

## Factors Associated with the Caregivers' Perception of the Oral Health of Individuals with Cerebral Palsy

Mariana Marinho Davino de Medeiros<sup>1</sup>, Mariana Leonel Martins<sup>2</sup>, Lays Nóbrega Gomes<sup>3</sup>, Andreia Medeiros Rodrigues Cardoso<sup>4</sup>, Wilton Wilney Nascimento Padilha<sup>5</sup>, Alessandro Leite Cavalcanti<sup>6</sup>

<sup>1</sup>Department of Prosthodontics and Periodontology, Piracicaba Dental School, University of Campinas, Piracicaba, SP, Brazil.

 0000-0002-2472-8747

<sup>2</sup>Department of Pediatric Dentistry and Orthodontics, School of Dentistry, Federal University of Rio de Janeiro, Rio de Janeiro, RJ, Brazil.  0000-0001-6777-3225

<sup>3</sup>Department of Dental Materials and Prosthodontics, Araraquara Dental School, São Paulo State University, Araraquara, SP, Brazil.

 0000-0002-9183-4742

<sup>4</sup>Department of Dentistry, University Center of João Pessoa, João Pessoa, PB, Brazil.  0000-0002-2682-1048

<sup>5</sup>Department of Clinical and Social Dentistry, Federal University of Paraíba, João Pessoa, PB, Brazil.  0000-0003-3056-9145

<sup>6</sup>Department of Dentistry, State University of Paraíba, Campina Grande, PB, Brazil.  0000-0003-3572-3332

Author to whom correspondence should be addressed: Mariana Marinho Davino de Medeiros, Department of Prosthodontics and Periodontology, Piracicaba Dental School, University of Campinas, Aracião, Piracicaba, São Paulo, Brazil. 13414-903. Phone: +55 83 98866-5872. E-mail: [mariana.davino@yahoo.com.br](mailto:mariana.davino@yahoo.com.br).

Academic Editors: Alessandro Leite Cavalcanti and Wilton Wilney Nascimento Padilha

Received: 16 April 2019 / Accepted: 30 August 2019 / Published: 17 September 2019

### Abstract

**Objective:** To evaluate factors associated with the caregivers' perception of the oral health of children and adolescents with cerebral palsy. **Material and Methods:** A cross-sectional study was carried out with 80 children and adolescents with cerebral palsy aged 2-18 years, registered at a reference institution and their respective caregivers. Caregivers provided socioeconomic, systemic and health perception and access to dental services data. A calibrated researcher ( $\kappa=0.75-0.98$ ) performed oral examinations using DMF-T, dmft, dental trauma, gingival bleeding index, community periodontal index, malocclusion index and the dental aesthetic index. The Poisson Regression was used ( $\alpha=0.05$ ). **Results:** According to the caregivers' perception, the oral health reports of children and adolescents with cerebral palsy considered good and poor was 73.8% and 26.3%, respectively. The poor oral health perception is associated with the presence of dental caries in anterior teeth (PR 1.34, 95% CI=1.11-1.63) and bleeding during tooth brushing (PR 1.20, 95% CI=1.04-1.40). **Conclusion:** Children and adolescents with cerebral palsy who presented lesions of caries in the anterior teeth and gingival bleeding during tooth brushing, more frequently, had poor oral health by their caregivers.

**Keywords:** Cerebral Palsy; Child; Adolescent; Oral Health; Caregivers.

## Introduction

Cerebral Palsy (CP) is defined as a set of movement and posture developmental disorders resulting from a non-progressive injury that occurred in the brain during the fetal or infantile period [1]. This motor disorder presents a global prevalence of 2.11 to 1000 live births [2], which increases according to the decrease in socioeconomic status [3]. In addition, individuals with CP present motor disorders that can be accompanied by changes in sensation, cognition, communication, behavior, and perception [1,4]. These changes limit self-care functions, such as feeding and oral hygiene [4,5].

