

Oral Health Status among Children with Cerebral Palsy in Dubai, United Arab Emirates

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ABSTRACT

Objectives: The purpose of this study was to assess the oral health status of children with cerebral palsy (CP) in Dubai, United Arab Emirates (UAE).

Materials and Methods: Eighty-four CP and 125 healthy children were recruited from special needs centers and private/public schools in Dubai. A dental examination for decayed-missing-filled teeth in primary dentition (dmft)/Decayed-Missing-Filled teeth in permanent dentition (DMFT) indices, simplified oral hygiene index, calculus index (CI), and oral debris index was conducted. In addition, assessments of occlusal, dentofacial, soft tissue anomalies and erosion were conducted. Statistical analysis was conducted using SPSS for Windows, version 20.0 (SPSS Inc., Chicago, IL, USA).

Results: DMFT/dmft scores were comparable in both groups. CI was significantly higher among children with CP. CP patients had a significantly higher proportion of anterior open bite, anterior spacing, Class II molar Angle malocclusion, trauma, high-arched palate, tongue thrust, lymphadenopathy, angular cheilitis, macroglossia, drooling, and erosion as compared to controls.

Conclusions: The study highlighted peculiar characteristics and needs for the CP patients in Dubai, UAE.

KEYWORDS: Caries prevalence, cerebral palsy, occlusal anomalies, oral conditions

INTRODUCTION

Cerebral palsy (CP) is a group of neuromuscular disorders affecting the development of movement and posture, causing activity limitations. Disturbances to the development of the infant brain including infection, trauma, hypoxia, and hyperbilirubinemia in addition to genetic and biochemical factors will cause these limitations in muscular activity.^[1]

Associated disturbances to sensation, cognition, perception, communication, and seizure disorders are frequently observed in CP patients in addition to the motor disorders.^[2]

CP is the most common motor disability occurring during childhood.^[3] The prevalence of CP around the world ranges from 1.5 to >4/1000 live births^[4] in the developed countries.

To an estimated 1.5–5.6 cases per 1000 live births in the developing world,^[4] there are no available studies to indicate the prevalence of CP in the United Arab Emirates (UAE).

Several studies concluded that patients with CP have numerous oral health problems.^[5] Neuromuscular disturbances can affect oral health significantly; they may result in changes of the orofacial region's structure and may affect the development of parafunctional habits, including feeding problems, difficulty maintaining oral hygiene (OH), and barriers to oral care access.

According to several authors, people with CP are reported to have poor OH, increased incidence of bruxism,^[6,7] drooling,^[8] traumatic dental injuries, and malocclusion.^[9-11]

Reports in the literature are conflicting regarding the dental caries experience of this group of individuals

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compared to the normal population. Some authors reported an increased prevalence, others report a decreased prevalence, while some reported no difference.^[7,12-16]

In addition, some studies found higher prevalence of gingivitis in CP children compared with healthy children.^[6,17]

To date, there has been only one study conducted in Sharjah, UAE, but none in Dubai assess the oral health of children with CP.^[18]

Therefore, the aim of this study was to assess the oral health status among children with CP compared with control subjects in Dubai, UAE.

MATERIALS AND METHODS

A quantitative case-control study design was used to compare oral health characteristics of CP children with that of healthy controls in Dubai. The study consisted of a census sample of all CP individuals enrolled in special needs centers located in Dubai aged 4–18 years whose parents consented to their contribution in the examination. The controls were healthy children from both governmental and private schools, located in the same geographic region as the special needs centers in Dubai. The controls were matched to the CP group in both age and gender and chosen by a stratified random sampling technique. Uncooperative children who did not allow an examination were excluded.

Sample size calculation was performed based on Cochran sample size equation. Our calculation depended on the prevalence of caries among CP among in a comparable community in the UAE. Using the data reported in a previous study of CP in the UAE^[18] and assuming a 20% nonresponse rate, the calculations yielded a working sample size of 82. The total sample size projected was 82 CP and 82 healthy children.

After obtaining the appropriate ethical approval from the Research and Ethics Committee of the Dubai Healthcare City dated March 26, 2014, and parental consents for examinations, data were collected using coded data sheets between September 1, 2014, and December 31, 2014. Dental examinations were conducted by two principal investigators calibrated and tested for intra- and inter-examiner reliability with Kappa statistical analysis revealing 80% agreement.

