

## Assessment of Oral Health Status of Children with Cerebral Palsy

Hend Seif El Din<sup>1</sup>, Basma Gamal<sup>2</sup>, Rasha Asklany<sup>3</sup>, Gehan Allam<sup>4</sup>

<sup>1</sup> MSc student at the Pediatric Dentistry & Dental Public Health Department, Faculty of Dentistry, Ain Shams University, Cairo, Egypt.

<sup>2</sup> Lecturer at Pediatric Dentistry and Dental Public Health Department, Faculty of Dentistry, Ain-Shams University, Cairo, Egypt.

<sup>3</sup> Pediatric Fellow, Vice manager for technical affairs at National institute of neuromotor system, General organization of teaching hospitals and institutes and Pediatric MD, Egypt

<sup>4</sup> Associate Professor of Pediatric Dentistry and Dental Public Health, Faculty of Dentistry, Ain shams University, Cairo, Egypt.

---

### Abstract:

**Objectives:** evaluating the oral health status of cerebral palsied children in Egypt in the terms of caries experience and dental anomalies.

**Subjects and Methods:** 102 cerebral palsied children, categorized into three age groups (3-6 years for primary dentition, 6-12 for mixed dentition and above 12 for permanent dentition) were diagnosed. Data were gathered through a face to face interview using a questionnaire and clinical examination. The questionnaire was used to assess socio-economic characteristics, medical history, previous dental visits, oral health habits and dietary habits. Clinical examination evaluated caries experience using DMFT/dmf/ def index for permanent, primary and mixed dentitions respectively and dental anomalies.

**Results:** The dmft/deft/DMFT indices' mean value for cerebral palsied children with carious teeth were 5.88±4.37, 4.19±2.42, 2±2.18 respectively.

**Conclusion:** Children with CP exhibited inadequate oral health status as reflected by substandard oral hygiene habits with high dental caries prevalence as well. Thus efforts should be concerted among parents/caregivers, children, and dental professionals to improve the suboptimal oral health of those children.

**Keywords:** Cerebral Palsy, caries, dental anomalies, bruxism, tongue thrust and malocclusion.

---

Date of Submission: 02-07-2024

Date of Acceptance: 13-07-2024

---

### I. Introduction:

Pediatric dentistry is the only branch of all the specialists that cares about patients with special needs, patients with cerebral palsy are among those children <sup>(1)</sup>

Cerebral palsy (CP) occurs due to unprogressive neurological disruption of the immature brains of infants and during pregnancy resulting in permanent movement and posture disorders. The actual causes are diverse, may be prenatal, perinatal or postnatal <sup>(2,3)</sup>

Prenatal such as anoxia and prematurity and postnatal such as meningoencephalitis infections with higher risks between twins. Moreover, genetic basis has been reported for some patients <sup>(4,5)</sup>

CP may be spastic, dyskinetic, ataxic or combination according to the type of motor symptoms and according to the count of the affected extremities it is termed hemiplegia, diplegia, tetraplegia or quadriplegia. Spastic type is the most predominant one (66-82%) <sup>(6)</sup>

There are some problems that may be associated with CP as speech problems, epilepsy, mental impairment, visual and hearing disorders <sup>(7)</sup>

The prevalence is still not well known as unfortunately it is undiagnosed early until childhood <sup>(8)</sup> CP, as a disease, does not cause exclusive intra oral defects, but there are several conditions that occur more likely and more markedly in patients with CP when compared with other normal individuals <sup>(9)</sup>. Most of the problems occur due to the inherent neuromuscular defects leading to lack of lip seal, malocclusion, mouth breathing and drooling of saliva which explain the dental difficulties faced in these patients <sup>(10,11)</sup>.

Studies have showed that, the increased risk of oral disease resulting according to the severity of the neurological damage. Cerebral palsied children usually have coordinative, intelligence, physical, sensory, cognitive and communication problems in doing self-care performances of activities of daily living (ADLs), such as showering, teeth brushing, walking, eating, wearing clothes and ambulating. These problems severely affect their ADLs, resulting in poor oral health condition as high caries index, massive periodontal inflammation

as well as decreased number and frequency of filled teeth and /or poor quality restorations. Consequently, patients with CP are dependent on caregivers for daily activities including oral and dental care <sup>(12,13)</sup>.

