

# Prevalence of dental caries in patients with intellectual disabilities from the Association of Exceptional Children's Parents and Friends of Southern Brazil

## Prevalência da cárie dentária em pacientes com deficiência intelectual da Associação de Pais e Amigos das Crianças Excepcionais do Sul do Brasil

Micheline Sandini TRENTIN<sup>1</sup>

Antonio Augusto Iponema COSTA<sup>2</sup>

Maurício BARANCELLI<sup>3</sup>

Marília Fagury Videira Marceliano-ALVES<sup>4</sup>

Daniela Cristina MIYAGAKI<sup>5</sup>

João Paulo De CARLI<sup>6</sup>

### ABSTRACT

#### Objective

This study was conducted to determine the prevalence and severity of dental caries, missing and restored teeth (DMFT) and the efficiency of oral health programs for patients with intellectual disabilities, from age 11 to 38, who attended at the Association of Exceptional Children's Parents and Friends (APAE) in Passo Fundo, southern Brazil.

#### Methods

The prevalence of dental caries was assessed by DMFT in 109 patients. The mean and standard deviation were evaluated by One-way ANOVA with 5% significance level.

#### Results

47 of the evaluated students were female and 62 male, with moderate mental disability, Down syndrome, cerebral paralysis and epilepsy. The DMFT average was 3.93 for 11-14 years, 3.47 for 15-19 years, 4.74 for 20-30 years and 5.68 for the group 31-40 years. There were no significant differences among the DMFT index, gender and intellectual disability for the groups.

#### Conclusion

Patients had acceptable oral hygiene within their limitations, suggesting that prevention and dental care program developed in APAE-PF/RS could be used as a model for health care for patients with intellectual disabilities in other institutions and other cities.

**Indexing terms:** Dental auxiliaries. Dental staff. Oral health. Professional competence.

### RESUMO

#### Objetivo

Determinar a prevalência e a severidade da cárie dentária, ausências dentárias e restaurações pelo índice CPOD, tão bem como a eficiência dos programas de saúde bucal de pacientes com deficiência intelectual, com idades de 11 a 38 anos, que frequentavam a Associação de Pais e Amigos das Crianças Excepcionais-APAE Passo Fundo, Sul do Brasil.

#### Métodos

A prevalência da cárie dentária foi avaliada pelo índice CPOD em 109 pacientes. A média e o desvio-padrão foram avaliados pela ANOVA unidirecional com nível de significância de 5%.

#### Resultados

47 dos estudantes avaliados eram do sexo feminino, e 62 do masculino, apresentando deficiência mental moderada, síndrome de Down, paralisia cerebral e epilepsia. A média do CPO-D foi de 3.93 para as idades de 11-14 anos, 3.47 para 15-19 anos, 4.74 para 20-30 anos e 5.68 para os pacientes com 31-40 anos. Não houve diferenças significativas entre o índice de CPOD, gênero e deficiência intelectual.

#### Conclusão

Os pacientes apresentaram higiene bucal aceitável dentro das suas limitações, sugerindo que o programa de prevenção e tratamento odontológico desenvolvido no APAE-PF/RS poderia ser utilizado como modelo de atenção à saúde para pacientes com deficiência intelectual em outras instituições e outras cidades.

**Termos de indexação:** Cárie dentária. Deficiência intelectual. Odontologia preventiva.

<sup>1</sup> Universidade de Passo Fundo, Faculdade de Odontologia, Departamento de Periodontia. Campus I, Km 292-Br 285, São José, CxP-611, Passo Fundo, RS, Brasil. Correspondência para / Correspondence to: MS TRENTIN. E-mail: <tmicheline@upf.br>.

<sup>2</sup> Universidade Regional Integrada Universitária do Alto Uruguai e Missões, Faculdade de Odontologia, Departamento de Ciências Orais. Erechim, RS, Brasil.

<sup>3</sup> Universidade de Passo Fundo, Faculdade de Odontologia, Departamento de Ortodontia. Passo Fundo, RS, Brasil.

<sup>4</sup> Universidade Federal do Rio de Janeiro, Faculdade de Odontologia. Rio de Janeiro, RJ, Brasil.

