

The Epidemiologic Survey of Traumatic Deciduous Teeth in Taiwan

**Shun-Te Huang^{1,2,3,4)}, Szu-Yu Hsiao²⁾, Hsiu-Yueh Liu³⁾, Horng-Sen Chen^{2,3)}, Chia-Hung Lo⁴⁾,
Chin-Hua Wu²⁾, Nai-Chih Chi²⁾ and Shu-Ya Lee²⁾**

¹⁾ *Graduate Institute of Oral Health Sciences, College of Dental Medicine, Kaohsiung Medical University, Kaohsiung, Taiwan*

²⁾ *Department of Pediatric Dentistry, Chung-Ho Memorial Hospital, Kaohsiung Medical University, Kaohsiung, Taiwan*

³⁾ *Graduate Institute of Dental Sciences, College of Dental Medicine, Kaohsiung Medical University, Kaohsiung, Taiwan*

⁴⁾ *Faculty of Dental Hygiene, College of Dental Medicine, Kaohsiung Medical University, Kaohsiung, Taiwan*

Abstract: The purpose of this study was to focus on the survey of the prevalence rate of dental trauma for Taiwanese children aged below six years. A total sample of 4,620 children was collected by stratified cluster sample design, and Probability Proportion to Size. The sample examined was 4,037 children and the completion rate was 87.38%. Training for the oral examination was provided to improve the coordination and reliability of the examiners to enhance consistency. A database was designed by Microsoft Access and data analyzed by statistics software SAS and JMP after data entry. Comparison between categorical variables was performed by using Pearson's chi-square test and between numerical variables by using t-test analysis. The prevalence rate of dental trauma to deciduous teeth for the 0-6 year-old children was 0.94%, boys had 1.12% and girls 0.68% prevalence rate of dental trauma. There was no significant difference between boys and girls in dental trauma prevalence. The prevalence rate of dental trauma by age showed that the highest peak occurred at 3 years old (1.19%), followed by 4 (0.95%) and then 5 year-old (0.92%) children. In our study, upper central incisors occupied 0.99% prevalence of dental trauma among primary dentition. Upper lateral incisors and lower central incisors only occupied a very small prevalence rate, less than 0.05%. A low prevalence rate of dental trauma occurred to the children aged below 6 years in Taiwan, which may be caused by different study and sampling method, different definition of dental trauma, and different care attitude of parents to children. Considering the high frequency of dental trauma in the 3-5 year-old children, the safety of kindergartens and the prevention of dental trauma to deciduous teeth should be considered.

Keywords: dental trauma, epidemiology, deciduous teeth

Introduction

Prevalence of dental trauma is the rate of dental trauma defined as the number of events and children who have experienced dental trauma, in a limited population during a limited period¹⁾. The prevalence of dental trauma has been reported to have a wide variation in different epidemiological studies. This variation may be caused by several different factors such as data collection method, sample selection and the place where the study was conducted²⁾.

The prevalence rate of dental trauma has been reported by authors from several countries. Andreasen reported 30% for the prevalence rate of dental trauma for 3-7 year-old children in Denmark³⁾. Zadik reported 11.1% in Israel for five year old children⁴⁾. Sanchez reported 16.6% for 3-6 year-old children in the Dominican Republic⁵⁾. Foreberg reported 12% for 1-6 year-old children in Sweden⁶⁾. Otuymi reported 30.8% for 1-5 year-old children in Nigeria⁷⁾. Hargreaves reported 15 % for 1-5 year-old children in South Africa⁸⁾. Cunha reported 16.3% for 0-3 year-old children in Brazil⁹⁾. So the prevalence rate of dental trauma for deciduous teeth ranged from 10-30%. These figures were influenced by the country, location, of course, and also varied according to the type of survey method used and definition of dental trauma¹⁰⁾, trauma classification, the dentition studied, geographical and behavioral differences between study locations and countries¹¹⁾. Even socio-economic status, the culture and

education status, and the attitude of parents to their children will affect the prevalence rate of dental trauma remarkably.

