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Orofacial and dental trauma of young children in Dunedin, New Zealand

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Abstract –*Aim:* The aims were to identify the predominant causes and types of orofacial injury in young children attending clinics at a University Dental School in Dunedin, New Zealand. *Material and methods:* A retrospective analysis of data from the records of all children aged 0–10 years who had been seen for orofacial trauma in 1999 and 2000 was undertaken. *Results and conclusions:* Three hundred traumatic incidents in 288 children were analysed; 86.6% had causes noted. In very young children, most injuries were because of falls, while collisions, falling and sports were responsible for more injuries in school-aged children. Playground equipment and ride-on vehicles played a role particularly in the older children. There were no incidents of trauma as a result of road traffic accidents. Ten injuries were caused by animals, mainly dogs. Location was recorded for two-thirds of accidents: the predominant place was at home, followed by school. No seasonal variation was apparent. There were 228 non-dental injuries, of which the majority were to the lips. The predominant dental injuries in both dentitions were concussions and subluxations with a significantly higher occurrence of both in the primary dentition ($P < 0.001$). Upper central incisors were most often involved. The age distribution for boys and girls was similar. In conclusion, the causes and types of orofacial trauma in this group of young New Zealand school children attending a university dental school were similar to other studies, except for the high proportion of concussions recorded in both dentitions. While the injuries were well described, not all records noted the cause or location. This has resulted in changes to the standard recording form to provide consistency in data capture. Information from this study will also be used to support child injury prevention strategies in New Zealand.

Orofacial trauma is a problem often encountered during childhood. Orofacial trauma covers injuries to the facial soft tissues and bones and to the mouth including the soft tissues, tongue and teeth. The primary dentition has been shown to suffer a higher prevalence of trauma than the permanent dentition (1–6) with an average of 30% of children experiencing some dental trauma to primary teeth. In the early mixed dentition, the reported prevalence of trauma in the permanent dentition ranges from 12% to 33% for boys and 4% to 19% for girls with all studies showing the higher prevalence in boys (7–10).

In children, falls are the most commonly reported causes of orofacial injury followed by collisions with objects. This may be related to degrees of motor development in young children (11). As children progress into late childhood and adolescence other factors such as collisions with each other, traffic accidents, sports injuries and violence contribute to the aetiology (12, 13). The factors may vary between different communities and seasons in some instances (13–15).

Dental trauma is most common in the anterior teeth and the upper incisors in particular (1, 4, 5, 10). The predominant types of injuries vary between the primary and permanent dentitions. In the primary dentition, luxation injuries appear to be the most common (2, 16–19). In the permanent dentition, uncomplicated crown fractures are the most commonly reported injuries (2, 11, 16, 19) and maxillary central incisor teeth are the most frequently injured (1, 2, 6, 10, 11, 13). Boys are more frequently affected than girls, and the incidence of boys damaging permanent teeth increases between 8 and 10 years while the incidence appears stable for girls at the same ages (1, 19).

Dental and orofacial trauma have social and economic impacts with regard to the treatment required. Borum and Andreasen (20) estimated that each primary tooth costs $60 USD for an uncomplicated injury and $200 USD for a complicated injury, with an annual cost of 0.5 million USD per 1 million inhabitants. Dental trauma may result in high treatment cost for patients, insurance companies or public health services. In New Zealand, the Accident Compensation Corporation (ACC) partly covers the cost of treatment after accidents, but there is still a part charge to the patient or parent. In the year 2000, the New Zealand ACC paid out just under $1 000 000 NZ in dental accident claims for 0- to 10-year-olds involving 8686 accidents (21). The 1996 census recorded 567 894 0- to 9-year-olds in New Zealand (22).

However, this figure did not capture related costs such as time off work and travel expenses that add to the financial burden of dental injuries.