The following indices were used: Angle malocclusion classification,^[19] caries index: decayed-missing-filled teeth in primary dentition (dmft)/decayed-missing-filled teeth in permanent dentition (DMFT) using WHO criteria, met need index (MNI), that is M + F/DMF, and restorative index (RI), that is F/F + D percent (%),

and erosion index modified by Walker *et al.*^[20] For OH status, simplified OH index of Greene and Vermillion^[21] was used, and for primary dentition, a separate record was done where the presence of gingivitis, calculus, and debris was marked as either present or absent.

Data were entered into a computer, using SPSS for Windows, software version 20.0 (SPSS Inc., Chicago, IL, USA). Numerical data were tested for normality using the Kolmogorov–Smirnov test. A cross-tabulation was used to examine the appropriate, in independency between categorical variables, and statistical analysis to test association was performed using Chi-square and Fisher’s exact tests. Where two or more continuous independent variables were examined, *t*-test, analyses of variance, Mann–Whitney, and Kruskal–Wallis test were used. $P < 0.05$ was considered significant in all statistical analysis.

RESULTS

STUDY SAMPLE CHARACTERISTICS

The demographical data about the nationality, gender, dentition, and age of the 84 children with CP and the 125 healthy controls are shown in Table 1.

DENTAL CARIES

Prevalence

The overall prevalence of dental caries among children with CP was 53% (44/84) while the healthy controls had a prevalence of 57.6% (72/125). The prevalence of caries in the primary teeth among children with CP was 58.9% (33/56), while for the healthy control, it was 70.5% (62/88). In the same context, the prevalence of caries in the permanent teeth among children with CP was 25.4% (16/63), while for the healthy controls, it was 17.9% (20/112).

Decayed-missing-filled teeth in permanent dentition/decayed-missing-filled teeth in primary dentition caries index

Tables 2 and 3 demonstrate the caries status of the sample population. No statistically significant difference

Table 1: Demographic characteristics and type of dentition among children with cerebral palsy and healthy subjects

Items	Categories	Control, n (%)	CP, n (%)	Total, n (%)
<i>n</i>		125	84	209
Nationality	Local Emirati	85 (68)	36 (42.9)	121 (57.9)
	Expatriate	40 (32)	48 (57.1)	88 (42.1)
Gender	Male	55 (44)	51 (60.7)	106 (50.7)
	Female	70 (56)	33 (39.3)	103 (49.3)
Dentition	Primary	13 (10.4)	23 (27.4)	36 (17.2)
	Permanent	36 (28.8)	27 (32.1)	63 (30.2)
	Mixed	76 (60.8)	34 (40.5)	110 (52.6)
Age	Average±SD	9.30±2.68	9.33±3.89	9.31±3.20

CP=Cerebral palsy, SD=Standard deviation

was found in the DMFT/dmft indices between CP and control groups.

The restorative care and the treatment received in both study groups and control groups were represented by the RI and the MNI. Looking at different age and dentition groups, CP children in the mixed dentition group had the lowest RI and MNI scores as compared to permanent and primary dentition as shown in Tables 2 and 3.

ORAL HYGIENE STATUS

OH index score was calculated for children in the mixed and permanent dentition groups, with no significant difference found between CP children compared with controls (1.68 ± 1.34 vs. 1.42 ± 1.14). Calculus index (CI) was found to be significantly higher among children with CP 0.56 ± 0.78 compared with controls 0.07 ± 0.27 ($P < 0.001$).

The proportion of gingivitis was found to be comparable between children with CP and the control group, at 58.8% and 70.4%, respectively ($P = 0.076$).

OCCUSAL ANOMALIES AND TRAUMATIC DENTAL INJURIES

The differences in Angle molar classification between CP and control groups are summarized in Figure 1. It is worth noting that the proportion of Class III was found to be significantly higher among healthy controls 14 (12.7%) compared with children with CP 3 (5.3%) ($P < 0.001$). Children with CP demonstrated significantly higher proportions of high arched palate at 79 (96.3%) versus 42 (33%) ($P < 0.001$).

As for other occlusal anomalies and traumatic dental injuries, the data collected for both the CP and the control groups are summarized in Table 4.