We are in special need to know well the oral health status of individuals with special needs to develop the proper clinical and community interventions for oral health promotion, prevention and treatment of these oral diseases. Unlikely, studies that document the oral health status of patients with CP are very few <sup>(14)</sup>.

There is a huge knowledge gap without enough evidence on more beneficial interventions that can be elected, nor the ideas, components or duration of these interventions <sup>(15)</sup>.

As individuals with CP form an important sector in Egypt, so we have to do good assessments to the oral health status among a group of children with CP and to evaluate the effect of an oral health education programme for their caregivers <sup>(16)</sup>.

## **II. SUBJECTS AND METHODS:**

**Study design:** This study was an observational study.

**Study Population:** A sample of 102 children with CP were collected from The National Institute of Neuromotor System, Egypt.

**Study procedures:**

### **A- Data collection:**

A questionnaire was designed to collect the following information from the child's parent or caregiver; sociodemographic data, medical and dental history, oral hygiene practices, dietary consistency either solid, semisolid or liquid diet and past dental visits through an interview which was face to face.

### **B- Clinical examination**

Intraoral examination was performed for all the subjects by a single investigator using disposable diagnostic sets under good illumination of the dental chair. Children were lying on the dental chair or on their parent's lap or on their wheelchair. Intraoral examination including:

- 1- Dental caries experience using the **decayed, missing, and filled primary and permanent teeth (dmft/deft/DMFT) indices** according to the age <sup>(17)</sup>
- 2- Other dental anomalies as bruxism, tongue thrust, malocclusion, anterior open bite, post crossbite, mouth breathing and dental trauma.

### **C- Preventive Measures:**

- Manual scaling and simple extractions were done. For those who had extensive calculus or many badly decayed teeth, they were instructed to go to the nearest clinic with the required facilities to receive the needed dental treatment under either local or general anesthesia.
- Mouth props were given to the parents who complained that their children refuse to open their mouths.
- Topical fluoride (5% sodium fluoride) was applied to all children, after removal of soft plaque by a gauze.

### **Statistical analysis:**

Categorical and ordinal data were presented as frequency and percentage values. Numerical data were presented as mean, standard deviation (SD), median, and interquartile range (IQR) values. They were analyzed for normality by viewing data distribution and using Shapiro-Wilk's test. Age data were normally distributed, while other numerical data were non-parametric. Numerical and ordinal data were analyzed using Kruskal-Wallis's test, followed by Dunn's post hoc test for different associations and a signed rank test for the effect of health promotion. Correlation analyses were made using Spearman's rank-order correlation coefficient. The significance level was set at  $p < 0.05$  within all tests.

## **III. Results:**

### **Sociodemographic data**

The summary statistics of sociodemographic data is presented in Table (1).

Out of the 102 individuals surveyed, there was a slightly higher prevalence of males (54.90%) compared to females (45.09%). The average age of the children was (8.34±3.95) years. Regarding parental education, most mothers (48.03) and fathers (51.96%) had basic education. Most of the surveyed children (75.49%) had no dental experience. However, among those who had, (64%) received some form of treatment. A vast majority (83.33%) of the children didn't practice regular teeth brushing, and among those who did, most (66.67%) brushed only once a week. The responsibility for brushing was almost equally divided between the child and

caregivers. Most surveyed children had some dental anomalies, with nearly half exhibiting bruxism or attrition and more than a quarter showing signs of tongue thrust. Other noted conditions included anterior open bite or posterior crossbite, mouth breathing, gingivitis, dental trauma, malocclusion, and hypocalcification. Table (2)