<sup>5</sup> Universidade de Passo Fundo, Faculdade de Odontologia, Departamento de Endodontia. Passo Fundo, RS, Brasil.

<sup>6</sup> Universidade de Passo Fundo, Faculdade de Odontologia. Passo Fundo, RS, Brasil

## INTRODUCTION

Patients with intellectual disabilities (ID) are those who do not fit into normal physical, intellectual or emotional parameters such as growth patterns, mental development and emotional control. These individuals require special education and additional assistance at appropriate centers for a period of time during their lives or indefinitely. Patients with severe mental disability often present the need for dental care because of the close relation among oral health and balance of stomatognathic functions such as mastication, phonation, and swallowing. Therefore, measures are taken to prevent diseases that leads to inflammation and infection that cause pain and affect the individual's general health<sup>1</sup>.

According to the World Health Organization (WHO)<sup>2</sup> 10% of the population in developed or developing countries has some kind of physical or mental disability. In less developed countries, this rate ranges between 15% and 30%. In Brazil, there are 45.6 million patients with disabilities, as shown by the 2010 census conducted by the Brazilian Institute of Geography and Statistics (IBGE)<sup>3</sup>.

There is a consensus agreement about the poor oral hygiene of ID<sup>4</sup>. This can be explained by their difficulty in understanding the importance of oral health, lack of motivation, manual dexterity and difficulties related to lack of communication, macroglossia, hypermotor or hypomotor activity, and physical limitation. In addition, lack of information of legal guardian and the many concerns and problems surrounding them, make oral health less of a priority, leading to its deterioration.

The most prevalent disease in the oral cavity are dental caries. Over the years, there has been a decline in Decayed, Missing and Filled Teeth DMFT index: (decayed permanent teeth, lost and restored) and deciduous teeth decayed, missing and restored (dmft). Comparing the latest surveys of the Project SB Brazil 2003 and 2010, it was noticed a decrease in DMFT at 12 years, from 2.8 to 2.1. Ages 15 to 19 fell from 6.1 to 4.2, while from 35 to 44 years, the reduction was from 20.1 to 16.3. The dmft at 5 years decreased from 2.8 to 2.35.

In the field of oral health, epidemiology has dealt with the collective diagnosis of the most prevalent oral diseases since the late 1930s, with the advent of the DMFT index<sup>5-6</sup>. It has still been the most widely used index on a global scale, serving as reference for the diagnosis of diseases of permanent teeth and for the formulation and assessment of oral health programs<sup>7-9</sup>.

Given the lack of studies of the oral health of ID in Passo Fundo/RS-Brazil, and in the nearby region, in southern Brazil, the aim of the present paper is to determine the DMFT index of students attending the Association of Exceptional Children's Parents and Friends (APAE/PF) and to associate it with the preventive measures used at that Institution. The present study aims to evaluate whether patients APAE/PF have DMFT higher than they have patients without special needs.

## METHODS

A cross-sectional, transversal quantitative study was conducted about the prevalence of dental caries in students who attended APAE/PF-RS Brazil between 2010 and 2011. The present study was approved by the Research Ethics Committee of University of Passo Fundo, in Passo Fundo, Rio Grande do Sul, Brazil, protocol n° 320/2009, according Helsinki's declaration, is manifested by the approval of the research project.

A multidisciplinary team consisting of neurologist, pediatrician, psychologist, physical therapist, occupational therapist and social workers initially evaluated all individuals admitted to APAE. All information were recorded in the APAE database, including the Wechsler Intelligence Scale for Children (WISC-III) test for the diagnosis of intellectual disability level, according to the International Classification of Diseases (ICD-10). For the present study, the researchers were able to access such records and supported by the multidisciplinary team.

A dental surgeon and two dentistry students performed the examinations. Previously, a calibration was performed intra and inter-examiner through Kappa, with agreement level of 90%, as well as a pilot project with 10% of the sample. Parents or legal guardians signed a informed consent form prior to their children's participation in the study.

The following aspects were taken into account for patient evaluation, quantification and standardization of the sample: type of disability, gender and age. The codes used to describe their intellectual disabilities were 1. moderate mental disability; 2. cerebral paralysis; 3. mental disability and epilepsy; 4. Down's syndrome. The codes used for age was: 1. for 11-14 years; 2. for 15-19 years; 3. for 20-30 years; and 4. for 31-38 years.