In this context, caregivers are responsible for making decisions and carrying out the daily activities related to the general and oral health of children and adolescents with CP [6]. However, despite the fact that the people with CP have a high frequency and severity of oral problems compared to those without CP [7,8], caregivers are more concerned with the general health than the oral health of these individuals, due to the complexity imposed by this disorder [9]. Moreover, the alterations present in individuals with CP generate an inability to verbalize emotions and anguishes [10]; thus, the caregivers seek oral health care, mostly, due to pain [11].

In this perspective, the caregivers' perception of the oral health of children and adolescents with CP is essential and may influence the oral hygiene frequency [12], as well as the search for access and use of dental services [11,12]. Studies [13-16] indicate that socioeconomic factors, such as family income [14-16], and clinical conditions, such as toothache due to dental caries [13], pain during dental eruption [16], dental caries [14,15], malocclusion [15] and need for dental treatment [14], influence the caregivers' perception of the oral health of children and adolescents. However, there is a lack of studies that assess the caregivers' perception of the oral health of people with CP and their factors associated. Therefore, the present study aimed to evaluate factors associated with the caregivers' perception of the oral health of children and adolescents with CP.

## Material and Methods

### Study Population

A cross-sectional study of inductive approach with statistical comparative procedure and intensive direct observation technique through clinical interview and clinical examination [17] was carried out at the Association of Parents and Friends of Children and Adolescents with Special Needs in the city of Campina Grande, Paraíba, Brazil from February to April 2014. The Association of Parents and Friends of Children and Adolescents with Special Needs is a philanthropic non-governmental organization created on September 1, 1982. In addition, this philanthropic non-governmental organization of Campina Grande is a reference institution in the performance of therapeutic activities and social integration for individuals with CP; however, it does not offer dental care for the users.

The population was composed of 97 children and adolescents aged 2-18 years with a clinical diagnosis of cerebral palsy (ICD-10 G80), and their respective primary caregivers. It was considered

as the primary caregiver of children and adolescents with CP, those responsible for making decisions and carrying out the daily activities of these individuals, who were 18 years of age or older [6]. The refusal to participate in the study and non-attendance for the clinical examination, after three successive attempts, was considered as a loss.

Thus, of the total of 97 patients, three refused to participate, and 14 did not attend the clinical examination after three attempts (17 patients lost), resulting in 80 participants (response rate: 82.5%). Among these participants, 59 were children (2 to 12 years), and 21 were adolescents (13 to 18 years). The classification of participants in children or adolescents was based on individuals' dentition [18]. Participants with deciduous and mixed dentition (up to 12 years old) were considered as children while those with permanent dentition (from 13 years) were considered adolescents [18].

#### Calibration and Training Process

Prior to data collection, the examiner was calibrated. The calibration had the participation of a dentist and a specialist in pediatric dentistry, which was considered the gold standard. The process had theoretical and clinical stages. In the theoretical stage, the criteria for the diagnosis of dental caries, periodontal changes, malocclusion, and trauma were discussed. In the clinical stage, 40 children and adolescents without neurological impairment were examined in a pre-school and in a public school. At the end, inter and intra-examiner kappa values of 0.75-1.00 were obtained.

#### Data Collection

Data collection was performed by a single examiner and a scorer. Initially, information about the location of CP and the type of neuromuscular dysfunction were obtained from the institution's medical records.

According to the anatomical location of the involved limbs, CP was classified in tetraparesis, diparesia, or hemiparesis [4,19]. In tetraparesis, the four limbs are equally compromised; in diparesia, the lower extremities are more compromised, compared to the upper extremities; while in hemiparesis there is exclusive involvement of one side of the body [4,19]. According to the type of neuromuscular dysfunction, CP was subdivided into spastic, extrapyramidal, ataxic, or mixed [4,19]. Spastic neuromuscular dysfunction is characterized by increased muscle tone, tendon reflexes, tremors, and weakness [4,19]. Extrapyramidal is characterized by continuous and uncontrollable movements of limbs [4,19]. The ataxic is characterized by the presence of voluntary tremors and compromised balance and motor coordination [4,19]. Finally, the mixed is the combination of the other cases [4,19].