There have been some previous studies on orofacial trauma in New Zealand. Most have looked at the occurrence of fractures or at sports related injuries (23–27), with only one (23) relating to early adolescence. Because there is little information about the causes of dental trauma in young New Zealand children, or the potential to estimate the long-term needs for treatment, the aims of the present study were to identify the predominant causes of and types of orofacial injury in young New Zealand children attending clinics at a university dental school. In New Zealand, ACC funds accident care in private dental practices and the university clinics in the same way. However, some patients may choose the university clinics for different reasons than they would choose a private practice. Therefore, the children in the study may not be representative of the normal population.

Materials and methods

The study was carried out at the University of Otago School of Dentistry in Dunedin New Zealand. Children aged 0–10 years, who had suffered orofacial trauma in 1999 and 2000, were identified from the patient database at the School of Dentistry. These 2 years were chosen as data recording changed after that time. As no complete analysis of causes of trauma in children of this age group in New Zealand has been carried out previously, these data provide an important historical baseline for future comparison of causes of trauma in New Zealand children. Ethical approval was obtained from the University of Otago Human Ethics Committee. Details of the trauma were recorded from each patient file. The information included: date of birth, gender, ethnicity, socio-economic status, medical history, dental history, any history of previous trauma, place and cause of injury, types of injuries and tissues involved, treatment provided and short-term (2–3 year) outcomes. The classification of the type of dental injury was based on the Andreasen modification of the WHO Classification (28). Information was also recorded for all other orofacial injuries including temporo-mandibular joint injuries, puncture wounds, burns and soft tissue injuries.

Information was recorded in Microsoft Excel™ and data was analysed using STATA (29). Analysis was carried out using the chi-squared test. The level of significance was set at <0.05.

Results

Two hundred and eighty-eight children aged between birth and 10 years of age were seen with trauma at the University of Otago School of Dentistry during 1999 and 2000. Twelve children (4.2%) suffered a second accident within the selected period allowing 300 injury occasions to be reviewed. The distribution of children suffering trauma in relation to age and gender is shown in Table 1. The age distribution is similar for boys and girls.

Table 1. Distribution of injuries in relation to age and gender

Age (years)	Male *N* (%)	Female *N* (%)	Total *N* (%)
<2	30 (16.3)	18 (15.5)	48 (16.0)
2–4	54 (29.4)	35 (30.2)	89 (29.7)
5–7	70 (38.0)	34 (29.3)	104 (34.7)
8–10	30 (16.3)	29 (25.0)	59 (19.6)
	184 (100)	116 (100)	300 (100)

The predominant causes of injury were different between the younger and older children (Table 2). In very young children, falling was the most common while collisions, falling and sports were responsible for more injuries in older school-aged children. Playground equipment and ride-on vehicles also played a role particularly in the older child. Equipment included swings and climbing frames. Ride-on vehicles were bicycles, scooters, roller blades and skateboards. Injuries caused by animals (3.3%) were mainly because of dogs. The place of injury was only noted for two-thirds of the accidents. The predominant locations where accidents occurred were at home (31%) and at school (19%). The other main places were in the street (11.0%) and at sports (10.0%) and playgrounds (19.0%). One accident occurred in a go-kart but no injuries were related to road traffic accidents. Seasonal variation was not evident. However, 19 (6.3%) accidents took place on or within a week of a child's birthday. This figure is higher than that which would have been expected for a period that represents only 15 days (4.1%) of each year.

The most common non-dental orofacial injuries recorded (45.2%) were to the lips with 13.6% of injuries being recorded to the periodontal tissues. Around 6.1–8.8% of injuries were recorded for other sites including oral mucosa, chin, face and only 2.2% of tongue injuries were seen in boys; usually caused by the child falling and biting his tongue. Scalp lacerations (8.8%) were mostly caused by dog bites. Two hundred and fifty permanent teeth and 475 primary teeth were injured (Table 3). Maxillary central incisors were the most commonly affected teeth. There were no significant differences between males and females with regard to the teeth that were injured, the severity of injuries or the numbers of teeth injured in either dentition. The number of tooth injuries involved fewer than four teeth per accident in 68% of the children. There were 92 cases (30.7%) of dental injuries alone and 70 (23.3%) cases of orofacial injuries alone while the remaining 138 (46%) involved both teeth and soft tissues. Two hundred and sixty-three non-dental injuries were recorded including 236 soft tissue lacerations, abrasions, swellings or contusions (89.7%). The other injuries included 17 fractures, two joint injuries, one puncture wound, four burns and three were unrecorded. Significantly more boys than girls experienced soft tissue or dental injuries ($P < 0.001$).