In addition, the patients were grouped in different categories according to the permanence in the institution (APAE): 1. Patients with 1-5 years in the Institution. 2.

Patients with 5-10 years in the Institution. 3: patients over 10 years in the Institution.

Age was stratified in order to avoid bias towards deciduous and permanent teeth, in compliance with WHO recommendation<sup>2</sup>. Patients younger than 11 years older than 38 years and those with physical disabilities were excluded of the study. Dental caries was clinically assessed by two dental undergraduate students from the University of Passo Fundo (UPF-RS/Brazil), previously trained to use the DMFT index.

The data were tabulated using the SPSS 20.0 for Windows (IBM Corporation 1 New Orchard Road Armonk, New York 10504-1722 United States), and the mean and standard deviation were calculated for each variable. It was also conducted ANOVA and post hoc (Tukey's test) at a 5% significance level for the association of the DMFT index with age, intellectual disabilities and gender. The criteria used for evaluation of dental caries was the DMFT index proposed by Klein and Palmer<sup>6</sup>, standardized by WHO<sup>2</sup> as detailed below (Chart 1). This evaluation was based on 28 permanent teeth of all patients of the study, the index DMFT represents disease and its consequences.

**Chart 1.** Codes proposed by WHO for the DMFT index and their respective clinical meanings.

PERMANENT TOOTH CODE	CLINICAL MEANING
0	Healthy crown or root
1	Decayed crown or root
2	Filled crown or root with caries
3	Filled crown or root without caries
4	Missing tooth due to caries
5	Permanent tooth missing for other reasons
6	Sealant
7	Bridge, crown or facing abutment
8	Unerrupted tooth
9	No record
T	Trauma or fracture

## RESULTS

Of the 109-assessed patients, 47 were female and 62 male. Regarding age, there was a higher prevalence of patients aged 15-19 years, and a lower prevalence of patients aged 31-38 years. The greater frequency and percentage of patients studied were of the age group of 15-19 years (43.5%), followed by the age group of 11-14

years (25.9%). Table 1 shows the distribution of patients in relation to different degrees of disability. 71% of the analyzed patients had moderate mental disability, 9% cerebral paralysis, 4.3% mental disability and epilepsy and 13.8% Down's Syndrome.

**Table 1.** Frequency and percentage (%) of patients analysed for different disabilities.

Intellectual Disabilities	Frequency	%
Moderate mental disability	77	71.0
Cerebral paralysis	10	9.0
Mental disability and epilepsy	6	6.0
Down's syndrome	16	14.0
Total	109	100

The mean DMFT index and the standard deviation were 3.93 and 3.48, for patients of the 11-14 age group, 3.47 and 2.95 for the 15-19 age group, 4.74 and 3.74 for the 20-30 age group, and 5.68 and 2.76 for the 30-38 age group. Patients in the 20-30 and 31-38 age groups had a higher DMFT index than younger patients, (4.74) and (5.68), respectively, which is considered by WHO as severe (Table 2).

**Table 2.** Mean  $\pm$  standard deviation of the DMFT among the different age groups.

Age	CPO-D (Average) $\pm$ Standard deviation
11-14 years	3.93 $\pm$ 3.48
15-19 years	3.47 $\pm$ 2.95
20-29 years	4.74 $\pm$ 3.74
30-38 years	5.68 $\pm$ 2.76

Table 3 shows the mean and standard deviation of different degrees of disabilities. It's observed that in moderate mental disorder (1) there was an average of 5.204 and dp (2.961) for decayed components, 20.81 and dp (3.86) for healthy teeth. For Cerebral Paralysis (2), it was observed that 20 teeth were decayed, 16 lost, 2 filled and only 8 were healthy. For mental disability and epilepsy (3), there was a homogeneity of data: average of 4.8 and SD: 2:34 to decayed teeth, missing teeth<sup>10</sup>, 12 restored and healthy. For patients with Down syndrome (4), it was observed that the average of decayed teeth was 4.52, lost 4.59, filled, 5.68 healthy and 16.47.

