

Orofacial and Dental Sports-related Injury Profile in School Going Children of National Capital Region, India

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How to cite the article:

Solanki N, Kaur G, Thukral R, Raval R, Agarwal A, Monga S. Orofacial and dental sports-related injury profile in school going children of National Capital Region, India. J Int Oral Health 2016;8(7):795-800.

Abstract:

Background: The aim of this study was to investigate the prevalence and risk factors associated with the occurrence of sports-related orofacial injuries among 8-11 years old school children in National Capital Region, India.

Materials and Methods: It included a stratified random sample of 2000 boys and girls attending various private schools. The sample size was calculated using a 95% confidence interval level; statistical significance was preset at 5% and a sample power of 98% was achieved. Data were collected through personal interview using a questionnaire. Data pertaining to the number and type of injury encountered was collected. The risk factors for sports injuries evaluated in this study were sex, use of protective equipment, velocity, and intensity of sports played; the level of coaching; the activity level and exposure time; the focus of attention; participation in contact/non-contact sports. Data were summarized and analyzed using the statistical software SPSS version 18.0.

Results: The prevalence of sports-related orofacial injuries was found to be 26.65%. All the risk factors evaluated in the study did yield statistically significant differences among the participants except sex, intensity of the game and exposure time.

Conclusions: The prevalence of sports-related orofacial injuries in national capital region is high and protective measures need to be strictly enforced so that the incidence of injuries associated with the significant risk factors can be reduced.

Key Words: Orofacial injuries, prevalence, sports injuries

Introduction

Sports, and in particular contact sports, correspond to one of the main causes of trauma: Up to 19% of injuries involving head and face and approximately 33% of dental injuries are indeed sports related.¹ Orofacial trauma is a very prevalent in sports practice and differs from other traumas in that it can be prevented, with the possibility of drastically reducing its occurrence using mouth devices that promote the protection of all dental and periodontal structures.²

Children are most susceptible to sports-related orofacial injury between the ages of 7 and 11 years as during this age group; their athletic skill levels are not matured.³ Pinkham and Kohn⁴ also suggested that children at the period of growth spurts are at increased injury risk because growth is expressed first in the long bones and then in the muscles causing a tremendous loss in flexibility.

All sporting activities have an associated risk of orofacial injuries due to falls, collisions, and contact with hard surfaces. Sporting injuries account for 10.4% of maxillofacial fractures.⁵ Thus, it is clear that participation in a number of sports does carry a considerable risk of sustaining dental injury, not only in the so-called contact sports such as rugby and hockey but also in less obviously dangerous sports such as bicycling.

There is a need to report the occurrence of orofacial sports-related injuries to establish a valid database that could be used to enhance treatment outcomes, to assist in designing better protective equipment and to promote better education of coaches, officials, players, and parents.⁶

Hence, the aim of this study was to focus on the prevalence and the risk factors associated with sports-related orofacial injuries in 8-11 years old school children of national capital region.

Materials and Methods

A cross-sectional survey was conducted with 2000 schoolchildren aged 8-11 years, of both sexes, attending private schools in national capital region, India. 500 children were selected from 10 private schools each in the four divisions of national capital region. The sample size calculation was performed using a confidence interval level of 95% level, keeping a margin of error of 2%, and estimated the prevalence

of orofacial injury to be 25%.⁷ The minimum sample size to satisfy the above requirements was 1875. A sample power of 98% was attained by this method.

A stratified random sampling was adopted to select the children. Among the selected schools, children participating in competitive and non-competitive sports, who were considered to be athletically active, belonging to the age group of 8-11 years, were included in the study. No other exclusion criteria were set aside. Local authorities (physical education teachers and school teachers) provided the necessary information for the selection of children who were involved in competitive sports activities. Necessary permissions to conduct the study were obtained from the school authorities and the parents of the selected children.

