Community Dental Health (2011) **28,** 104–106
Received 2 June 2009; Accepted 10 November 2009

doi:10.1922/CDH_2562Shekhar03

Traumatic dental injuries to primary incisors and the terminal or occlusal plane relationship in Indian preschool children

M.G. Shekhar[1] and R. Mohan[2]

[1]*Associate Professor, Faculty of Pedodontics and Preventive Dentistry, NTRUHS, AP, India;* [2]*GPT, Restorative Department, Heath Hospital, Cardiff University Dental Hospital, Cardiff, UK*

Objective: To determine the prevalence of traumatic dental injuries to primary incisors in 3-5 year-old preschool children and to study the relationship between dental injuries and age, gender and terminal plane relation. ***Basic research design:*** A cross-sectional study was conducted in 1,126 preschool children aged three to five years enrolled in eleven private and public nursery schools, randomly selected in Chennai, India. ***Method:*** Data regarding the age, gender, cause and type of trauma and terminal plane relation were recorded. Maxillary and mandibular primary incisors were examined for traumatic injuries and were recorded according to the method described by Andreasen & Andreasen (1994). Data were analyzed through descriptive analysis and chi-square test. ***Results***: Traumatic injuries to primary incisors were identified in 6.2% of children. No significant gender differences in prevalence were seen ($p > 0.05$). Enamel fractures (57.3%) dominated amongst the type of injuries. Majority of children who sustained traumatic dental injuries to their primary incisors were associated with mesial step molar relation. ***Conclusion:*** Mesial step molar relation may be considered one of the possible predisposing factors to trauma in primary dentition. Further, there is need to intensify oral health education targeted at both parents and teachers at nursery schools to inform them about consequences of primary teeth injuries on permanent dentition and emphasize the importance of prevention of dental injuries in children

Key Words: Dental trauma, preschool children, primary incisors, terminal plane relation

Introduction

Traumatic injuries to primary teeth are common and affects approximately one-third of pre-school children. Studies have reported a varying prevalence rates ranging from 10% -40% (Andreasen and Andreasen 1994, Beltrao *et al*., 2007, Robson *et al*., 2009, Granville-Garcia *et al*., 2006).

Traumatic injuries to primary teeth can affect the development and eruption of permanent teeth. Discoloration of permanent teeth with or without hypoplasia, dilacerations of crown/root, and partial/total failure of root development are amongst the most frequent sequelae of traumatic injuries to the primary dentition (Andreasen and Andreasen 1994, Flores 2002). Injuries to primary dentition have received less attention compared to those on permanent dentition as parents often overlook the need for dentists to examine injuries to primary dentition.

Reports on the prevalence of traumatic dental injuries in preschool children are rare. A review of the literature revealed no reported data on the prevalence of traumatic dental injuries in preschool children of Chennai. This city is a major centre of trade and education for South India, inhabitated by people of different ethnicity, cultures and socio-economic strata. So a need for research into dental trauma in primary teeth exists in order to have a baseline data for future preventive and management plans. Further the relationship between terminal or occlusal plane and dental injuries in primary teeth has not yet been reported in the literature. The present study was conducted to determine the prevalence of traumatic injuries to primary incisors in 3-5 year-old preschool children of Chennai and to study the relationship between dental injuries and age, gender and terminal plane.

Methods

A cross sectional survey was conducted in Chennai, India which included 1,126 preschool children (624 boys and 502 girls), aged 3-5 years, randomly selected from 11 public and private nursery schools in a suburban area of Chennai, India. Prior to the survey, permission to examine the children was obtained from the school authorities concerned and written consent for participation was obtained from the parents. The study was approved by the Local Research Ethics Committee of Chennai. Parents were invited on the day of examination and were interviewed along with their children.

Dental examinations were conducted in class rooms under natural lighting, with the aid of mouth mirror and included only maxillary and mandibular primary incisors. The criteria used to assess traumatic dental injuries were based on the method described by Andreasen and Andreasen (1994). One well trained and calibrated examiner participated in the study and 10% of subjects were re-examined at the end of the day for any intra-examiner variability. Details concerning the age, gender, cause of trauma, type of trauma and occlusal or terminal plane relation were recorded in a pretested proforma.

Correspondence to: Dr. M. Guna Shekhar, #160, 5th cross, 28th main, Sector-1, HSR layout, Bangalore-560102, India.
E-mail: drguna1234@rediffmail.com

Table 1. Distribution of children with traumatized teeth by gender (n=1126)

	Primary incisors (3-5years)		
Gender	*No. of cases examined*	*No. of cases with trauma*	*No. of fractured teeth*
Boys	624 (55.4%)	38 (54.3%)	48 (58.5%)
Girls	502 (44.6%)	32 (45.7%)	34 (41.5%)
Total	1126	70 (6.2%)	82
p-value	** p > 0.05*		

Statistical evaluation by means of the Chi-square test
* no significant gender difference, *p*-value >0.05

Occlusal or terminal plane relationship in primary dentition has been described as Mesial step (when distal surface of mandibular primary second molar lies mesial to that of maxillary primary second molar), Distal step (when distal surface of mandibular primary second molar lies distal to that of maxillary primary second molar), and flush terminal plane (both distal surfaces lie in same vertical plane).