**Table 3.** Mean  $\pm$  standard deviation of the components decayed, missing, filled teeth and healthy for the different degrees of disability of the patients analyzed.

Disabilities	Decayed	Missing	Filled teeth	Healthy
Moderate mental disorder	5.20 $\pm$ 2.96	1.92 $\pm$ 1.18	6.12 $\pm$ 7.53	20.81 $\pm$ 3.86
Cerebral Paralysis	4.18 $\pm$ 3.10	21.12 $\pm$ 5.70	9.00 $\pm$ 9.89	4.83 $\pm$ 6.33
Mental disability and epilepsy	4.80 $\pm$ 2.34	8.00 $\pm$ 5.45	5.33 $\pm$ 2.30	12.50 $\pm$ 4.75
Down syndrome	4.52 $\pm$ 3.28	4.59 $\pm$ 4.01	5.68 $\pm$ 5.9	16.47 $\pm$ 4.46
Total	4,81 $\pm$ 2.98	4,08 $\pm$ 4.20	4,79 $\pm$ 4.38	18,59 $\pm$ 5.26

It could be also observed in this table, that there were significant differences when compared to healthy teeth ( $p = 0.003$ ) and lost ( $p = 0.000$ ) and age of patients by ANOVA test at 5%. Patients younger had higher levels of healthy teeth than patients with higher age. It can be observed that past experience of caries was more prevalent in older age groups (Table 4). It is observed in table 5 that there were no significant differences between genders ( $p = 0.368$ ) compared with teeth decayed, missing, filled and healthy by ANOVA at 5% significance level.

**Table 4.** Comparison of average DMFT of patients with age (ANOVA  $p < 0.05$ ).

DMFT	n	Average	p
Decay	90	9.185	0.873
Missing	54	8.96	0.003
Filled teeth	71	20.54	0.274
Healthy	102	18.41	> 0.0001

**Table 5.** Comparison of the mean DMFT index in relation to gender of patients (ANOVA  $p < 0.05$ ).

	n	Mean Square	p
Gender	109	0.248	0.368
Decay	92	9.088	0.527
Missing	56	10.301	0.198
Filed teeth	73	21.63	0.684
Healthy	104	25.019	0.055

## DISCUSSION

Detailed information about the distribution of caries and its biopsychosocial determinants is the first and foremost step in planning oral health programs, especially for patients with intellectual disabilities (ID)<sup>11</sup>. This issue has been dealt with in several clinical

studies<sup>8-9</sup>. In these studies, ID had a higher prevalence and severity of dental caries compared to "non-special" patients<sup>11</sup>. The larger impairment of oral health in these patients can be explained by their physical, mental and social limitations, in addition to the use of systemic (psychoactive) drugs that can lead to the loss of oral integrity<sup>12-13</sup>.

Besides patient-specific factors, these studies correlate this high prevalence of dental caries with patients' socioeconomic background as families are often socially and emotionally disadvantaged and hardly provided with education on health, increasing the odds for oral diseases among these patients<sup>3,12-16</sup>. Most patients assessed in this study had good oral hygiene, regardless of how severe their disabilities were. These data are consistent with studies reporting that institutionalized patients had better oral health than non-institutionalized ones<sup>15,17</sup>.

This finding could be related to the interdisciplinary work carried out at APAE/PF, the School of Dentistry of UPF have provided dental care for more than 15 years, through the Extension Project for Prevention of Oral Diseases. In addition the work of speech therapists, helped with the correction of aggravating factors such as mouth breathing and also played a crucial role in the reduction of dental caries in the local population.

No significant differences was observed in this study between the DMFT index and gender and severity of disabilities. Similar results were obtained from 750 twelve-year-old PSN in Flanders, Belgium<sup>18</sup>. The study included different types of disabilities (mild and moderate mental disability and motor and hearing impairment). Of the assessed PSN, 78% had dental caries, which was more common among individuals with mild mental disability (84%) and less common among those with physical disability. In a study of cariogram, it observed that the only variable that correlated with higher caries experience (DMFT) was the content of the diet<sup>19</sup>.