Soon after, face-to-face with the caregiver, a clinical file was filled out in a service room of the institution. This clinical file included information about demographic and socioeconomic characteristics (sex, children's age, caregiver's schooling, monthly family income according to the minimum wage in Brazil), caregiver's perception regarding general and oral health of patients with CP, access to dental service (time of the last visit to dentist) and systemic (medication use).

Then, after supervised tooth brushing, clinical exams were performed with the patient sitting in a wheelchair or a traditional chair. The examiner used a light emitting-diode (LED) lamp attached to the head, flat dental mirrors, periodontal probes (Community Periodontal Index - CPI, Trinity Ind. Com. Ltda, São Paulo, SP, Brazil), mouth openers, wooden spatulas, and disposable gauzes.

Oral exams were performed by calibrated examiner with registration of DMF-T, dmft records [18], gingival bleeding index in the age group of 2-6 years [20], adapted for use of four index teeth [21], community periodontal index in the age group of 7-18 years in six index teeth [18,22], malocclusion index [23] and dental aesthetics index [23].

In the general clinical examination, the ability to communicate of the children and adolescent with CP, which is classified as normal, mild, moderate or severe disability, was observed [24]. The normal ability to communicate is characterized by the absence of difficulty in using speech [24]. The mild deficiency in communication ability is characterized by the presence of difficulty in the use of speech; however, the individual can speak [24]. The moderate deficiency in communication ability refers to the lack of use of speech to communicate [24]. Finally, the severe deficiency in the ability to communicate is characterized by a lack of communication [24].

### Statistical Analysis

In the data analysis, descriptive statistics were performed for sample characterization. After categorization, the bivariate and multivariate Poisson regression analysis with robust variance ( $p < 0.05$ ) was used to determine the association between independent variables (socioeconomic, general health perception, systemic and oral ones) and the dependent variable (oral health perception). In the multivariate regression model, which used a hierarchical approach [25], were maintained the variables that reached  $p < 0.20$  in the bivariate analysis. After performing the multivariate analysis, independent variables presenting  $p < 0.05$  were considered as associated with the caregivers' perception of the oral health of children and adolescents with CP. The Statistical Package for the Social Sciences (SPSS for Windows, version 20.0, SPSS Inc, Chicago, IL, USA) was used for data analysis.

### Ethical Aspects

This study followed ethical guidelines recommended by Resolution 466/12 of the Brazilian National Health Council of the Health Ministry and was approved by the Research Ethics Committee of the State University of Paraíba (CAAE 20215413.4.0000.5187). All the participants and responsible were informed about the research and exclusively participated of the study the subjects that their responsible signed the Free and Informed Consent Form.

### Results

Eighty children and adolescents with CP were examined, being 59 children (73.8%) and 21 adolescents (26.3%). These children and adolescents, more frequently, were males (52.5%) and presented tetraparesis (56.2%), spastic neuromuscular dysfunction (75.0%) and monthly family

income less than or equal to 900 reais (52.5%). The primary caregivers were the mother (86.3%), the grandmother (7.5%), the father (5.0%) or the aunt (1.3%), and more frequently presented more than 8 years of study (66.3%).

According to the caregivers' perception, the frequency of oral health for children and adolescents with CP considered good and poor was 73.8% and 26.3%, respectively. For the multivariate model, we incorporated the independent variables that presented  $p < 0.20$  in the bivariate analysis: caregiver education, family income, general health perception, presence of caries lesion, presence of caries lesion in anterior teeth, periodontal changes, presence of bleeding during tooth brushing and presence of darkened teeth ( $p < 0.20$ ) (Table 1). In the final model of the Poisson regression, the oral health perception of children and adolescents with CP considered poor by the caregivers was associated with the presence of caries lesion in anterior teeth (PR 1.34; CI 95%=1.11-1.63) and bleeding during tooth brushing (PR 1.20; CI 95%=1.04-1.40) (Table 1).