Data were collected by personal interview with the children using a questionnaire. Children were interviewed concerning use of protective equipment; any previous sports-related orofacial and dental injuries sustained; whether the injuries occurred during game or practice; number of times the participant encountered an injury; the type of injury (bruises, lacerations, dental [completely knocked out, fractured or loosened], concussions or jaw fractures). The children facing injuries were also questioned whether they took any medical/dental advice the same.

The risk factors for sports injuries evaluated in this study were sex, use of sports-related orofacial protective equipment (helmet, facemask or mouthguard), velocity and intensity of sports played; the level of coaching; the activity level and exposure time; the focus of attention; participation in contact/non-contact sports.

- Velocity of sports is defined as ability of an athlete to move as fast as possible, through the optimal range of motion, in a deliberate and intentional manner, in a particular direction⁸
- The intensity of sports is the qualitative component of work an athlete performs in a given time. The more work the athlete performs per unit of time, the higher the intensity⁹
- Velocity and intensity of sports were recorded based on the guidelines of the American Academy of Pediatrics Committee¹⁰ on Sports Medicine and Fitness. The above guidelines were modified for the convenience of recording as in Table 1
- Level of coaching was alienated into none, untrained, part-time; trained part-time and full-time professional coaches
- The level of activity was discerned based on the level at which the students played these games. High represented students participating in sports at district/national level, medium for students in the school team and low for children taking up the game as a recreational activity
- Exposure time was recorded based on the time the children participated in the activity. It was classified into high (>14 h/week), medium (7-14 h/week), and low (<7 h/week)

Table 1: Classification of sports-based on the velocity and intensity.

High intensity High velocity	High intensity Moderate velocity	Moderate intensity Moderate velocity	Low intensity Low velocity
<ul style="list-style-type: none"> • Boxing • Cycling • Football • Rugby • Running (sprint) • Skating 	<ul style="list-style-type: none"> • Badminton • Basketball • Hockey • Table tennis • Lawn tennis • Volleyball 	<ul style="list-style-type: none"> • Field events (jumping, throwing) • Gymnastics • Karate or judo • Weight lifting 	<ul style="list-style-type: none"> • Cricket • Rifle shooting

- Focus of attention was described based on the sports being practiced into solo, one on one, team offense or team defense sports.

The proportion of students' response to each question was expressed in absolute number and percentage. All results were analyzed using the Statistical Package for Social Science (SPSS 18.0). The Chi-square test was used for a number of comparisons. The significance level was set at 5%.

Results

The prevalence of sports-related orofacial injuries was found to be 26.65% (n = 533). Table 2 shows the distribution of participants based on the various factors evaluated and injuries encountered. Of the 2000 children examined in the survey, 853 (43.65%) were females and 1147 (57.35%) were males. The prevalence of injuries among boys was higher than among girls, 28.3% and 24.4%, respectively, but the difference was not found to be statistically significant (P < 0.05).

Of the 533 children who suffered sports-related orofacial injuries, 337 (63.28%) children sustained these injuries during game and 196 (36.72%) children got injured during their practice sessions. Dental injuries were sustained by 238 (11.9%) children. The rate of encountering an injury varied from 189 (35.46%) children reporting an injury twice to 14 (2.63%) children reporting that they had sustained sports-related orofacial injury 5 times in life. 326 (61.16%) children had taken some medical or dental advice for the injuries while the rest did not.

A total of 1162 orofacial injuries were reported in this study. Of these, 343 (29.51%) were dental; while the majority, i.e., 643 (55.33%) involved bruising of face. Lacerating injuries to the lips, cheek and tongue accounted for 15.14% of all injuries. Of the total 343 dental injuries, 245 (71.43%) were fracture injuries and 75 (21.87%) reported some kind of periodontal injuries except avulsion (i.e., the teeth were loosened but still in place). 23 cases (6.70%) of avulsion were reported.

Protective equipment use was reported by 43.2% of the population. When compared with the occurrence of injury, statistically significant differences (P < 0.05) were found in

Table 2: Prevalence of risk factors for sports-related orofacial injury.

