_\_\_\_\_  
Presidente da Banca Examinadora

  
\_\_\_\_\_  
Examinador 1

  
\_\_\_\_\_  
Examinador 2

  
\_\_\_\_\_  
Aluno