**Table 1. Distribution of children and adolescents with CP in Poisson regression bivariate and multivariate models for caregivers' perception of the oral health.**

Variables	Perception of Oral Health		p-value	Bivariate		Multivariate
	Good N (%)	Poor N (%)		Unadjusted PR* (95% CI)	p-value	
<b>Sex</b>						
Male	33 (78.6)	9 (21.4)	0.300	0.92 (0.79-1.07)	-	-
Female	26 (68.4)	12 (31.6)		1.00	-	-
<b>Age</b>						
2 to 12 Years	42 (71.2)	17 (28.8)	0.355	1.08 (0.91-1.27)	-	-
13 to 18 Years	17 (81.0)	4 (19.0)		1.00	-	-
<b>Caregiver Education</b>						
≤8 Schooling	23 (65.7)	12 (34.3)	0.148	1.11 (0.96-1.30)	0.226	1.10 (0.94-1.30)
>8 Schooling	36 (80.0)	9 (20.0)		1.00		1.00
<b>Monthly Family Income</b>						
≤US\$ 241.56	28 (66.7)	14 (33.3)	0.119	1.12 (0.97-1.30)	0.328	1.08 (0.92-1.27)
>US\$ 241.56	31 (81.6)	7 (18.4)		1.00		1.00
<b>Caregivers' Perception of the General Health of Children and Adolescents</b>						
Good	58 (75.3)	19 (24.7)	0.084	0.74 (0.53-1.04)	0.595	1.04 (0.88-1.23)
Poor	1 (33.3)	2 (66.7)		1.00		1.00
<b>Oral Health Perception of Caregivers</b>						
Good	33 (78.6)	9 (21.4)	0.300	0.92 (0.79-1.07)	-	-
Poor	26 (68.4)	12 (31.6)		1.00	-	-
<b>Time Elapsed Since the Last Dental Appointment</b>						
≤12 Months	25 (71.4)	10 (28.6)	0.722	1.02 (0.88-1.20)	-	-
>12 Months	33 (75.0)	11 (25.0)		1.00	-	-
<b>CP Location</b>						
Tetraparesis	32 (71.1)	13 (28.9)	0.786	1.03 (0.82-1.28)	-	-
Diparetic	18 (78.3)	5 (21.7)	0.829	0.97 (0.76-1.23)	-	-
Hemiparesis	9 (75.0)	3 (25.0)		1.00	-	-
<b>Type of Neuromuscular Disability of CP</b>						
Spastic	44 (73.3)	16 (26.7)	0.698	1.03 (0.86-1.24)	-	-
Extrapyramidal	14 (77.8)	4 (22.2)		1.00	-	-
<b>Communication Capability</b>						
Normal	4 (66.7)	2 (33.3)	1.000	1.00 (0.69-1.44)	-	-
Mild Deficiency	15 (75.0)	5 (25.0)	0.647	0.93 (0.71-1.23)	-	-

