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Assessment of dental trauma among cerebral palsy individuals in Udaipur city

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Abstract – *Objective*: (i) To assess the prevalence of traumatic dental injuries (TDI) in individuals with cerebral palsy and its possible relationship with type of palsy at Udaipur city, Rajasthan, India. (ii) To assess the prevalence of temporomandibular joint symptoms in cerebral palsy individuals. *Materials and methods*: The total sample comprised of 281 cerebral palsy individuals in the age group of 10–35 years. Clinical examination for dental trauma was performed on the basis of Andreasen & Andreasen classification (1994). Chi-square test, multiple logistic and stepwise linear regression analyses were carried out to find out the relationship between cerebral palsy individuals with different independent variables. *Results*: Findings of the study indicated that there was highest prevalence of TDI in cerebral palsy patients with hemiplegia (40.6%) (P = 0.00). Stepwise and multiple logistic regression analyses showed that the best predictors for dental traumatic injuries was overjet and type of cerebral palsy. *Conclusion*: It was concluded that hemiplegic cerebral palsy patients were most prone to TDI.

Cerebral palsy is defined as a non-progressive disorder that manifests as abnormality of motion and posture, and results from a central nervous system injury sustained in the early period of brain development, usually defined at first 3–5 years of life (1). The cause of cerebral palsy is unknown in 50% of the cases, and prematurity remains the most frequent risk factor. Children with cerebral palsy suffer from multiple problems and potential disabilities such as mental disabilities, feeding difficulties, ophthalmologic, and hearing impairments. Epilepsy is also a common finding in patients with cerebral palsy (2, 3). Advances in perinatology may lead to increasing survival of preterms and a change in the distribution of clinical types of cerebral palsy (4, 5).

Cerebral palsy is traditionally classified by motor type and topographical distribution. A classification based on motor type might include the terms spastic, dyskinetic, ataxic, hypotonic, and mixed. The most commonly used terms in classifications of topographical distribution are hemiplegia, diplegia, and quadriplegia, but the terms monoplegia, paraplegia, triplegia, double hemiplegia, and tetraplegia are also used (6). Until recently, the severity of cerebral palsy was described in subjective terms such as mild, moderate, and severe. The gross motor function classification system is a simple five-level, ordinal grading system to describe gross motor function in patients with cerebral palsy (7).

In dentistry, several important aspects, such as ability to maintain oral hygiene, caries, and periodontal conditions, have been discussed in individuals with cerebral palsy (8–13). Nevertheless, the dental literature presents only a few studies evaluating the prevalence of dental trauma in children with different kinds of disabilities (14, 15) or cerebral palsy. In a study by Holan et al., 68 subjects with cerebral palsy were evaluated to assess dental trauma. The study reported that 57% of these patients had signs of trauma to their permanent teeth. The author emphasized the importance of alerting caregivers to carry out a careful investigation of the events that resulted in dental injuries to individuals and disabilities. The author also suggested several ways to reduce dental trauma (16). In one study, dental injuries were detected in 18% of children 5–15 years old. This was higher than the prevalence of dental injury (11%) in a group of healthy children (15). In another study, 28.8% of the children with handicaps had traumatized their teeth (14).

Traumatic injuries to the dental tissues and supporting periodontal structures might cause functional, emotional, and esthetic impairments that will require immediate and case-specific management by the dentist. Thus, the objectives of the study were to assess the prevalence of traumatic dental injuries (TDI) in individuals with cerebral palsy and its possible relationship with type of palsy and to assess the prevalence of temporomandibular joint (TMJ) symptoms in cerebral palsy individuals.

Materials and methods

Study design

A cross-sectional descriptive survey was conducted among 281 cerebral palsy individuals in the age range of 10–35 years visiting the special care hospital (Narayan Seva Sansthan) at Udaipur city during August to September 2010.

Ethical approval

Before the commencement of the study, ethical approval was obtained from the ethical committee of the Pacific Dental College and Hospital, Udaipur, Rajasthan.

Informed consent

Written informed consent was obtained from the authorities of the hospital and also from the guardians of the patients at the hospital.

Proforma details

The proforma was pilot tested on 20 subjects. The intraexaminer reliability for recordings ranged from 0.89 to 0.96. Prior to the intraoral examination, lip coverage of the incisor teeth was assessed for each participant. If the lips covered the upper incisors in the rest position, then the lip coverage was considered to be adequate, and if the lips failed to cover the upper incisors, exposing majority of their crown height, then it was recorded as inadequate. Maxillary incisor overjet measurement and TMJ examination were also performed (17). Next, all maxillary and mandibular permanent teeth from canine to canine were examined for traumatic injury. Trauma was scored according to Andreasen & Andreasen classification (1994), which is based on classification system adopted by the World Health Organization (WHO) (18).