The above data were interesting to us for surveying the real status of dental trauma to deciduous teeth in Taiwan. There is insufficient data on the of prevalence rate reported in Taiwan nationwide, so the purpose of this study was to focus on the survey of the prevalence rate of dental trauma for Taiwanese children aged below six years, and which age group has the highest prevalence rate, the gender variation, which teeth are involved and how many teeth will be affected.

Materials and Methods

The sample was extracted from a survey of oral health status for children aged 0-6 years old appointed by the National Bureau of Health Promotion from June, 2004 to May, 2005 in Taiwan. A total sample of 4,620 children was collected by stratified cluster sample design, and Probability Proportion to Size (PPS). The sample examined was 4,037 children, the completion rate was 87.38%.

There were ten items for the oral health status examination such as craniofacial assessment, TMJ function, tooth morphology assessment, dentition status and treatment need, plaque index, gingival status, oral habit(s), occlusal status, orthodontic status and treatment needs. Dental trauma was included in the 4th item, dentition status. Dental trauma was recorded according to the definition of this examination record, only fracture of the enamel, dentin and crown root, discoloration of teeth, infra-occlusal incisors, and unusual rotation of central and lateral incisors which could be diagnosed, were recorded in this study. Concussion, dislocation, root fracture,

Correspondence to Szu-Yu Hsiao, DDS, PhD., Graduate Institute of Oral Health Sciences, College of Dental Medicine, Kaohsiung Medical University, 100, Shih-Chuan 1st Rd., Kaohsiung City, Taiwan, Tel: +886-7-3121101*2272, Fax: +886-7-3233752, E-mail: shunteh@kmu.edu.tw

Table 1: Sample size and age

Gender	N	0 y/o	1 y/o	2 y/o	3 y/o	4 y/o	5 y/o	6 y/o
Boy	2136	4	9	76	279	714	848	206
Girl	1901	1	5	71	226	650	786	162
Total	4037	5	14	147	505	1364	1634	368

Table 2: Prevalence rate of Traumatic Deciduous Teeth in Taiwan (by gender)

Gender	N	Had no trauma		Had trauma	
		N	%	N	%
Boy	2,136	2,112	98.88	24	1.12
Girl	1,901	1,888	99.32	13	0.68
Total	4,037	4,000	99.06	37	0.94

P-value = 0.1481

exfoliation, dento-alveolar fracture, trauma to the oral supporting tissue and those conditions which could not be diagnosed directly were excluded and not recorded.

The oral examination was performed by qualified dentists specializing in pediatric dentistry, from Kaohsiung Medical University Hospital. Training for the oral examination was provided to improve the coordination and reliability of the examiners to enhance the consistency. The examination, using mouth mirror, was carried out under natural light or electric flashlight.

Oral examinations were performed according to the principles and methods of the WHO. Stratified cluster sampling design and PPS were used. A database was designed by Microsoft Access and data were analyzed by statistics software SAS and JMP after data entry. Comparison between categorical variables was performed by using Pearson's chi-square test and between numerical variables by using t-test analysis. Differences at the 5% level of probability were considered statistically significant.

Results

The distribution of age showed that the highest number appeared in the 4 and 5 years old children. There were few children aged 0-

Table 3: Prevalence rate of Traumatic Deciduous Teeth in Taiwan (by ages)

Age	N	Had no trauma		Had trauma	
		N	%	N	%
0	5	5	100.00	0	0.00
1	14	14	100.00	0	0.00
2	147	146	99.32	1	0.68
3	505	499	98.81	6	1.19
4	1,364	1,351	99.05	13	0.95
5	1,634	1,619	99.08	15	0.92
6	368	366	99.46	2	0.54
Total	4,037	4,000	99.06	37	0.94

P-value=0.9738

1 years old in this study to make sufficient representation (Table 1). The prevalence rate of dental trauma to deciduous teeth for the 0-6 year-old children was 0.94%. Boys had 1.12%, and girls 0.68% prevalence rate of dental trauma. There was no significant difference between boys and girls in dental trauma prevalence (Table 2).