Data were analyzed through descriptive analysis and Chi-square test. Significance was set at 5% level.

Results

A total of 70 children (6.2%) of the study population presented with dental trauma. There were no significant differences in the prevalence of traumatic injuries between boys and girls (p>0.05) (**Table 1**). The overall ratio of trauma between boys and girls was 1.18:1. The most frequent age group at which trauma occurred was five years in primary dentition in both the genders.

The leading cause of injury was unspecified falls (48.6%) followed by unknown etiology (34.3%) and collisions (17.14%) respectively. The most commonly affected teeth were maxillary central incisors followed by maxillary laterals. Enamel fractures (57.3%) dominated among the type of injury seen in primary dentition followed by discoloration (15.9%), enamel-dentin fractures (10.9%), avulsion (9.8%), intrusive luxation (3.7%), and enamel/dentin/pulp fractures (2.4%).

The distribution of children with traumatized teeth according to terminal plane relationship is shown in **Table 2.** Mesial step molar relation accounted for 47.3% of the study sample followed by flush terminal (29.9%) and distal step relation (22.7%). Injuries were more common in children with mesial step molar relation (7.32%) followed in descending order by the flush terminal (6.82%) and distal step relation (3.12%).

Chi-square test demonstrated no significant association between traumatic injuries and terminal plane relation (p>0.05). However, statistically significant relation with traumatic injuries was noted between mesial step and distal step molar relation (p<0.05), and flush terminal and distal step molar relations (p<0.05). Further the association between flush terminal and mesial step molar relation was not significant (p>0.05).

Table 2. Distribution of children with traumatized teeth according to terminal plane relationship (n =70)

Type of Malocclusion	*No. of children with trauma*	*%*	*No. of children without trauma*	*Total*
Mesial step	39	7.3	494	533
Flush terminal	23	6.8	314	337
Distal step	08	3.1	248	256
Total	70	6.2	1056	1126

* mesial step-distal step, p<0.05, significant
** flush terminal plane-distal step, p<0.05, significant
*** mesial step-flush terminal plane, p>0.05, not significant
**** overall trauma prevalence to terminal plane relation, p>0.05, not significant

Discussion

The prevalence of traumatic injuries to primary incisors (6.2%) observed in this study was lower than in most other studies (Beltrao *et al*., 2007, Kramer *et al*., 2003) on primary teeth taking age into account. However, it would be inappropriate to compare prevalence figures found in various studies because of lack of uniformity in sampling, examination procedure, diagnostic criteria and age groups.

This study showed that even though boys suffered more injuries than girls, no statistically significant differences were found between them, corroborating with previous studies (Beltrao *et al*., 2007, Jorge *et al*., 2009, Avsar and Topaloglu, 2009). Boys were 1.18 times more likely to have traumatic dental injuries than girls, similar to the ratio reported by Forsberg and Tedestam (1990).

Dental injuries are infrequent during the first year of life and increase substantially with the child's first effort to move about. The frequency increases as the child begins to walk and run due to lack of experience and coordination and reaches its peak just before school age. The present investigation reported five years as the most accident prone age in primary dentition, whereas some studies, have reported common age group with traumatic injuries ranging between 2 - 4 years (Beltrao *et al*., 2007, Kramer *et al*., 2003, Shayegan *et al*., 2007). Andreasen (1994) reported that as a child begins to walk and run the incidence of dental injuries increases until an initial peak around the age of four years. Studies have reported a significant increase in the risk of trauma when associated with factors like increasing age (Granville-Garcia *et al*., 2006, Ferreira *et al*., 2009) , family income (Ferreira *et al*., 2009)**,** obesity (Granville-Garcia *et al*., 2006), and high social vulnerability (Jorge *et al*., 2009) **.**

The most common cause of trauma to primary incisors in the present study was unspecified falls which corresponds well with most of the studies in the literature

(Jorge *et al*., 2009, Ekanayake and Perera 2008, Kirzioğlu *et al*., 2005, Muriithi *et al*., 2005). Falls were followed by unknown etiology (34.3%) as several young children and/or parents did not remember the cause of dental trauma.

Most of the injuries noted in our study involved the maxillary central incisors, a finding consistent with the literature on dental trauma (Beltrao *et al*., 2007, Shayegan *et al*., 2007, Ekanayake and Perera 2008, Muriithi *et al*., 2005). The maxillary central incisors owing to their position in dental arch tend to be the first to receive a direct blow producing a fracture. In addition, the upper jaw is fixed to the skull which makes it rigid, while the lower jaw, being a flexible part, tends to reduce the impact forces directed on the lower anterior teeth by movement (Baghdady *et al*., 1981).