Moderate Deficiency	34 (75.6)	11 (24.4)	0.592	0.93 (0.72-1.20)	-	-
Serious Deficiency	6 (66.7)	3 (33.3)		1.00	-	-
Use of Medication						
Yes	42 (72.4)	16 (27.6)	0.652	1.04 (0.87-1.23)	-	-
No	17 (73.3)	5 (22.7)		1.00	-	-
Dental Caries Lesion						
Yes	28 (62.2)	17 (37.8)	0.003	1.23 (1.07-1.42)	0.647	0.96 (0.80-1.14)
No	31 (88.6)	4 (11.4)		1.00		1.00
Caries Lesion in Upper Anterior Tooth						
Yes	5 (38.5)	8 (61.5)	0.001	1.38 (1.14-1.66)	0.002	1.34 (1.11-1.63)
No	40 (83.3)	8 (16.7)		1.00		1.00
Tooth Loss						
Yes	7 (87.5)	1 (12.5)	0.255	0.88 (0.70-1.09)	-	-
No	52 (72.2)	20 (27.8)		1.00	-	-
Periodontal Changes						
Yes	45 (69.2)	20 (30.8)	0.000	1.30 (1.20-1.42)	0.083	1.14 (0.98-1.33)
No	7 (100.0)	0 (0.0)		1.00		1.00
Malocclusion						
Yes	13 (81.2)	3 (18.8)	0.395	0.92 (0.76-1.10)	-	-
No	45 (71.4)	18 (28.6)		1.00	-	-
Trauma						
Yes	19 (65.5)	10 (34.5)	0.212	1.10 (0.94-1.29)	-	-
No	40 (78.4)	11 (21.6)		1.00	-	-
Toothache						
Yes	7 (58.3)	5 (41.7)	0.208	1.14 (0.92-1.14)	-	-
No	52 (76.5)	16 (23.5)		1.00	-	-
Darkened Tooth						
Yes	24 (63.2)	14 (36.8)	0.035	1.17 (1.01-1.36)	0.354	1.07 (0.92-1.25)
No	35 (83.3)	7 (16.7)		1.00		1.00
Gingival Bleeding During Tooth Brushing						
Yes	27 (60.0)	18 (40.0)	0.000	1.28 (1.12-1.47)	0.013	1.20 (1.04-1.40)
No	32 (91.4)	3 (8.6)		1.00		1.00

\*Unadjusted Poisson Regression for caregivers' perception of the oral health of children and adolescents with CP (dependent variable) and socioeconomic characteristics, general health perception, access to dental services, oral and systemic characteristics (independent variables); \*\*Variables incorporated into the multivariate model ( $p < 0.20$ ): caregiver education, family income, caregivers' perception of the general health of children and adolescents, dental caries lesion, caries lesion in the upper anterior tooth, periodontal changes, gingival bleeding during tooth brushing and darkened tooth; †Multivariate Poisson regression adjusted for caregivers' perception of the oral health of children and adolescents with CP (dependent variable) and socioeconomic characteristics, general health perception, access to dental services, oral and systemic characteristics (independent variables) by the hierarchical procedure.

## Discussion

Children and adolescents with CP present motor disorders that make them dependent on caregivers for daily activities [1]. This makes it essential to know the caregivers' perception of the oral health of these children and adolescents, as well as the factors associated, in order to qualify the oral care performed on these individuals.

In this study, 26.3% of caregivers considered the oral health of children and adolescents with CP as poor. However, lower frequencies were observed in research conducted in English children with different levels of physical disabilities, medical histories, and behavioral problems [26]. Thus, these children may have worse general health conditions [26] than the participants in the present study. The higher impairment of the general health may concern more the caregivers than the oral health problems, influencing the perception of oral health [9]. In contrast, in another study [12], 66.2% of the children and adolescents with CP-related epilepsy had their dental status classified as

bad according to the caregivers' perception. This high frequency of poor oral health is due to the presence of epilepsy, which increases in sixfold-higher odds of having oral health classified as bad [12].

In our study, the poor perception of oral health of children and adolescents with CP, according to caregivers, was associated with the presence of caries lesion in anterior teeth. This result corroborates the Brazilian study in children without disabilities [15], which suggests that the oral condition needs to be evident to the caregivers perceive [13]. In addition, when oral problems involve clinical discomfort and impairment of eating, aesthetics, and communication, the health and general well-being of the people are greatly affected [16], which may influence the perception.

Clinical manifestations of dental caries are primary markers of oral health impairment [13]. However, the visualization of oral problems can be impaired [26] due to the presence of involuntary movements, pathological oral reflexes, spasticity of mastication muscles, lack of cooperation and mouth opening limitation [26,27]. This compromises the caregivers' perception of oral health of children and adolescents with CP. On the other hand, when the caries lesion in the cavitated form is located in the anterior teeth, it becomes more visible. This is due to the impairment of aesthetics and function, which causes discomfort and difficulty to feed [13,15] and, consequently, may reflect on the negative caregivers' perception of the oral health of children and adolescents with CP.