Table 4: Prevalence rate of Traumatic Deciduous Teeth in Taiwan (by tooth number)

Tooth number	N	%
None	4,000	99.08
One	30	0.74
Two	7	0.17
Total	4,037	100.00

The prevalence rate of dental trauma by age showed that the highest peak happened at 3 years old (1.19%). Followed by 4 (0.95%) and then 5 year-old (0.92%) children (Table 3).

There was only 0.74% of the deciduous teeth which had one tooth traumatized, 0.17% had two teeth traumatized (Table 4). In our study, there were only seven children, 3 boys and 4 girls, who had two traumatized teeth, their traumatized teeth were maxillary right and left central incisors, 3 children in the 4 year-old group and 2 children in the 5 year-old group and 2 children were in the 3 and 6 year-old group. The most severe dental trauma seems to happen in 4 and 5 year-old children.

In our study, upper central incisors occupied 0.99% prevalence of dental trauma among primary dentition. Upper lateral incisors and lower central incisors only occupied a very small prevalence rate, less than 0.05% (Table 5).

Discussion

Compared to the reported prevalence rate of dental trauma which occurred to children aged below 6 years³⁻⁹⁾, our study showed a low value, it may be caused by the different study and sampling method, different definition of dental trauma and the different care attitude of parents to children, because parents in Taiwan have a tendency to overprotect their children from sport, games, or outdoor activity during childhood.

Cunha RF⁹⁾ reported the prevalence of dental trauma was 62.6% in boys and 37.4% in girls for children aged 0-3 years old. Boys had a higher prevalence rate than girls. In the Larena's study¹²⁾ more boys (61.84%) presented traumatic injuries than girls (38.2%). Andraesen(1994)²⁾ reported the same tendency showing the prevalence rate of dental trauma of boys was higher than girls. In our study, the prevalence rate of dental trauma was 64.86% in

Table 5: Prevalence rate of Deciduous Teeth Trauma in Taiwan (by tooth type)

Tooth type	Had trauma			Had trauma		
	N	N	%	N	%	
53	4,037	0	0.00	83	0.00	
52	4,037	1	0.02	82	0.00	
51	4,037	18	0.45	81	0.00	
61	4,037	22	0.54	71	0.05	
62	4,037	1	0.02	72	0.00	
63	4,037	0	0.00	73	0.00	
Total		42	1.04	Total 2	0.05	

boys and 35.13% in girls. All of these surveys have shown the same tendency.

In a study by Larena del Rosario¹²⁾ of Mexico City children, 2-3 year-old children presented the highest prevalence rate of dental trauma followed by 4-5 and 6-7 year-old children. Kramer¹⁰⁾ reported the largest prevalence rate of dental trauma was demonstrated by 3-4 year-old children, followed by 4-5 year-old children, 5-6 year-old and 2-3 year-old children occupied the third

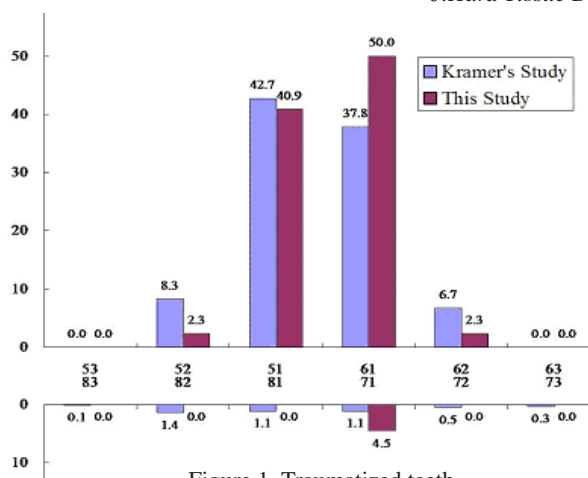


Figure 1. Traumatized teeth

rank. Larena's study, Kramer's, and ours showed that dental trauma occurred more in preschool age, which might suggest that safety in kindergartens should be strengthened. Cunha⁹ reported that children aged 1-2 years old had a high prevalence rate of dental trauma among children aged 0-3 years old. He also reported that 39.9% of children aged 1-2 years old have a high prevalence rate of dental trauma⁹. Therefore, more attention should be paid to protecting 1-2 year-old children from dental trauma.