**Table (1):** Summary statistics for demographic data.

Parameter		Value
Gender [n (%)]	Male	56 (54.90%)
	Female	46 (45.09%)
Age (years)	Mean±SD	8.34±3.95
	Median (IQR)	8.00 (7.38)
Mother education [n (%)]	Illiterate	40 (39.22%)
	Basic education	49 (48.03%)
	High education	13 (12.74%)
Father education [n (%)]	Illiterate	40 (39.21%)
	Basic education	53 (51.96%)
	High education	9 (8.82%)
Previous dental visits [n (%)]	No	78 (76.47%)
	Yes	24 (23.53%)
Dental history [n (%)] (n=25)	No treatment	10 (40.00%)
	Treatment	15 (60.00%)
Teeth brushing [n (%)]	No	85 (83.33%)
	Yes	17 (16.67%)
Brushing frequency [n (%)] (n=18)	Once/ day	6 (33.33%)
	Once/ week	12 (66.67%)
Brushing by [n (%)] (n=18)	Child	8 (44.44%)
	Caregiver	10 (55.56%)

**Table (2-A):** caries index of those patients:

Index		Score
DMFT	Mean±SD	3.06±3.13
	Median (IQR)	3.00 (4.00)
def	Mean±SD	3.08±2.99
	Median (IQR)	3.00 (6.00)
dmf	Mean±SD	4.27±5.80
	Median (IQR)	1.00 (8.25)

**Table (2-B):** prevalence of different dental anomalies:

Dental anomalies	Free	Value
	Bruxism/attrition	51 (50.00%)
	Tongue thrust	27 (26.47%)
	Ant Open Bite/post Crossbite	21 (20.59%)
	Free	18 (17.65%)

	<b>Mouth breathing</b>	19 (18.63%)
	<b>Gingivitis</b>	12 (11.76%)
	<b>Trauma</b>	7 (6.86%)
	<b>Malocclusion</b>	14 (13.73%)
	<b>Hypocalcification</b>	6 (5.88%)

#### **IV. Discussion:**

Cerebral palsy is the most common physical childhood disability<sup>(18)</sup>. Since children with CP present permanent disorders in posture and movement that provoke motor loss and generate difficulties in the performance of daily life activities, they are subjected to have poor oral health that definitely affects the overall general health and oral health related quality of life.

Participated children were selected from The National Institute of Neuromotor System. This Institute was selected as it is one of the largest centers that have pediatric neurology and physiotherapy clinics.

A total 102 participated children of three different age ranges (3-6), (6-12) and (12-14) to make sure that all oral health problems are recorded during primary, mixed and permanent dentitions respectively.

Intraoral examination was done using disposable diagnostic sets for good infection control management.

Results of this study revealed that the percentage of males (54.90%) was higher than females (45.09%) with male/female ratio 1.3:1 and this is correlated with the findings of other studies<sup>(12,18-20)</sup>.

Regarding dental history, only 23.53% of the cerebral palsied children had visited the dentist in the past years. Moreover, the appointment was mostly driven by a specific problem rather than a preventive measure. A similar observation was reported in a study done by Sinha et al.<sup>(21)</sup>. This can be attributed to the physical and financial burden of having a disabled child as parents have been fully dedicating their time and efforts to learn how to deal with their children and how to control and improve their medical condition<sup>(8)</sup>.

In our present study, most of the cerebral palsied children (83.33%) did not brush their teeth and need supervision upon tooth brushing as children with CP always have difficulties in self-cleaning and communicating oral health needs. children's lack of a regular brushing habit and this seems to be realistic<sup>(22,23)</sup>.

This finding goes with the study done by Oredugba et al<sup>(24)</sup> that revealed that only 7% of parents brushed their child's teeth twice daily and with the study conducted by Sinha et al<sup>(21)</sup> who reported that only 8 CP children out of 50 (16 %) get their teeth brushed twice daily. On the other hand, this finding was contradicted with the results reported by Vpk V et al, who reported that more than 50% of the parents brushed only once daily<sup>(25)</sup>.