Schedule of the survey

All the patients visiting the outpatient department of the special care hospital from August to September 2010 were reviewed for potential enrollment in the study.

Methodology

On the predecided days, the investigator visited the special care hospital. The purpose of the study was informed and explained to the participants and their guardians, and consent was obtained. The subjects were interviewed to obtain information in the questionnaire and were examined clinically. Clinical examination (type III) was carried out in the wards of special care hospital under adequate natural light using mouth mirror, explorer, and CPI probe.

Statistical analysis

Data were analyzed using the STATISTICAL PACKAGE FOR SOCIAL SCIENCES version 15.0 software (SPSS Inc., Chicago, IL, USA). Chi-square test, stepwise linear multiple regression, and multiple logistic regression were used for comparisons.

Results

Table 1 shows distribution of study subjects according to age, gender, overjet, lip coverage, and TMJ symptoms. Among the total 281 participants, 79 were diplegic, 134 were hemiplegic, and 68 were quadriplegic. There were 168 (59.8%) subjects with TMJ symptoms.

Table 1. Distribution of study subjects

	Type of cerebral palsy						
	Diplegia n (%)	Hemiplegia n (%)	Quadriplegia n (%)				
Age group (years	6)						
10–15	10 (12.7)	18 (13.4)	11 (16.2)				
16–20	19 (24.1)	55 (41)	29 (42.6)				
21–25	39 (49.4)	50 (63.3)	18 (26.5)				
26-30	7 (8.9)	9 (6.7)	6 (8.8)				
31–35	4 (5.1)	2 (1.5)	4 (5.9)				
Sex							
Male	44 (55.7)	61 (45.5)	39 (57.4)				
Female	35 (44.3)	73 (54.5)	29 (42.6)				
Overjet							
≤3 mm	40 (50.6)	34 (25.4)	23 (33.8)				
>3 mm	39 (49.4)	100 (74.6)	45 (66.2)				
Lip coverage							
Competent	49 (62)	46 (34.3)	46 (67.6)				
Incompetent	13 (16.5)	44 (32.8)	16 (23.5)				
Potentially incompetent	0 (0)	19 (14.2)	6 (8.8)				
Everted	17 (21.5)	25 (18.7)	0 (0)				
TMJ symptoms							
Yes	50 (63.3)	78 (58.2)	40 (58.8)				
No	29 (36.6)	56 (41.2)	28 (41.2)				
Total (<i>n</i> = 281)	79 (100)	134 (100)	68 (100%)				

Table 2 shows that prevalence of treated dental injury was significantly highest among hemiplegic patients (n = 18, 13.4%) followed by diplegic (n = 4, 5%) and quadriplegic patients (n = 0). A similar pattern was also observed in missing tooth because of injury, but the prevalence of pulp injury was significantly highest among quadriplegic individuals (n = 9, 11.9%) followed by diplegic (n = 4, 5.9%).

Table 3 shows stepwise linear multiple regression analysis, which was executed to estimate the linear relationship between TDI as a dependent variable and various independent variables. The best predictors in the descending order for traumatic injuries were overjet and type of cerebral palsy. The variance obtained for overjet and type of cerebral palsy were 20.6% and 27.9%, respectively.

Table 4 reveals that the TDI in individuals with cerebral palsy were higher among hemiplegia compared with diplegia and quadriplegia. TDI were higher among the subjects having overjet >3 mm compared with subjects having overjet <3 mm.

Discussion

This study assessed the prevalence of TDI in individuals with cerebral palsy and its possible relationship with type of palsy in a sample of 281 subjects. The overall prevalence of TDI was found to be 57.7%, which was higher than the prevalence obtained for healthy individuals in the study by Shyama et al. (19) and for handicapped individuals in the study by Nunn & Murray (14).