Bastone (2000)¹³ reported that the number of traumatized deciduous teeth per patient has varied from between 1.1 and 2.0, but this variation could be influenced by the actual trauma being recorded, the classification used and the study location. The studies by Liew, Daly¹⁴ and Martin et al¹⁵, conducted for all age groups from after hours dental clinics, reported more severe trauma occurred to older patients and involved more teeth per patient than had been found in private practice.

The number of traumatized teeth per patient also varied by country and site of the studies. The type of study also affected the frequency of multiple trauma per person. Only one tooth trauma occurred in most studies conducted at school dental services and general clinics. Those studies conducted in hospital departments and after hours clinics observed one and two traumatic teeth in equal proportions, or two teeth or more, frequently combined with more severe dental trauma in after hours clinics and it may also indicate that people attend hospitals rather than dental clinics for more severe dental trauma^{14, 15}. Kramer (2003)¹⁰ reported that single tooth trauma was predominant in all age groups.

In our study, dental trauma occurred mostly in the upper arch, 95.46%, than to the lower arch, 4.54%. In primary dentition, Bastone¹³ reported that the prevalence of dental trauma in the upper arch (89.4%) was greater than in the lower arch (10.6%). Maxillary central incisors were the most frequently involved in both dentitions. In Kramer's study¹⁰, the prevalence of dental trauma occurring in the upper jaw was 95.50%, the lower jaw was 4.50%. That was very similar to our report.

By calculating the percentage of traumatized tooth type in 12 anterior teeth, the upper central incisor, the most occupied definitely, 90.90%, compared to 4.60% in the upper lateral incisor. Lower anterior teeth only occupied a very small amount, 4.50%, in dental trauma. In Kramer's study, the same tendency was observed (Figure 1). Bastone (2000)¹³ also reported that the maxillary central incisors were the most frequently injured teeth in all studies for both the primary and secondary dentition. In most studies, the second most frequently injured teeth were maxillary lateral incisors.

It is obvious that gender, age and history of trauma are important predisposing factors to dental trauma. Large maxillary overjet and

incomplete lip closure also tend to sustain dental trauma.¹³ Galea¹⁶ observed that the severity of injuries appeared to increase when there was an associated injury to the lower lip, while one third of the trauma occurred in subjects with some form of malocclusion. Female subjects with prominent maxillary incisors and incompetent lip closure often had trauma to the supporting structures of the teeth¹³.

Burden¹⁷ observed that subjects with an overjet greater than the normal range (0-3.5mm) were significantly more likely to have received trauma to the maxillary incisors. It also appeared that the prevalence of dental trauma in females increased as the overjet increased. Dearing¹⁸ and Hunter et al¹⁹ also observed a significant difference in the frequency of fractured incisors between patients with an increased overjet.

Hamilton et al¹¹ observed that significantly more children in the lower socio-economic groups have more dental trauma compared with the higher socio-economic groups, while Onetto et al²⁰ observed that a high percentage of patients with dental trauma complain about previous dental trauma.

Conclusions

In summary, although our study, compared to other studies, showed a low prevalence rate of dental trauma to children aged below 6 years in Taiwan, it may be caused by different study and sampling method, different definition of dental trauma, and different care attitude of parents to children. The gender variation, age distribution, jaw and tooth type difference have shown a close similarity to other reports. Considering the high frequency of dental trauma which occurs in 3-5 year-old children, an age when children attend kindergarten, the safety of the kindergartens and the prevention of dental trauma to deciduous teeth should be considered. The cause of dental trauma, the place where the dental trauma occurs to the children and other factors which we did not cover in this study should be surveyed in the near future.