The predominant dental injuries recorded were concussions and subluxations in both primary and permanent teeth with a significantly higher occurrence of concussions and luxation injuries in the primary dentition ($P < 0.001$) (Table 4).

Table 2. Causes of orofacial injuries related to age

Cause	<2 *N* (%)	2–4 *N* (%)	5–7 *N* (%)	8–10 *N* (%)	Total *N* (%)
Playground equipment	3 (6.3)	9 (10.1)	13 (12.5)	5 (8.5)	30 (10.0)
Bicycle, roller blades scooter, skateboard,	0 (0.0)	7 (7.9)	15 (14.4)	6 (10.2)	28 (9.3)
Sport	0 (0.0)	1 (1.1)	3 (2.9)	7 (11.9)	11 (3.7)
Fall	28 (58.3)	51 (57.3)	40 (38.5)	13 (22.0)	132 (44.0)
Collision	6 (12.5)	8 (9.0)	17 (16.3)	18 (30.5)	49 (16.3)
Animal	2 (4.2)	3 (3.4)	3 (2.9)	2 (3.4)	10 (3.3)
Other/not recorded	9 (18.7)	10 (11.2)	13 (12.5)	8 (13.5)	40 (13.4)
Total (%)	48 (100)	89 (100)	104 (100)	59 (100)	300 (100)

Table 3. Occurrence of injuries in primary and permanent teeth

	Male *N* (%)	Female *N* (%)	Total *N* (%)
Primary			
Upper central incisors	148 (51.8)	81 (42.8)	229 (48.2)
Upper lateral incisors	90 (31.6)	55 (29.1)	145 (30.5)
Upper canines	19 (6.6)	11 (5.8)	30 (6.3)
Upper molars	1 (0.3)	0 (0.0)	1 (0.2)
Lower incisors	19 (6.6)	40 (21.2)	59 (12.4)
Lower canines	7 (2.4)	2 (1.1)	9 (2.0)
Lower molars	2 (0.7)	0 (0.0)	2 (0.4)
	286 (100)	189 (100)	475 (100)
Permanent			
Upper central incisors	74 (53.6)	53 (47.3)	127 (50.8)
Upper lateral incisors	28 (20.4)	25 (22.3)	53 (21.2)
Upper canines	0 (0.0)	2 (1.8)	2 (0.8)
Upper premolars	1 (0.7)	0 (0.0)	1 (0.4)
Lower incisors	34 (24.6)	30 (26.8)	64 (25.6)
Lower canines	1 (0.7)	2 (1.8)	3 (1.2)
	138 (100)	112 (100)	250 (100)

Table 4. Types of injuries in primary and permanent teeth

Injury	Primary *N* (%)	Permanent *N* (%)	Total *N* (%)
Enamel infraction	0 (0.0)	5 (1.8)	5 (0.6)
Enamel fracture	18 (3.5)	13 (4.6)	31 (3.9)
Enamel + dentine fracture	28 (5.4)	31 (11.0)	59 (7.4)
Complicated crown fracture	8 (1.5)	3 (1.1)	11 (1.4)
Root fracture	7 (1.3)		7 (0.9)
Concussion	288 (55.5)	179 (63.1)	467 (58.1)
Subluxation	111 (21.4)	31 (11.0)	142 (17.7)
Extrusive luxation	7 (1.3)	2 (0.7)	9 (1.1)
Lateral luxation	10 (1.9)	2 (0.7)	12 (1.5)
Intrusive luxation	10 (1.9)		10 (1.2)
Avulsion	28 (5.4)	7 (2.5)	35 (4.4)
Alveolar fracture	1 (0.2)	6 (2.1)	7 (0.9)
Not recorded/other	3 (0.7)	4 (1.4)	7 (0.9)
	519 (100)	283 (100)	802 (100)