Previous study reported the higher need for treatment of people with disabilities is related to dental extractions and restorative procedures<sup>20</sup>. Given the results of this study and the studies reported above, it could be suggested that health professionals perform educational, health promotion, disease prevention, rehabilitation of the demands of treatment, oral hygiene instruction and healthy diet for students.

A previously work on cerebral paralysis patients, the DMFT index increased with age and with the severity of the disability, and so did the necessity of dental care<sup>21</sup>.

The authors also mention that children with moderate cerebral paralysis needed more dental care and had more decayed and missing teeth. Their results are similar to ours in that PSN in the 31-38 age group showed higher DMFT indices than in the other groups. In contrast, Ngcobo et al.<sup>22</sup> reported that children with disabilities (intellectual, learning and brain paralyzes) had lower prevalence of caries compared to the general population, regardless of disability.

In a study<sup>23</sup>, in Europe with patients aged 2 to 6, 7 to 12 and older than 13 years affected by mental disability, cerebral paralysis, autistic disorder, and Down's syndrome, dental caries was assessed according to WHO criteria. Neither deft nor DMFT indices varied significantly relating to the type of disability, but to oral hygiene. The author points out that autistic child have better oral hygiene than those with mental disability. However, our study did not find differences in the oral hygiene of students at APAE/PF-RS as to the type of disability.

The WHO<sup>2</sup> establishes the age of 12 years as reference for the DMFT index, with the following levels of severity: very low prevalence (0.1-1.1); low prevalence (1.2-2.6); moderate prevalence (2.7-4.4) and high prevalence (4.5-6.5). O' Donnell et al.<sup>16</sup> described dental caries and oral hygiene of 100 children and adults with mental disability in Hong Kong. The mean of DMFT index was 1.23 for 14 year-olds and 5.73 for the 25-35 age group. Similar results were observed in this study, in which age played a crucial role in the DMFT index where the most prevalent disease in the oral cavity was a cavity. Over the years there has been a decline in DMFT index and dmft. Comparing the latest surveys of the Project SB Brazil 2003 and 2010, it was noticed a decrease in DMFT at 12 years, from 2.8 to 2.1. Aged 15 to 19 fell from 6.1 to 4.2, while from 35 to 44 years, the reduction was from 20.1 to 16.3. The dmft at 5 years decreased from 2.8 to 2.35. The mean values were 3.93 for the 11-14 age group, 3.47 for the 15-19 age group, 4.74 for the 20-29 age group and 5.68 for the 30-38 age group, thus indicating that the DMFT index increased with age. In a study with Thai children aged 6 and 12 years, also concluded that the number of caries increased with age<sup>24</sup>.

According to WHO criteria<sup>2</sup> it can be stated that the results of our study are encouraging, as most assessed patients showed good oral hygiene and are not so distant from those with mild to moderate prevalence. The DMFT index was slightly greater than expected, indicating high prevalence, is seen in older patients, aged between 20 and

38 years, with indices of 4.74 and 5.68, respectively. This is partly because younger patients have been followed up on a weekly basis by extension projects at APAE/PF-RS for about 15 consecutive years, with the aim of instructing students on how to take care of their oral health through practical and educational activities. When ID are younger, their parents have more control over their oral hygiene, but as they grow older, most of them seek to be more independent, refusing the constant help from their caregivers.

The results of our study are also related to the length of time (years) students attending at APAE. Since APAE has a permanent oral health extension work, this certainly influenced the results of our study. Therefore, 30 patients and 27.5% of the sample are in the Institution for 1-5 years. Patients with 5-10 years in the Institution, with 55 patients and 50.45%, and patients over 10 years in the Institution with 24 patients and 22% of the sample.

Prevention programs that include videos and manual training for people with special needs, regular professional assistance, dental plaque control, dietary control, water fluoridation and application of sealants are efficient measures for the prevention of dental diseases in these patients<sup>14</sup>. Furthermore, it requires that professionals prepare themselves for the care of patients with special needs<sup>24-25</sup>. In the study with 219 ID, concluded that special dental care programs are important for institutionalized patients with mental disability in order to reduce the prevalence of caries and periodontal disease<sup>15-17</sup>. Also, the studies with 12-year-old ID, highlighted the necessity to provide educators and parents with qualification in oral health<sup>18</sup>.