In discordance, a study carried out in Brazil [13] concluded that the presence of dental caries lesion in the anterior teeth was not a factor associated with the poor perception of the caregivers about the oral health of children. However, the caregivers' perception of the oral health of children was associated with dental caries when toothache was present [13], which also evidences the oral complaint in question and, consequently, influences perception.

Bleeding during tooth brushing was also associated with the poor perception of the caregivers about the oral health of children and adolescents with CP. In the literature, the research that assessed the associated factors with the caregivers' perception of the oral health of children did not include in the data analysis the variable bleeding during tooth brushing, preventing this result can be compared with other studies. However, the presence of bleeding during tooth brushing has been described as a factor associated with negative self-perception of oral health [27]. Therefore, although periodontal changes are asymptomatic [28], the bleeding during tooth brushing becomes an alert for the presence of an oral problem, contributing to the caregivers perceive the poor oral health status of children and adolescents with CP.

However, this study has some limitations, such as a cross-sectional design that only demonstrate the presence or absence of associations, not allowing the establishment of cause and effect relationships. Furthermore, the sample is not representative of all individuals with CP due to the size and research location, a rehabilitation institution. On the other hand, there are no similar studies in literature, both in relation to the proposed objective as to the sample size and population studied.

Moreover, the oral health classification, that is according to the caregivers' perception may not be consistent with which would be reported by children and adolescents. However, it was observed that caregivers were reliable substitutes for the children regarding oral health perception due to the similarity found between oral health classification of children reported by caregivers and children themselves [29]. Given the above, longitudinal and case-control studies should be conducted, with a larger sample and selection criteria similar to previous studies, allowing comparisons.

Considering that caregivers are responsible for home oral health care of children and adolescents with CP [6,30], they need to be trained. Capacitation can be elaborated based on the factors associated with the perception of the oral health of this population since this reflects the difficulties found by the caregivers to identify the oral health problems of these individuals. Therefore, the training should guide and motivate caregivers to perform better home oral health care, as well as encourage the search for access to professional oral health care for these children and adolescents.

Although the Brazilian Federal Government has created the National Plan for the Rights of Persons with Disabilities - Living Without Limits, which acts in the dental care of people with disabilities [31], the actions of this plan in the state of Paraíba face difficulties of the process. In primary care, most dentists did not have access to the training course to assist people with disabilities. In part of the Dentistry Specialty Centers, the service does not show resolving, and the demand continues to be suppressed. Finally, in the high complexity, demand is not supported and is often not offered. In addition, there is no insertion of dental offices in institutions for the rehabilitation of people with disabilities in the state. In this perspective, the results of this study can assist in the qualification of the oral health care network for people with disabilities and in the elaboration of an action plan focused on the formation in permanent health education, centered on the caregiver and the problematization of oral health care for people with disabilities.

## Conclusion

Children and adolescents with cerebral palsy who had dental caries lesions in anterior tooth and gingival bleeding during dental brushing, more frequently, had their oral health considered poor by their caregivers. Therefore, it is suggested that for the caregivers to perceive the oral health of the children and adolescents with cerebral palsy as bad, it is necessary the presence of visible oral injuries. From this perspective, it is necessary to train caregivers to identify the dental caries lesion and indicators of poor oral hygiene in their initial stages. Thus, caregivers will be able to seek early the professional oral health care, as well as improve the home oral health care performed in children and adolescents with cerebral palsy, in order to restore the oral health of these individuals.

**Authors' Contributions:** MMDM, MLM, AMRC, WWNP and ALC conceptualized the study. LNG and AMRC performed the data collection. MMDM, MLM, LNG and AMRC performed statistical analysis and

interpreted data. MMDM and AMRC were the major contributors in writing the manuscript. All authors contributed significantly to the writing of the manuscript and revised it critically for important the intellectual content. All authors read and approved the final manuscript.