Enamel fractures represented the majority of traumatic injuries noted in this investigation followed by discoloration and enamel-dentin fracture. These results were in concurrence with those of other studies (Beltrao *et al*., 2007, Robson *et al*., 2009, Granville-Garcia *et al*., 2006, Jorge *et al*., 2009). Other authors, however, claim that most common injuries were luxations (Kirzioğlu *et al*., 2005, Muriithi *et al*., 2005). The present investigation recorded three cases of intrusive luxations (3.7%) in boys with mean age of 4.4 years. The energy of an impact causing such a severe injury may reflect the increase in the risk of injury to the permanent successor. Moreover, the higher possibility of lacking information related to luxation injuries in our study might be due to the fact that children could have injured their teeth at younger age which would have healed at the time of examination thereby resulting in being unnoticed.

The majority of children who suffered dental trauma in the present study exhibited mesial step molar relation followed by flush terminal and distal step molar relation. This finding suggested that mesial step molar relation may be considered as one of the possible predisposing factors to trauma in primary dentition. Studies revealed that children with increased over jet (possible distal step or flush terminal relation) showed higher prevalence to traumatic injuries (Robson *et al*., 2009, Noori and Al-Obaidi 2009). Moreover, mesial step in primary dentition may transform into a class I or class III molar relation in permanent dentition depending on the availability of spaces in primary dentition and differential growth of maxilla and mandible. Hence it would be inappropriate to consider mesial step as a possible predisposing factor to trauma in permanent incisors.

Conclusions

In conclusion, the prevalence of trauma to primary incisors in 3-5 year old preschool children of Chennai, South India was 6.2%. The findings of the present study suggested that mesial step molar relation could be one of the possible predisposing factors to trauma in primary dentition. Supervision of the children by teachers in the classrooms and during play hours is recommended to relatively control their activity. In the light of the present study, there is a need to intensify oral health education targeted at both parents and teachers at the nursery schools to inform them about the consequences of primary teeth injuries on permanent dentition and emphasize the importance of prevention of dental injuries in children.

References

Andreasen, J.O. and Andreasen, F.M. (1994): Textbook and Colour Atlas of Traumatic Injuries to Teeth, 3rd ed. Copenhagen: Munksgaard.

Avşar, A. and Topaloglu, B. (2009): Traumatic tooth injuries to primary teeth of children aged 0-3 years. *Dent Traumatol* **25**(3), 323-327.

Baghdady, V.S., Ghose, L.J., Enke, H. (1981): Traumatic anterior teeth in Iraqi and Sudanese children – a comparative study. *J Dent Res* **60**, 677-680.

Beltrao, E.M., Cavalcanti, A.L., Albuquerque, S,S., Duarte, R,C. (2007): Prevalence of dental trauma children aged 1-3 years in Joao Pessoa (Brazil). *Eur Arch Paediatr Dent* **8**, 141-143.

Ekanayake, L. and Perera, M. (2008): Pattern of traumatic dental injuries in children attending the University Dental Hospital, Sri Lanka. *Dent Traumatol* **24,** 471-474.

Ferreira, J.M., Fernandes de Andrade, E.M., Katz, C.R., Rosenblatt, A. (2009): Prevalence of dental trauma in deciduous teeth of Brazilian children. *Dent Traumatol* **25**(2), 219-223.

Flores, M.T. (2002): Traumatic injuries in the primary dentition. *Dent Traumatol* **18**, 298.

Forsberg, C.M. and Tedestam, G. (1990): Traumatic injuries to teeth in Swedish children living in an urban area. *Swed Dent J* **14**, 115-122.

Granville-Garcia, A,F., de Menezes, V.A., de Lira, P.I. (2006): Dental trauma and associated factors in Brazilian preschoolers. *Dent Traumatol* **22**(6), 318-322.

Jorge, K.O., Moysés, S.J., Ferreira e Ferreira, E., Ramos-Jorge, M.L., de Araújo Zarzar, P.M. (2009): Prevalence and factors associated to dental trauma in infants 1-3 years of age. *Dent Traumatol* **25**(2), 185-189.

Kirzioğlu, Z., Karayilmaz, H., Ertürk, M.S., Köseler Sentut, T. (2005): Epidemiology of traumatised primary teeth in the west-Mediterranean region of Turkey. *Int Dent J* **55**, 329-333.

Kramer, P.F., Zembruski, C., Ferreira, S.H., Feldens, C.A. (2003): Traumatic dental injuries in Brazilian preschool children. *Dent Traumatol* **19**, 299-303.

Muriithi, H.M., Masiga, M.A., Chindia, M.L. (2005): Dental injuries in 0-15 year olds at the Kenyatta National Hospital, Nairobi. *East Afr Med J* **82**(11), 592-597.

Noori, A.J. and Al-Obaidi, W.A. (2009): Traumatic dental injuries among primary school children in Sulaimani city, Iraq. *Dent Traumatol* **25**(4), 442-446.

Robson, F., Ramos-Jorge, M,L., Bendo, C.B., Vale, M.P., Paiva, S.M., Pordeus, I.A. (2009): Prevalence and determining factors of traumatic injuries to primary teeth in preschool children. *Dent Traumatol* **25**(1), 118-122.

Shayegan, A., De Maertelaer, V., Vanden Abbeele, A. (2007): The prevalence of traumatic dental injuries: a 24-month survey. *J Dent Child (Chic)* **74**, 194-199.