Table 2.	Prevalence	of	traumatic	dental	in	iuries	by	different	tv	pes	of	cerebral	pal	sv
									/	P			P	~ ./

	Type of palsy						
Scores	Diplegia	Hemiplegia	Quadriplegia	Total	χ^2	<i>P</i> -value	
No injury							
А	79 (100)	134 (100)	68 (100)	281 (100)	69.555	0.000	
В	869	1485	750	3104			
Treated dental	injury						
А	4 (5)	18 (13.4)	0	22 (7.82)	13.986	0.007	
В	8	22 ΄	0	30			
Enamel fractur	e only						
А	21 (26.6)	61 (45.5)	14 (20.6)	96 (34,2)	29.222	0.000	
В	34	72	22	128			
Enamel/dentin	fracture						
А	10 (12.3)	33 (24.6)	18 (26.5)	81 (21.7)	5.386	0.068	
В	18	44	26	88			
Pulp iniury							
Α	4 (5 9)	0	9 (11 9)	13 (1 6)	14 94	0 001	
В	7	0	18	25		01001	
-		-					
Missing becau	se of injury						
A	7 (8.9)	16 (11.9)	0	23 (8.2)	8.624	0.001	
В	12	21	0	34			
Excluded							
Δ	0	0	0	0	_	_	
D	0	0	0	0	_	_	

Table 3. Stepwise linear multiple regression with dental traumatic injuries as the dependent variable

Model	R	R^2	F	Р			
1 2	0.454 0.528	0.206 0.279	72.372 35.729	0.000 ¹ 0.000 ²			
¹ Predictors: (Constant) Overjet. ² Predictors: (Constant) Overjet, type of cerebral palsy.							

Table 4. Odds Ratio (OR) and 95% confidence interval (CI) for traumatic dental injuries according to multiple logistic regression

Independent variable	OR (CI)	<i>P</i> -value
Sex Male vs female	0.327 (0.374–1.390)	0.328
Age Younger vs older	0.375 (0.756–2801)	0.262
Overjet More than 3 mm vs <3 mm	2.157 (4.104–18.203)	0.000
Lip coverage Competent vs incompetent	0.225 (0.126-0.557)	0.345
Type of cerebral palsy Diplegia vs Hemiplegia vs Quadriplegia	1.771 (0.072–0.405) 2.964 (0.022–0.123) 0	0.000

In the present study, significant correlation was found between TDI and type of cerebral palsy. The total prevalence of enamel or enamel-dentin fracture was found to be 62.9%, which is less than the findings of the study by Costa et al. (84.9%) (20). This observation may be due to difference in the age group of both studies. As healthy children maintain an unrestricted lifestyle, they may injure their teeth during bicycle riding, contact sports, and other dynamic activities. Such activities can be ruled out as potential hazards for children and adolescents with cerebral palsy whose ambulation activity is limited. However, inability of individuals with cerebral palsy to control abrupt body movements may be a predisposing factor that increases the risk of traumatic injuries to the teeth. In individuals with cerebral palsy, injuries occurred indoors because of falls and involuntary head movements. Falls were associated with loss of balance while attempting to move from the wheel chair to bed or bathtub or lavatory seat.

Crown fractures with pulp exposure were most commonly seen in quadriplegic individuals in our study, which may be due to the fact that both of their upper and lower limbs are affected, which makes it more difficult for them to perform various day to day activities without assistance, thereby making them more prone to severe TDI. In diplegic and hemiplegic individuals, at least one or more of their limbs are active, which may support them during any falls or collisions and may reduce the severity of the injury. Tooth missing because of injury was highest among hemiplegic individuals because of highest mobility shown by this group. As seen in the studies of normal individuals, the present study also revealed that the risk of injury to anterior teeth increased significantly with increase in incisal overjet (21, 22).

The prevalence of TDI in a group of individuals with cerebral palsy was found to be much higher than that of healthy populations, despite the fact that cerebral palsy individuals do not take part in violent sport activities as healthy children do. This should alert caregivers to carry out a profound investigation of the events that result in dental injuries in disabled individuals and seek for preventive measures such as mouthguards, padding hard objects that have the potential of harming the teeth, and safe transportation of the children in wheel chairs. Prevalence of TMJ symptoms was found to be higher among cerebral palsy patients in the present study, which is in correlation with the findings of the study by Bhowate & Dubey (23). Regression analysis also displayed type of cerebral palsy as a predictor for dental traumatic injuries, suggesting highest prevalence of TDI in hemiplegic individuals followed by diplegic and quadriplegic individuals. This difference may be attributed to the greater mobility of the hemiplegic individuals than the diplegic and quadriplegic group.

Conclusion

Hemiplegic cerebral palsy patients were found to be most prone to TDI. It is important to establish awareness programs to stimulate parents/caregivers to adopt preventive measures as well as to instruct them on how to manage TDI to provide timely treatment, which will improve the prognosis for the traumatized teeth.

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