**Financial Support:** This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) – Finance Code 001.

**Conflict of Interest:** The authors declare no conflicts of interest.

## References

- [1] Ruiz Brunner MLM, Cuestas E. The construction of cerebral palsy definition: A historical journey to the present. *Rev Fac Cien Med Univ Nac Cordoba* 2019; 76(2):113-7. <https://doi.org/10.31053/1853.0605.v76.n2.23649>
- [2] Van Naarden Braun K, Doernberg N, Schieve L, Christensen D, Goodman A, Yeargin-Allsopp M. Birth prevalence of cerebral palsy: A population-based study. *Pediatrics* 2016; 137(1):e20152872. <https://doi.org/10.1542/peds.2015-2872>
- [3] Solaski M, Majnemer A, Oskoui M. Contribution of socio-economic status on the prevalence of cerebral palsy: A systematic search and review. *Dev Med Child Neurol* 2014; 56(11):1043-51. <https://doi.org/10.1111/dmcn.12456>
- [4] Gulati S, Sondhi V. Cerebral Palsy: An Overview. *Indian J Pediatr* 2018; 85(11):1006-16. <https://doi.org/10.1007/s12098-017-2475-1>
- [5] Sellers D, Bryant E, Hunter A, Campbell V, Morris C. The eating and drinking ability classification system for cerebral palsy: A study of reliability and stability over time. *J Pediatr Rehabil Med* 2019; 12(2):123-31. <https://doi.org/10.3233/PRM-180581>
- [6] Barros ALO, de Gutierrez GM, Barros AO, Santos MTBR. Quality of life and burden of caregivers of children and adolescents with disabilities. *Spec Care Dentist* 2019; 39(4):380-88. <https://doi.org/10.1111/scd.12400>
- [7] Diéguez-Pérez M, 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. <https://doi.org/10.4317/jced.52922>
- [8] 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* 2015; 19(1):78-82. <https://doi.org/10.4103/0972-124X.145800>
- [9] Weckwerth SA, Weckwerth GM, Ferrairo BM, Chicrala GM, Ambrosio AM, Toyoshima GH, et al. Parents' perception of dental caries in intellectually disabled children. *Spec Care Dentist* 2016; 36(6):300-6. <https://doi.org/10.1111/scd.12191>
- [10] Kavlak E, Tekin F. Examining various factors affecting communication skills in children with cerebral palsy. *NeuroRehabilitation* 2019; 44(2):161-73. <https://doi.org/10.3233/NRE-182580>
- [11] Shaghaghian S, Savadi N, Amin M. Evaluation of parental awareness regarding their child's oral hygiene. *Int J Dent Hyg* 2017; 15(4):e149-e155. <https://doi.org/10.1111/idh.12221>
- [12] Subki AH, Mukhtar AM, Saggaf OM, Ali RA, Khalifa KA, Al-Lulu DM, et al. Parental perceptions of dental health and need for treatment in children with epilepsy: a multicenter cross-sectional study. *Pediatric Health Med Ther* 2018; 9:165-72. <https://doi.org/10.2147/PHMT.S174964>
- [13] Gomes MC, Clementino MA, Pinto-Sarmiento TC, Costa EM, Martins CC, Granville-Garcia AF, et al. Parental perceptions of oral health status in preschool children and associated factors. *Braz Dent J* 2015; 26(4):428-34. <https://doi.org/10.1590/0103-6440201300245>
- [14] Talekar BS, Rozier RG, Slade GD, Ennett ST. Parental perceptions of their preschool-aged children's oral health. *J Am Dent Assoc* 2005; 136(3):364-72. <https://doi.org/10.14219/jada.archive.2005.0179>
- [15] Piovesan C, Marquezan M, Kramer PF, Bönecker M, Ardenghi TM. Socioeconomic and clinical factors associated with caregivers' perceptions of children's oral health in Brazil. *Community Dent Oral Epidemiol* 2011; 39(3):260-7. <https://doi.org/10.1111/j.1600-0528.2010.00598.x>
- [16] Wandera M, Kayondo J, Engebretsen IM, Okullo I, Astrøm AN. Factors associated with caregivers' perception of children's health and oral health status: A study of 6- to 36-month-olds in Uganda. *Int J Paediatr Dent* 2009; 19(4):251-62. <https://doi.org/10.1111/j.1365-263X.2009.00969.x>
- [17] Lakatos, EM, Marconi, MA. *Fundamentos de Metodologia Científica*. 6. ed. São Paulo: Atlas, 2009. [In Portuguese]
- [18] World Health Organization. *Oral Health Surveys: Basic Methods*. 5<sup>th</sup>. ed. World Health Organization: Geneva, 2013.
- [19] Murphy N, Such-Neibar T. Cerebral palsy diagnosis and management: The state of the art. *Curr Probl Pediatr Adolesc Health Care* 2003; 33(5):146-69. [https://doi.org/10.1016/S1538-5442\(03\)00002-6](https://doi.org/10.1016/S1538-5442(03)00002-6)
- [20] Ainamo J, Bay I. Problems and proposals for recording gingivitis and plaque. *Int Dent J* 1975; 25(4):229-35.