Possible limitations of this study occur because the survey had been conducted in an institution that has their own dental clinic and the students receive weekly instruction in oral hygiene. We suggest future research in this line to present solutions to these patients incorporating other APAE of southern Brazil. Therefore, it is important that legal surrogates also comply with oral hygiene practices together with the ID, as their caregivers often neglected the oral health of those who are more independent. Providing oral health education of parents, caregivers and nurses', strengthening prevention programs at a very young age, and encouraging dentists to set up a dental care system for this population with disabilities is an urgent need.

It may be concluded that students from APAE/PF-RS have good oral health, with a moderate DMFT index,

and that few patients have tooth losses. This is due in part to the fact that the sample is homogenous in terms of treatment of these individuals and that oral hygiene and motor coordination patterns are similar. Furthermore, we highlight another important factor, the existence of Interdisciplinary Programs and Extensive Promotion of Oral Health, linked to the UPF in APAE/PF-RS that due to its feature interdisciplinary, can serve as a model, extended to other institutions of the same character, and adapted according to their peculiarities.

## CONCLUSION

Within the limitations of this study could be concluded that patients from APAE had acceptable oral hygiene to the dental procedure proposed. The observed DMFT indexes were relatively low for individuals with different levels of disability, but were not different among them. The older patients had higher caries rates and higher dental losses than the younger ones; It is important to have a focused, constant and multidisciplinary monitoring of patients with disabilities in institutions that

have patients with intellectual disabilities.

## ACKNOWLEDGMENTS

This study was supported by grants from the Research Support Foundation in Rio Grande do Sul (FAPERGS).

## Collaborators

MS TRENTIN, main researcher responsible for the experimental part of the research, data analysis, scientific writing and revision of the text in Portuguese. AAI COSTA, assisted on the experimental part of the research, literature review and revised the final text. M BARANCELLI, assisted on the experimental part of the research, literature review and on the data tabulation. MAFV MARCELIANO, assisted on the text revision in Portuguese and English and formatting to the Journal. DC MIYAGAKI, assisted in the finalization of the text in English and Portuguese. JP CARLI, assisted in scientific writing the article and reviewing the final text.

## REFERENCES

- Al-Qahtani Z, Wyne AH. Caries experience and oral hygiene status of blind, deaf and mentally retarded female children in Riyadh, Saudi Arabia. *Odontostomatol Trop*. 2004 Mar;27(105):37-40.
- World Health Organization [cited 2016 Aug 30]. Available from: <<http://www.who.int/en/>>.
- Instituto Brasileiro de Geografia e Estatística Brasil [citado 2016 April 10]. Disponível em: <<http://www.ibge.gov.br/>>.
- Beil H, Mayer M, Rozier RG. Dental care utilization and expenditures in children with special health care needs. *J Am Dent Assoc*. 2014;140(9):1147-55. doi.org/10.14219/jada.archive.2009.0343.
- Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Secretaria de Vigilância em Saúde. Departamento de Atenção Básica e Coordenação Geral de Saúde Bucal. SB Brasil: pesquisa nacional de saúde bucal - resultados principais [citado 2016 Set 2]. Disponível em: <[http://dab.saude.gov.br/cnsb/sbbrasil/arquivos/projeto\\_sb2010\\_relatorio\\_final.pdf](http://dab.saude.gov.br/cnsb/sbbrasil/arquivos/projeto_sb2010_relatorio_final.pdf)>.
- Klein H, Palmer CE. Dental caries in American Indian children. *Pub Health Bulletin*. 1937;239:1-53.
- WHO. The World Health Report: reducing risks, promoting healthy life [citado 2016 Aug 30]. Available from: <[http://www.who.int/whr/2002/en/whr02\\_en.pdf](http://www.who.int/whr/2002/en/whr02_en.pdf)>.
- Huebner CE, Chi DL, Masterson E, Milgrom P. Preventive dental health care experiences of preschool-age children with special health care needs. *Spec Care Dentist*. 2015;35(2):68-77. doi: 10.1111/scd.12084
- Chen CY, Chen YW, Tsai TP, Shih WY. Oral health status of children with special health care needs receiving dental treatment under general anesthesia at the dental clinic of Taipei Veterans General Hospital in Taiwan. *J Chin Med Assoc*. 2014;77(4):198-202. doi: 10.1016/j.jcma.2014.01.008
- Mayes SD, Calhoun SM. Similarities and differences in Wechsler Intelligence Scale for Children-Third Edition (WISC-III) Profiles: Support for Subtest Analysis in Clinical Referrals. *Clin Neuropsychol*. 2004;18(4):559-72. doi: 10.1080/13854040490888530
- Hoffmann RHS, Cypriano S, Sousa MLR, Wada RS. Dental caries experience in children from public and private schools from a city with fluoridated water. *Cad Saúde Pública*. 2004;20:522-528. doi: 10.1590/S0102-311X2004000200020
- Morgan J. Why is periodontal disease more prevalent and more severe in people with Down syndrome? *Spec Care Dentist*. 2007;27(5):196-201.
- Chi DL, Ettinger RL. Prevention and nonsurgical management of dental caries over the life course for individuals with special health care needs. *J Calif Dent Assoc*. 2014;42(7):455-63.
- Glassman P, Subar P. Creating and mainting oral health for dependent people in Institutional settings. *J Public Health Dent*. 2010;70(Suppl 1):40-8. doi: 10.1111/j.1752-7325.2010.00174.x
- Pregliasco F, Ottolina P, Mensi C, Carmagnola D, Giussani F, Abati S, et al. Oral health profile in an institutionalized population