Question	Previous Injury		Total	P value
	Yes (n [%])	No (n [%])		
Sex				
Male	325 (28.3)	822 (71.7)	1147 (100.0)	>0.05 (Non-significant)
Female	208 (24.4)	645 (75.6)	853 (100.0)	
Total	533 (26.7)	1467 (73.3)	2000 (100.0)	
Protective equipment				
Yes	38 (4.6)	826 (95.4)	864 (100.0)	<0.05 (Significant)
No	495 (43.5)	641 (56.5)	1136 (100.0)	
Total	533 (26.7)	1467 (73.3)	2000 (100.0)	
Velocity of sport				
High	281 (43.0)	372 (57.0)	653 (100.0)	<0.05 (Significant)
Medium	167 (17.3)	797 (82.7)	964 (100.0)	
Low	85 (17.6)	398 (82.4)	483 (100.0)	
Total	533 (26.7)	1467 (73.3)	2000 (100.0)	
Intensity of sport				
High	284 (30.7)	642 (69.3)	926 (100.0)	>0.05 (Non-significant)
Medium	136 (27.3)	362 (72.7)	498 (100.0)	
Low	113 (19.6)	463 (80.4)	576 (100.0)	
Total	533 (26.7)	1467 (73.3)	2000 (100.0)	
Level of activity				
High	80 (19.0)	341 (81.0)	421 (100.0)	<0.05 (Significant)
Medium	436 (30.0)	1017 (70.0)	1453 (100.0)	
Low	17 (15.6)	109 (84.4)	126 (100.0)	
Total	533 (26.7)	1467 (73.3)	2000 (100.0)	
Exposure time				
High	107 (36.1)	189 (63.9)	296 (100.0)	>0.05 (Non-significant)
Medium	321 (25.4)	943 (74.6)	1264 (100.0)	
Low	105 (23.8)	335 (76.2)	440 (100.0)	
Total	533 (26.7)	1467 (73.3)	2000 (100.0)	
Level of coaching				
None	54 (12.4)	383 (87.6)	437 (100.0)	<0.05 (Significant)
Untrained, part time	308 (37.4)	516 (62.6)	824 (100.0)	
Trained, part time	159 (22.6)	544 (77.4)	703 (100.0)	
Full time professional	12 (33.3)	24 (66.7)	36 (100.0)	
Total	533 (26.7)	1467 (73.3)	2000 (100.0)	
Focus of attention				
Solo	118 (16.1)	614 (84.9)	732 (100.0)	<0.05 (Significant)
One on one	155 (36.6)	268 (63.4)	423 (100.0)	
Team offense	163 (30.5)	371 (69.5)	534 (100.0)	
Team defense	97 (31.2)	214 (68.8)	311 (100.0)	
Total	533 (26.7)	1467 (73.3)	2000 (100.0)	
Contact sport				
Yes	465 (36.3)	817 (63.7)	1282 (100.0)	<0.05 (Significant)
No	68 (9.5)	650 (90.5)	718 (100.0)	
Total	533 (26.7)	1467 (73.3)	2000 (100.0)	

children using any of the three kinds of protective equipment compared to children not using any.

Among the 653 children who participated in high velocity sports, 281 (43.03%) reported to have suffered an injury while only 85 (17.6%) of the 483 children participating in low velocity sports reported injuries. This difference was found to be statistically significant ($P < 0.05$). However, intensity sports did not show a significant difference among the ones participating in high, medium, and low intensity sports with the prevalence in the three categories being 30.67%, 27.31% and 19.61%, respectively ($P > 0.05$).

The prevalence of injuries in the children playing games at different levels showed a significantly ($P < 0.05$) higher incidence for the medium level activity (30%) followed by high level (19%). A high exposure time (36.15%) was also seen to be associated with higher rate of injuries than compared to medium (25.4%) and low (23.86%) exposure times. However, the difference was not statistically significant ($P = 0.05$).