References

1. Last JM. A dictionary of epidemiology. 3rd edition. Oxford: Oxford University Press; 1995.
2. Andreasen JO, Andreasen FM. Textbook and color atlas of traumatic injuries to the teeth. 3rd edition. Copenhagen: Munksgaard, pp.771; 1994.
3. Andreasen JO, Ravn JJ. Epidemiology of traumatic dental injuries to primary and permanent teeth in a Danish population sample. *Int J Oral Surg* 1: 235-239; 1972.
4. Zadik D. A survey of traumatized primary anterior teeth in Jerusalem preschool children. *Community Dent Oral Epidemiol* 4: 149-151; 1976.
5. Sanchez JR, Sanchez R, Garcia-Godoy F. Traumatic injuries of the anterior teeth in preschool children. *Acta Odontol Pediatr* 2: 17-23; 1981.
6. Forsberg CM, Tedestam G. Traumatic injuries to teeth in Swedish children living in an urban area. *Swed Dent J* 14: 115-122; 1990.
7. Otuyemi OD, Segun-Ojo IO, Adegboye AA. Traumatic anterior dental injuries in Nigerian preschool children. *East Afr Med J* 73: 604-606; 1996.
8. Hargreaves JA, Cleaton-Jones PE, Roberts GJ, Williams S, Matejka JM. Trauma to primary teeth of South African preschool children. *Endod Dent Traumatol* 15: 73-76; 1999.
9. Cunha RF, Pugliesi DM, de Mello Vieira AE. Oral trauma in Brazilian patients aged 0-3 years. *Dent Traumatol* 17: 210- and the extent and adequacy of treatment received. *Br Dent J* 182: 91-95; 1997.
10. Kramer PF, Zembruski C, Ferreira SH, Feldens CA. Traumatic dental injuries in Brazilian preschool children. *Dent Traumatol*

- 19:299-303; 2003
11. Hamilton FA, Hill FJ, Holloway PJ. AN investigation of dent-alveolar trauma and its treatment in an adolescent population. Part 1: The prevalence and incidence of injuries and the extent and adequacy of treatment received. *Br Dent J* 182: 91-95; 1997
 12. Llarena del Rosario ME, Acosta Alfaro VM, Garcia-Godoy F. Traumatic injuries to primary teeth in Mexico City children. *Endod Dent Traumatol* 8: 213-214; 1992.
 13. Bastone EB, Freer TJ, McNamara JR. Epidemiology of dental trauma: a review of the literature. *Aust Dent J* 45: 2-9; 2000.
 14. Liew VP, Daly CG. Anterior dental trauma treated after-hours in Newcastle, Australia. *Community Dent Oral Epidemiol* 14: 362-366; 1986.
 15. Martin IG, Daly CG, Liew VP. After-hours treatment of anterior dental trauma in Newcastle and western Sydney: a four-year study. *Aust Dent J* 35: 27-31; 1990.
 16. Galea H. An investigation of dental injuries treated in an acute care general hospital. *J Am Dent Assoc* 109: 434-438; 1984.
 17. Burden DJ. An investigation of the association between overjet size, lip coverage, and traumatic injury to maxillary incisors. *Eur J Orthod* 17: 513-517; 1995.
 18. Dearing SG. Overbite, overjet, lip-drape and incisor tooth fracture in children. *N Z Dent J* 80: 50-52; 1984.
 19. Hunter ML, Hunter B, Kingdon A, Addy M, Dummer PM, Shaw WC. Traumatic injury to maxillary incisor teeth in a group of South Wales school children. *Endod Dent Traumatol* 6: 260-264; 1990.
 20. Onetto JE, Flores MT, Garbarino ML. Dental trauma in children and adolescents in Valparaiso, Chile. *Endod Dent Traumatol* 10: 223-227; 1994.