ORAL SOFT TISSUES' ANOMALIES

Children with CP had a significantly higher proportion of angular cheilitis 21 (25.6%), compared with zero in healthy controls, and higher proportion of macroglossia

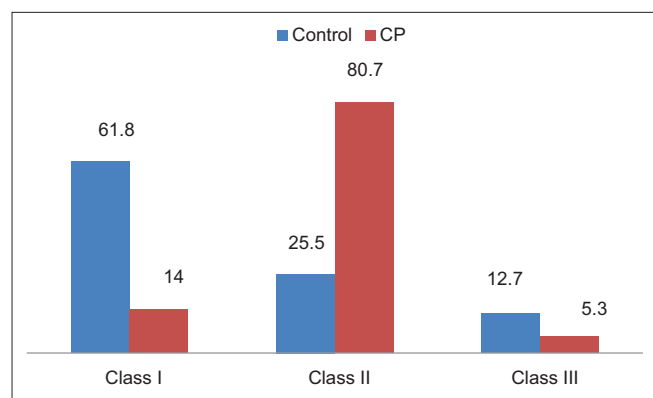


Figure 1: Percentage of distribution of permanent molar Angle classification in cerebral palsy and control

49 (59.8%), compared with zero among healthy controls. Further, children with CP had higher proportions of drooling 72 (87.8%) compared with zero among healthy controls, tongue thrust 26 (31.7%) versus 2 (1.6%), respectively ($P < 0.001$ for the above anomalies).

EROSION

According to the pyramid graph [Figure 2], the severity of erosion was significantly higher among CP children compared to healthy controls ($P < 0.001$). The proportion of CP children with erosion was 42.7% versus 15.2% in the control group. While the percentage of CP children with erosion into enamel was 24.4% (20/82) compared to 11.2% (14/125) in the control group, the percentage of erosion into enamel and dentine was 15.9% (13/82) in CP children versus 4% (5/125) in healthy children. In addition, the percentage of severe erosion, extending into

Table 2: Caries status (decayed-missing-filled teeth), restorative index, and met treatment index (mean values in both permanent and mixed dentition)

	Controls (n=125)	CP (n=83)	P
DMFT index	2.16±2.89	2.83±2.86	0.180
Filled	0.22±0.61	0.53±2.04	0.143
RI*	4.7	1.9	-
MNI**	0.24	0.32	-

*RI=F/F + D, **MNI=M + F/DMF. DMFT=Decayed-missing-filled teeth, RI=Restorative index, MNI=Met need index, CP=Cerebral palsy

Table 3: Primary dentition caries status, restorative index and met treatment index

Primary dentition	Control (n=13)	CP (n=23)	P
dmft index	2.69±3.00	4.04±5.46	0.415
RI	0.03	0.02	-
MNI	0.03	0.23	-

dmft=Decayed-missing-filled teeth, RI=Restorative index, MNI=Met need index, CP=Cerebral palsy

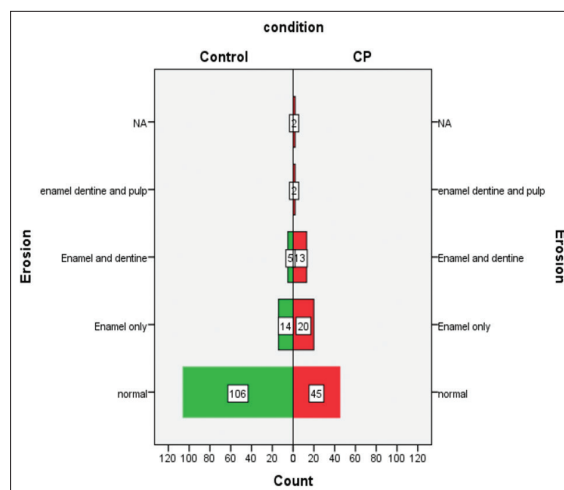


Figure 2: Erosion severity in cerebral palsy children and control group

Table 4: Occlusal anomalies and traumatic dental injuries in cerebral palsy children and control

Anomaly	Control (%)	CP (%)	P
Vertical			
Open bite	14 (11.2)	25 (29.3)	0.001*
Deep bite	23 (18.4)	20 (33.2)	0.254
Transverse			
Cross bite	35 (28)	21 (25)	0.341
Scissor bite	3 (2.4)	4 (3.7)	0.448
Spacing			
Anterior spacing	40 (32)	42 (50)	0.007*
Posterior spacing	10 (8)	8 (8.5)	0.542
Crowding			
Anterior crowding	35 (28)	20 (33.2)	0.272
Posterior crowding	4 (3.2)	11 (12.2)	0.013*
Trauma	4 (3.2)	27 (31.7)	0.001*

*Statistically significant. CP=Cerebral palsy

dentine and pulp, was 0% in the control group compared to 2% (2/82) in CP group.

DISCUSSION

This study provided an opportunity to assess the oral health problems among children with CP in Dubai, an area that has never been investigated before.