In the present study, caries prevalence compromised 66.67% among the participating children which is similar to findings of the study done Mathew et al who reported that caries prevalence was 65.8% among Indian children with CP who aged below 18 years<sup>(26)</sup>, while this finding is higher than that of Chu and Lo where they noted that 43% of the Chinese students with CP had untreated dental caries<sup>(27)</sup>. In addition, the mean values of DMFT, def<sup>t</sup> and dmft were 3.06±3.13, 3.08±2.99 and 4.27±5.80 respectively which is higher than the finding of several previous studies done in Egypt<sup>(16)</sup>, Sudan<sup>(28)</sup>.

The high caries prevalence in children with CP which left untreated could be attributed to risk factors such long term usage of sugar-based medications<sup>(23)</sup>, high salivary osmolality<sup>(29)</sup>, soft diet intake with food stagnation in the buccal and labial sulci due to their poor masticatory muscular control<sup>(30,31)</sup>, high frequency of carbohydrate intake and reduced hand dexterity, making it difficult for them to use a toothbrush<sup>(32,33)</sup> all these factors contributing in maintaining adequate oral hygiene.

Results of the current study revealed that (50%) of the children were suffering from bruxism which is the habitual grinding of teeth that is a common occurrence in people with CP. These results are in agreement with previous findings in the study done by Kachwinya<sup>(34)</sup> in which a high prevalence of bruxism (52.2%) was reported in persons who have CP. However; these results are contradicted with Sedky<sup>(12)</sup> who mentioned that a low percentage of the CP children (19.4%) were suffering from bruxism and with Montserrat<sup>(35)</sup> who reported that only (22%) of CP children presented bruxism.

Numerous studies have been performed to detect the prevalence of malocclusion in CP children but with different results. Findings of the current study revealed that only 13.73% of the sharing CP children had malocclusion.

These results are lower than the outcomes of Chandna et al<sup>(36)</sup> and sruthi et al<sup>(37)</sup> who reported that 70.58% and 58.7% of cerebral palsied children had Class II malocclusion respectively.

The present study examined an important group of special health care needs; children with CP. The oral health status and oral health promotion of those children had not been given enough attention in literature. Thus, the goal of this study is to enhance the general and oral health of children with (CP) by implementing educational and preventive measures as soon as the disease is recognized. This could involve motivating and educating caregivers about the proper degree of regular oral hygiene activities.

#### **Ethical consideration:**

- Approval from Faculty of Dentistry Ain-Shams University research ethics committee was gathered (FDASU-Rec IM022226).
- Approval from the National Institute of Neuromotor System and the different institutions was gathered before beginning of the study (INM00052).

#### **IV. Limitations:**

- All the participants were collected only from The National Institute of Neuromotor System together with the small sample size could prevent generalization of the findings.
- The current study did not include a healthy control group for comparison of the findings.

#### **V. Conclusion:**

Children with a history of CP exhibited inadequate oral health status as reflected by substandard oral hygiene scores and gingival health with high dental caries prevalence as well. Thus efforts should be concerted among parents/caregivers, children, and dental professionals to improve the suboptimal oral health of those children.