Discussion

As has been demonstrated in other studies (1, 3, 4), the incidence of orofacial injuries in this study peaked in mid-childhood and then appeared to taper off. More children from 2–4 to 5–7 years of age suffered injuries in this study. It seems that this was related to development of motor skills, or accidents while learning new physical skills. The occurrence of second injuries in 4.2% of children should be noted. Dental clinicians often note some children seem accident-prone, and the occurrence of further trauma as demonstrated in this study suggests that consideration might be given to referring these children for further assessment when other factors such as problems with sight or motor skills may be contributing to the accidents. The main causes of orofacial injuries, falling and collisions, have been shown in most other studies (2, 11, 12, 14, 17, 30). Falling was more likely in children under 5 years of age while collisions were more likely in school-aged children. Boys sustained slightly more injuries from falling and bicycle accidents while girls had more collision and playground equipment accidents. Sports injuries started to increase after children began school. This is the time at which participation in team sports commences. The most common sport related injuries occurred during soccer where most children reported being hit in the face by a ball. In other ball sports in New Zealand, children are required to wear mouthguards at all practices and games. The results of the current study suggest that mouthguards might be considered for other ball sports perhaps by younger less experienced players. In a New Zealand study (25) of sports-related dental injuries, swimming was the most frequent cause, followed by rugby league and sports such as basketball, hockey and baseball that are not played by as many children under 10 years of age. Of note were the numbers of injuries caused by dog bites. The problem of general dog-related injuries has resulted in recent legislation in New Zealand (31) that requires some breeds of dogs to be muzzled in public places and all dogs have to be on leads or under control in most public areas. A significant difference from other studies was the lack of injuries from motor vehicle accidents. This may reflect the legal requirement for all children to be restrained in motor vehicles in New Zealand. The majority of injuries occurred at home or at school, a finding that is similar to many other studies (2, 16, 19).

The injuries were divided into non-dental and dental injuries. The reason for high numbers of periodontal tissue injuries in children has been previously suggested to be because the supporting tissues are more elastic in younger children and teeth are more likely to be displaced (1). Upper and lower incisors were the most common teeth injured in both dentitions: 91.1% of primary teeth and 97.6% of permanent teeth. A difference from other studies was the low percentage of

avulsions in the total numbers of injuries recorded: 5.4% of primary teeth and 2.5% of permanent teeth (1, 8, 14). A possible explanation is that more minor trauma is being recorded, in particular concussion injury. This may be a result of the requirement in New Zealand to register all injuries with the ACC within 1 year of the incident to ensure ongoing financial contribution to treatment. Because at the time of injury it cannot always be known if further care will be needed, most tooth injuries are documented no matter how minor. Other types of dental injuries appeared to have similar incidences to those in previously reported studies.

This study revealed that while most of the types of injuries were well described, the records failed to capture the cause of the injuries for 13.4% of accidents. This is a limitation in the study and illustrates the difficulties of collecting retrospective data from clinical records. However, this should not preclude investigating outcomes in this way and the results of this current study have resulted in changes to recording forms both to remind and provide greater consistency in the information collected by clinicians. This information would allow an estimation of the long-term follow up and/or treatment need including a projection of costs either for individual patients or for bodies which fund or partly fund care after dental trauma. The results of this study and previous studies (7, 32, 33) support the need to educate all caregivers of children on the prevention of dental injuries. Information from this study will also be used to support child injury prevention strategies in New Zealand.

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