DENTAL CARIES

In this study, there was no statistically significant difference in caries experience presented by the dmft and the DMFT between CP children and healthy controls as measured by DMFT/dmft in all age groups. Significantly higher DMFT in CP patients was reported in a study in Sharjah, UAE.^[18]

In a 1991 study, the prevalence of caries was reported to be lower among children with CP compared to healthy controls.^[22] This was consistent with the present study findings, where the prevalence of caries was found to be lower in CP children compared to healthy controls.

Among the studied, CP children MNI and RI were lower compared with healthy control subjects in mixed and permanent dentition. These results indicate the higher need of dental services for this vulnerable group of patients. However, in primary dentition, MNI was higher in CP children compared with healthy control subjects. Kakaounaki reported that 82% of dental interventions in children with disabilities are extractions.^[23]

ORAL HYGIENE STATUS

Periodontal disease and poor OH represent significant problems for special needs children. No difference was found in OH index between our study and control groups.

The CI was found to be significantly higher among children with CP compared with healthy controls. The

higher calculus in CP patients may be attributed to the high calcium content in their saliva.^[24]

Due to challenges with patient cooperation in the study group and the limited time available for performing the examination, our study did not measure any parameter for periodontal disease such as the basic periodontal examination (BPE).^[25]

OCCUSAL ANOMALIES

In the present study, CP patients had significantly higher proportion of anterior open bite. Carmagnani *et al.* reported that anterior open bites were significant in CP patients with double hemiplegia (64%).^[26] In relation to spacing between teeth, it was found that the proportion of anterior spacing was significantly higher among children with CP.

For crowding, the data revealed that the proportion of posterior crowding was significantly higher among children with CP compared to healthy controls. Folakemi found that spacing of the anterior segment was more prevalent in CP group compared to healthy control.^[27]

In this study, the proportion of trauma was found to be significantly higher among children with CP compared with that of healthy controls. This is due to certain factors which predispose CP population to dental trauma including high prevalence of Class II malocclusion with prominent maxillary incisors, incompetent lips, struggle in ambulation, and increased incidence of seizures.^[3] Incidence of dental trauma among CP population was found to be as high as 57% in one study.^[28]

It is well established that Class II malocclusion is more common in CP children due to hypotonia of the orofacial musculature and forward thrust of the tongue.^[6,7] This typical pattern of malocclusion was confirmed in our study, where CP patients had significantly higher Class II malocclusions compared to controls.

ORAL SOFT TISSUES

The CP sample in this study had significantly higher proportions of macroglossia, angular cheilitis, and drooling compared to healthy controls. Drooling was found in 87.8% of CP children in this study. It was reported in a previous that drooling affects up to 58% of children with CP.^[29]

EROSION

In this study, the severity of erosion was significantly higher among CP children compared to healthy control. The dental practitioner may be able to minimize erosion in CP patients through preventive measures, such as application of a fluoridated solution.^[30]

The study design was sound and the sample size was higher than the sample size power calculation; numerous

important indices were measured for the study and control group. The majority of dental and soft tissue anomalies previously reported to be higher in CP patients were also recorded. The data collection process was standardized, calibrated, and organized.

Only CP children in special needs schools and centers were invited to participate in the study. CP children who are raised at home were out of reach and could not be tracked. This may have affected our results.

Our study did not measure any parameter for periodontal disease such as the BPE due to challenges with patient cooperation in the study group and the limited time available for performing the examination.

CONCLUSIONS

Caries experience was similar between the CP and the control subjects.

CP patients had significantly higher CI than healthy children.

CP patients had significantly higher proportions of Class II molar relationship, anterior open bite, anterior spacing, and trauma to anterior teeth.

Soft tissue findings in the CP group revealed significantly higher frequencies of angular cheilitis, macroglossia, and drooling.

The severity of erosion was significantly higher among CP patients compared to healthy controls.

The authors suggest investigating and improving the healthcare system provided for CP children, including general anesthesia facilities. Parental/caregiver oral health awareness programs are essential for prevention of oral disease in this group of patients. The authors also suggest establishing a data registry for children with CP in the UAE. This will help in epidemiological studies and the provision of comprehensive oral health care for these children.

Currently, no systematic review is available to measure the oral health status of CP patients. The conduction of such a review will provide essential high-quality evidence in this area.

A similar study conducted in all the Emirates of the UAE is recommended to give a more comprehensive picture. Inclusion of the periodontal status of the CP patients in the clinical examination would shed light on this important oral health issue.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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