#### **References:**

- [1]. Definition of Pediatric Dentistry. AAPD *Pediatr Dent*; (Special issue) 22:4-6, 2000.
- [2]. Dourado MR, Andrade PM, Ramos-Jorge ML, Moreira RN, Oliveira-Ferreira F. Association between executive/attentional functions and caries in children with cerebral palsy. *Res Dev Disabil*. 2013;34:2493-2499.
- [3]. Subramaniam P, Babu KL, Rodriguez A. Relation of salivary risk factors to dental caries in children with cerebral palsy. *J Clin Pediatr Dent*. 2010;34:355-360.
- [4]. El-Mcliegy E.H.K. and El-Sabbagh M.H.: Etiology of developmental delay in Egyptian children: An overview, social communication, 2003.
- [5]. Khattab NM, Omar OM, Sabbagh H et al. ORAL HEALTH STATUS IN CEREBRAL PALSIED EGYPTIAN CHILDREN. Vol. 49, *Egyptian Dental Journal*. 2003.
- [6]. Bottcher L. Children with spastic cerebral palsy, their cognitive functioning, and social participation: a review. *Child Neuropsychol*. 2010;16:209-228.
- [7]. Bensi, C., Costacurta, M., & Docimo, R. (2020). Oral health in children with cerebral palsy: A systematic review and meta-analysis. In *Special Care in Dentistry* (Vol. 40, Issue 5, pp. 401–411). Blackwell Publishing Inc. <https://doi.org/10.1111/scd.12506>.
- [8]. Du RY, McGrath C, Yiu CK, King NM. Health- and oral health-related quality of life among preschool children with cerebral palsy. *Qual Life Res*. 2010;19:1367-1371.
- [9]. Dougherty NJ. A review of cerebral palsy for the oral health professional. *Dent Clin North Am*. 2009;53:329-539.
- [10]. Carmagnani FG, Goncalves GK, Correa MS, dos Santos MT. Occlusal characteristics in cerebral palsy patients. *J Dent Child (Chic)*. 2007;74:41-45.
- [11]. Hegde AM, Pani SC. Drooling of saliva in children with cerebral palsy-etiology, prevalence, and relationship to salivary flow rate in an Indian population. *Spec Care Dentist*. 2009;29:163-168.
- [12]. Sedky NA. Assessment of oral and dental health status in children with cerebral palsy: An exploratory study. *Int J Health Sci (Qassim)*. 2018 Jan-Feb;12(1):4-14. PMID: 29623011; PMCID: PMC5870305.
- [13]. Maiya A, Shetty YR, Rai K, Padmanabhan V, Hegde AM. Use of different oral hygiene strategies in children with cerebral palsy: a comparative study. *J Int Soc Prev Community Dent*. 2015;5: 389-393.
- [14]. Glassman P, Miller C. Social supports and prevention strategies as adjuncts and alternatives to sedation and anesthesia for people with special needs. *Spec Care Dentist*. 2009;29(1):31-38.
- [15]. Butani Y, Gansky SA, Weintraub JA. Parental perception of oral health status of children in mainstream and special education classrooms. *Spec Care Dentist*. 2009;29(4):156-162.
- [16]. Bizarra M de F, Ribeiro Graça S. Short-term impact of an oral health program for adults with cerebral palsy. *Special Care in Dentistry*. 2020 Jan 1;40(1):26–34.
- [17]. World Health Organization. *Oral Health Survey. Basic methods*, 5th ed. Geneva, WHO, 2013. .
- [18]. Morgan JP, Minihan PM, Stark PC, Finkelman MD, professor A, Yantsides KE, et al. The oral health status of 4,732 adults with intellectual and developmental disabilities HHS Public Access. *J Am Dent Assoc*. 2012;143(8):838–46.
- [19]. Pezzementi ML, Fisher MA. Oral health status of people with intellectual disabilities in the southeastern United States. *J Am Dent Assoc [Internet]*. 2005 [cited 2024 Jan 18];136(7):903–12. Available from: <https://pubmed.ncbi.nlm.nih.gov/16060471/>
- [20]. Khattab NM, Omar OM, Sabbagh H et al. ORAL HEALTH STATUS IN CEREBRAL PALSIED EGYPTIAN CHILDREN. Vol. 49, *Egyptian Dental Journal*. 2003.
- [21]. Sinha N, Singh B, Chhabra KG, Patil S. Comparison of oral health status between children with cerebral palsy and normal children in India: A case-control study. *J Indian Soc Periodontol [Internet]*. 2015 Jan 1 [cited 2024 Jan 26];19(1):78. Available