The level of coaching was found to be a yet another significant factor affecting the rate of occurrence of sports-related orofacial injuries with a significantly higher incidence ($P < 0.05$) for injuries occurring under untrained, part-time coaches

(36.93%) than trained, part-time coaches (22.61%). The incidence was higher also for full-time professional coaches (33.3%). However, the percentage of children taking coaching under full-time professional coaches was low.

Considering the foci of attention in games, one on one (36.64%) games involved a significantly ($P < 0.05$) higher number of participants with injuries, whereas in team games, team offense accounted for 30.52% and team defense accounted for 31.19% of the injured participants. Solo games involved 16.12% participants with injuries. Similarly, contact sports (36.27%) accounted for a significantly higher ($P < 0.05$) number of injuries in their participants than non-contact sports (9.47%).

Discussion

The results of this study indicate that the prevalence of sports-related orofacial injuries in 8-11 years old athletically active schoolchildren of NCR 26.65%. This is in accordance with the literature wherein reviews have listed the prevalence of such injuries to be in between 11% and 40%.⁷ Pribble *et al.*¹¹ showed the prevalence of sports-related orofacial injuries in 8-14 years old soccer playing children to be 11%.

A higher injury rate during games than the practice sessions is actually contrary to the findings of Andrade *et al.*¹² who reported a higher rate of injury during practice than in game. However, the age groups of the two studies are not similar. Hence, the mental pressure of the game can be accounted as a possible factor for the variable results in this study as the adults can be thought to deal with stress during the game in a better way than 8-11 years old children as in this study.

This study also evaluated the frequency and the type of sports-related orofacial injuries that the children had experienced. The results show that majority of the injury susceptible children are being exposed to injury quite frequently, and studies need to be carried out to evaluate the risk factors and plan high-level specific strategies aimed at prevention of injuries to such highly susceptible children.

Dental injuries were encountered by 11.9% ($n = 238$) of the participants involved in the study. Such a high incidence of dental trauma due to sports has not been reported in the past in the literature especially in this age group. Even recent studies¹³⁻¹⁵ have reported a sports-related dental injury incidence of <3%. The reasons for such a big variation in incidence among dental injuries could be that in all the earlier studies, the selected group comprised children of all athletic caliber and no stratification was done based on the active participation in sports activities as in this study.

The other orofacial injuries evaluated in this study were bruising of face, lacerations on lip, cheek and tongue; concussion injuries or any fractures of the jaws or facial bone.

The reason for including these injuries was that the sports-related protective devices have the ability to prevent other types of orofacial injuries also. Facemasks can help prevent bruises and lacerations. Helmets and mouthguards have been implicated in the prevention of concussion injuries by reducing the impact of the blow. The incidence of jaw fractures can also be reduced with the help of these protective devices. The results of this study also validate a significantly ($P < 0.05$) protective role of these orofacial equipment in the prevention of sports-related orofacial injury.

A total of 1162 injuries were recorded in this study. Of these, 55.33% were bruising injuries. Lacerations of the lip, cheek and tongue comprised 15.14% of all injuries. Dental injuries accounted for 29.51% of all injuries. Thus, bruises were the most common injuries encountered by the participants.

Pribble *et al.*¹¹ in their study on 8-14 years old children participating in competitive soccer had found that dental injuries accounted for 12.5% of all injuries while lacerations in that study accounted for 75% of all injuries. These variations could be accountable to the involvement of participants of only one high velocity, high intensity game, i.e., competitive soccer. However, this study also took into account participants of another high velocity, high intensity sports besides soccer and also participants of low and medium velocity and intensity sports. Moreover, bruising injuries were not taken into account in that study.

Among the dental injuries, the most common ones seen were fractures of teeth (71.43%) followed by loosened (all periodontal traumatic injuries except avulsion) (21.87%) teeth, and the least number of cases were of avulsion (6.7%). Similar results have also been reported by other authors.¹²⁻¹⁴

Of the 533 participants who had suffered from sports-related orofacial injuries, 61% had taken a medical or dental advice for the same. Thus, the awareness among the participants for injury management was found to be quite high. The reasons for this could be that the sample comprised only private schools of Ludhiana. Similar results of awareness of injury management were reported by Ramagoni *et al.*,¹⁶ who reported an awareness of about 55.2% for referral to a doctor/dentist.