- of Italian adults with mental retardation. *Spec Care Dentist*. 2001;21(6):227-31.
16. Donnell DO, Sheiham A, Wai YK. Dental findings in 4-, 14-, and 25-to 35-year-old Hong Kong residents with mental and physical disabilities. *Spec Care Dentist*. 2002;22(6):231-4.
  17. Lucca MQ, Loureiro CA. Experience of caries in patients with cerebral paralysis. *RGO, Rev Gaúch Odontol*. 2011;59:387-395.
  18. Martens L, Marks L, Goffin G, Gizani S, Vinckier F, Declerck D. Oral hygiene in 12-year-old disabled children in Flanders, Belgium, related to manual dexterity. *Community Dent Oral Epidemiol*. 2000;28:73-80. doi: 10.1034/j.1600-0528.2000.280110.x
  19. Giacaman RA, Miranda Reyes P, Bravo Leon V. Caries risk assessment in Chilean adolescents and adults and its association with caries experience. *Braz Oral Res*. 2013;27:7-13. doi: org/10.1590/S1806-83242013000100002.
  20. Salles PS, Tannure PN, Oliveira CA, Souza IP, Portela MB, Castro GF. Dental needs and management of children with special health care needs according to type of disability. *J Dent Child (Chic)*. 2012;79(3):165-9.
  21. Huang ST. The oral health status and treatment needs of institutionalized children with cerebral paralysis in Taiwan. *J Dent Sci*. 2012;5:75-89. doi.org/10.1016/S1991-7902(10)60012-8
  22. Nqobobo CB, Yengopal V, Rudolph MJ, Thekiso M, Joosab Z. Dental caries prevalence in children attending special needs schools in Johannesburg, Gauteng Province, South Africa. *SADJ*. 2012 Aug;67(7):308-13.
  23. Altun C, Guven G, Akgun OM, Akkurt MD, Basak F, Akbulut E. Oral health status of disabled individuals attending special schools. *Eur J Dent*. 2010;4:361-6.
  24. Liu HY, Huang ST, Hsiao SY, Chen CC, Hu WC, Yen YY. Dental caries associated with dietary and toothbrushing habits of 6 to 12-year-old mentally retarded children in Taiwan. *J Dent Sci*. 2009;4:61-74. doi: 10.1016/S1991-7902(09)60010-6
  25. Iponema AAC, Della Bona A, Trentin MS. Influence of different intellectual disability level on caries and periodontal disease. *Braz Dent J*. 2016;27(1):52-55. doi: 10.1590/0103-6440201600420

Received on: 18/11/2016

Final version resubmitted on: 16/5/2017

Approved on: 30/9/2017