- [21] Guare R de O, Ciampioni AL. Prevalence of periodontal disease in the primary dentition of children with cerebral palsy. *J Dent Child* 2004; 71(1):27-32.
- [22] Araújo LML, Cezário, ES, Araújo LHL, Costa, FO, Zenóbio, EG. Condições periodontais de crianças e adolescentes participantes de um programa de saúde bucal. *Pesqui Bras Odontopediatria Clín Integr* 2011; 11(2):177-181. <https://doi.org/10.4034/PBOCI.2011.112.05> [In Portuguese]
- [23] World Health Organization. *Oral Health Surveys: Basic Methods*. 3<sup>rd</sup>. ed. Geneva: ORH/EPID; 1987.
- [24] Dickinson HO, Parkinson KN, Ravens-Sieberer U, Schirripa G, Thyen U, Arnaud C, et al. Self-reported quality of life of 8-12-year-old children with cerebral palsy: A cross-sectional European study. *Lancet* 2007; 369(9580):2171-8. [https://doi.org/10.1016/S0140-6736\(07\)61013-7](https://doi.org/10.1016/S0140-6736(07)61013-7)
- [25] Victora CG, Huttly SR, Fuch SC, Olinto MTA. The role of conceptual frameworks in epidemiological analysis: A hierarquical approach. *Int J Epidemiol* 1997; 26(1):224-7. <https://doi.org/10.1093/ije/26.1.224>
- [26] Lee Y, Dickinson C. Parental perceptions of oral health and access to oral health care services for children with special educational needs in South Bedfordshire. *J Disab Oral Health* 2009; 10(4):156-60.
- [27] Carvalho RB, Mendes RF, Prado RR Jr, Moita Neto JM. Oral health and oral motor function in children with cerebral palsy. *Spec Care Dentist* 2011; 31(2):58-62. <https://doi.org/10.1111/j.1754-4505.2011.00180.x>
- [28] Vale EB, Mendes ACG, Moreira RS. Self-perceived oral health among adults in Northeastern Brazil. *Rev Saúde Pública* 2013; 47(3):98-108. <https://doi.org/10.1590/S0034-8910.2013047004893>.
- [29] Abanto J, Carvalho TS, Mendes FM, Wanderley MT, Bönecker M, Raggio DP. Impact of oral diseases and disorders on oral health-related quality of life of preschool children. *Community Dent Oral Epidemiol* 2011; 39(2):105-14. <https://doi.org/10.1111/j.1600-0528.2010.00580.x>
- [30] Castilho LS, Abreu MHNG, Souza DH, Souza e Silva ME, Resende VLS. Factors associated with gingivitis in children with developmental disabilities. *Braz Res Pediatr Dent Integr Clin* 2016; 16(1):441-8. <https://doi.org/10.4034/PBOCI.2016.161.46>
- [31] Brasil. Lei No. 7.612, 17 de Novembro de 2011. Plano Nacional dos Direitos das Pessoas com Deficiência – Plano Viver sem Limites. *Diário Oficial da União* 2011; 17 Nov. [In Portuguese]