A comparison of sports participation based on sex when related to the occurrence of injury did not yield significant results ($P > 0.05$). Thus, in this study, orofacial injury rates were found to be independent of sex and both sexes experienced a statistically insignificant difference in the number of injuries experienced.

High velocity sports such as cycling, football, rugby, soccer, running (sprint), and skating are supposed to be a risk factor for a more frequent and severe form of orofacial injury than

would be low and medium velocity sports. The results of the present study also corroborate to the above-mentioned observations. Furthermore, high intensity sports such as football, rugby, basketball, and hockey involve more work and hence are supposed to be associated with a higher risk of injury. However, in this study, the difference of the rate of injuries among the ones involved in high (30.67%), moderate (27.31%), and low (19.62%) intensity sports was not found to be statistically significant.

Although the rate of injuries was higher for high intensity sports, still the difference was found to be insignificant. These results show that the velocity of sports is a more important and determining factor for sports-related orofacial injury than its intensity in this age group. However, the importance of the intensity of sports cannot be underestimated for the higher age groups.

Another important factor taken into account in this study was the level of activity. At higher levels of competition, increased stress and the desire to perform better are supposed to be associated with a higher risk of sports-related injury. However, with a higher level of the competition, the sports tend to become more organized; better methods of protection and a higher level of coaching are provided to the participants thereby reducing this risk of sports injury. In our study, medium level of activity (referring to participation at school level) was found to be associated with the highest level of injuries (30%) and this difference was statistically significant when put in comparison to high (19%) and low (15.6%) levels of activity.

Yet another factor proposed to be a risk factor for sports injury is the exposure time, i.e., the time for which children participate in sports activity. The results of this study did not show a significant difference in the rate of injuries among the participants involved in various sports for different exposure times. However, studies by Ma¹⁷ had clearly shown the length of training time to be a significant factor affecting sports injury. Thus, further studies need to be undertaken to clarify the correlation between exposure time and the incidence of sports-related orofacial injuries.

The level of coaching being provided to the participants was another risk factor that was evaluated in this study. As all the participants were school students, so the majority of them (76.35%) claimed to be trained under some kind of coach or a physical education instructor. Few students (1.8%) were also taking special training from sports academies outside school.

Good coaching is deemed to be a crucial factor in preventing the occurrence of sports-related orofacial injuries since coaches not only help the participant excel his skills but also prepare them both mentally and physically for the sport at a competitive level. The results of this study seemed to be in concordance with the former statement.

The higher incidence of sports-related injuries in children taking coaching under full-time professional coaches cannot be considered statistically comparable as the sample was inadequate in this category. Further studies are needed to establish a proper relationship.¹⁸

An equally important factor recognized as a risk factor for a sports-related orofacial injury is the focus of attention of each participant in the game. One on one sports involved the maximum number of participants who encountered sports injuries (as they involve a direct combat and the participant is susceptible to injury throughout the period of the game). Team sports can involve either an attacking (offense) or a defensive role. Whereby, the attacker is supposed to have a higher chance of getting injured due to high velocity, the defender is equally susceptible to injury by the transfer of energy in case of a collision. Solo sports quite often involve a lesser risk as the only state of incident happening is through a fall or tiredness.

From the above discussion, it is clear that contact sports will be at a greater risk of injuring their participants compared to non-contact sports. This study also found out similar results with a highly significant variation. The results are well supported by studies^{19,20} which also reported higher overall injury rates for sports entailing more frequent and powerful body contact.

Conclusion

It can be concluded that the prevalence of sports-related orofacial injuries in National capital region high and protective measures need to be strictly enforced so that the incidence of injuries associated with the significant risk factors can be reduced and these children can enjoy the healthy benefits of participating in sports activities without the fear of encountering a traumatic orofacial injury.

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