- from: /pmc/articles/PMC4365163/
- [22]. De Camargo MAF, Antunes JLF. Untreated dental caries in children with cerebral palsy in the Brazilian context. *Int J Paediatr Dent*. 2008;18(2):131–8.
- [23]. Romeo DM, Venezia I, Pede E, Brogna C. Cerebral palsy and sex differences in children: A narrative review of the literature. *J Neurosci Res*. 2023 May 1;101(5):783–95.
- [24]. Oredugba BDS FWACS MPH M SND RCS Ed FA. Comparative oral health of children and adolescents with cerebral palsy and controls. *J Disabil Oral Heal*. 2011;12:81–7.
- [25]. Vpk V, Mohanty VR, Balappanavar AY, Juneja M, Gupta V, Kapoor S. Effectiveness of different parenting interventions on oral hygiene of cerebral palsy children: A randomized controlled trial. *Spec Care Dent Off Publ Am Assoc Hosp Dent Acad Dent Handicap Am Soc Geriatr Dent*. 2020 Jul;40(4):335–43.
- [26]. Mathew MG, Sciences T, Lecturer S, Dentistry P, Science T. *International Journal of Dentistry and Oral Science ( IJDOS ) ISSN : 2377-8075 Oral Health Status Of Children Affected With Cerebral Palsy*. 2021;8(6):3089–94.
- [27]. Chu CH, Lo ECM. Oral health status of Chinese teenagers with cerebral palsy. *Community Dent Health*. 2010 Dec;27(4):222–6.
- [28]. Hamid HM, Abuaffan AH. Parental Oral Health Knowledge, Attitude, Practice and Caries Status of Sudanese Cerebral Palsy Children. *Pediatr Heal Res*. 2017;2(2).
- [29]. Santos MTBR, Ferreira MCD, Mendes FM, de Oliveira Guaré R. Assessing salivary osmolality as a caries risk indicator in cerebral palsy children. *Int J Paediatr Dent [Internet]*. 2014 Mar [cited 2024 Mar 6];24(2):84–9. Available from: <https://pubmed.ncbi.nlm.nih.gov/23551764/>
- [30]. Akhter R, Hassan NMM, Martin EF, Muhit M, Haque MR, Smithers-Sheedy H, et al. Risk factors for dental caries among children with cerebral palsy in a low-resource setting. *Dev Med Child Neurol*. 2017 May 1;59(5):538–43.
- [31]. Cardoso AMR, Gomes LN, Silva CRD, Soares R de SC, de Abreu MHNG, Padilha WWN, et al. Dental caries and periodontal disease in brazilian children and adolescents with cerebral palsy. *Int J Environ Res Public Health*. 2015;12(1):335–53.
- [32]. Alhammad NS, Wyne AH. Caries experience and oral hygiene status of cerebral palsy children in Riyadh. *Odontostomatol Trop*. 2010;33(130):5–9.
- [33]. Wyne AH, Al-Hammad NS, Splieth CH. Dental caries and related risk factors in Saudi cerebral palsy children. *Neurosci J [Internet]*. 2017 Oct 1 [cited 2024 Mar 8];22(4):282–6. Available from: <https://nsj.org.sa/content/22/4/2>.
- [34]. Kachwinya SM, Kemoli AM, Owino R, Okullo I, Bermudez J, Seminario AL. Oral health status and barriers to oral healthcare among children with cerebral palsy attending a health care center in Kampala, Uganda. *BMC Oral Health [Internet]*. 2022 Dec 1 [cited 2024 Mar 19];22(1):1–9. Available from: <https://link.springer.com/articles/10.1186/s12903-022-02677-2>
- [35]. Montserrat Diéguez-Pérez, de Nova-García MJ, Mourelle-Martínez MR, Bartolomé-Villar B. Oral health in children with physical (Cerebral Palsy) and intellectual (Down Syndrome) disabilities: Systematic review I. *J Clin Exp Dent*. 2016;8(3):e337–43.
- [36]. Chandna P, Adlakha VK, Joshi JL. Oral status of a group of cerebral palsy children. *J Dent Oral Hyg [Internet]*. 2011;3(2):18–21. Available from: <http://www.academicjournals.org/JDOH>
- [37]. Sruthi KS, Yashoda R, Puranik MP. Oral health status and parental perception of child oral health-related quality of life among children with cerebral palsy in Bangalore city: A cross-sectional study. *Spec Care Dent*. 2021;41(3):340–8.