

## Evaluation of caries risk in pre-school children using the CAMBRA protocol and CAST index

### Avaliação do risco de cárie em crianças em idade pré-escolar utilizando o protocolo CAMBRA e o índice CAST

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**ABSTRACT**

**Objective:** To evaluate the risk of caries and oral health condition in children, using the CAMBRA protocol of the American Academy of Pediatric Dentistry (AAPD) and the Species and Treatment Index for Caries Assessment (CAST) in preschoolers. **Method:** It is characterized as a cross-sectional retrospective observational analytical study, with clinical examination procedures, questionnaires and oral hygiene analysis in children from 2 to 5 years old. 507 preschoolers aged 2 to 5 years were evaluated in public daycare centers in the city of São Gonçalo - Brazil. **Results:** The CAMBRA protocol has a moderate risk of 55.4%, while 44.6% has a high risk of caries, from 2 to 5 years. When considering the range of 2 to 3 years apart, 67.1% of children are at high risk. The CAST index showed 10.6% of lesions caused by caries, correlated between caries and the CAST index. **Conclusion:** It is necessary to implement preventive strategies to reduce caries in this studied group.

**Keywords:** Dental caries, Child health, Health promotion.

**RESUMO**

**Objetivo:** Avaliar o risco de cárie e a condição de saúde bucal em crianças, utilizando o protocolo CAMBRA da Academia Americana de Odontologia Pediátrica (AAPD) e o Índice de Espécies e Tratamento para Avaliação de Cárie (CAST) em pré-escolares. **Método:** Caracteriza-se como um estudo analítico observacional retrospectivo do tipo transversal, com procedimentos de exame clínico, questionários e análises de higiene bucal em crianças de 2 a 5 anos de idade. Foram avaliados 507 pré-escolares de 2 a 5 anos em creches públicas da cidade de São Gonçalo - Brasil. **Resultados:** O protocolo CAMBRA apresenta risco moderado de 55,4%, enquanto 44,6% apresenta risco elevado de cárie, de 2 a 5 anos. Ao considerar o intervalo de 2 a 3 anos de intervalo, 67,1% das crianças apresentam alto risco. O índice CAST mostrou 10,6% de lesões causadas por cárie, correlacionado entre cárie e o índice CAST. **Conclusão:** É necessário implementar estratégias preventivas para redução da cárie neste grupo estudado.

**Palavras-chave:** Cárie dentária, Saúde infantil, Promoção de saúde.

## 1 INTRODUCTION

Early childhood caries (ECC) is considered a public health problem in different parts of the world. Although oral health has been recognized as a component of general health, the FDI World Dental Federation (2016) expanded the definition of “oral health” as part of general health and well-being, including the possibility of laughing, talking, expressing feelings without pain or discomfort. Besides its known definition of multifaceted etiology, it reinforces for the dental and medical classes the need to promote awareness about the different dimensions of oral health as part of general health.<sup>1,2</sup>

Cariou lesions impact the quality of life of children and is undoubtedly one of the most prevalent health conditions that generate financial costs for public service and the families of preschoolers, in addition to the biological factors specific to each individual, ECC is influenced by the family's behavioral character, lifestyle, thus family approaches are essential for its prevention.<sup>3,4</sup> The early identification of these risk groups allows health authorities to plan preventive measures and use resources more efficiently.<sup>5,6</sup> There are several protocols for risk assessment of dental caries in the literature and in order to standardize them, since 2016 the American Academy of Pediatric Dentistry developed a protocol for risk assessment of caries called CAMBRA. This protocol is considered a possible standard protocol, as it is easy and quick to apply, in addition to individualizing the child's dental care and the need for preventive and / or therapeutic procedures.<sup>5,6</sup>

The concept that caries is a multifactorial disease limits the strategies for its control. (2013; Januário et al. 2017).<sup>7,8</sup> Thus, it is necessary to understand the etiology and prevalence of ECC<sup>9</sup> and identify the groups at greatest risk, proposing specific programs to the authorities allow prevention or treatment in the local daycare centers of São Gonçalo – Rio de Janeiro – Brazil.

The present study evaluated the oral health conditions in babies and children from 0 to 5 years old, proposing a treatment and care plan based on the risk of the CAMBRA protocol (Caries Management by Risk Assessment, AAPD) and using the CAST index (Caries Assessment Spectrum and Treatment).

## 2 METHODS

The research project was approved by the Research Ethics Committee of Hospital Universitário Clementino Fraga Filho - Federal University of Rio de Janeiro (UFRJ), 83091718. 0000.5257, under protocol number 2582.522, according to Declaration of Helsinki. This is a cross-sectional retrospective observational analytical study. The study

design was provided by the clinical research website after registration (RBR-47qws8), with clinical examination procedures, questionnaires, and analysis of oral hygiene in children aged 2 to 5 years, held in public daycare centers in the city of São Gonçalo. The survey started in 2018 and ended in 2019. The sample consisted of children from 2 to 5 years old, of both sexes, healthy, born and domiciled in the city of São Gonçalo. Children were selected and the consent form were signed by the parents and/or guardians. Children over 5 years old or those with no parental consent were excluded of the study.

Children who needed specialized care were referred with a letter containing the treatment needed to the Municipal Health Secretariat of São Gonçalo. The study presented a calibration with  $K=0.92$  and the intercalibration with agreement of 92% and  $K = 0.82$  for CAST and 0.89 for CAMBRA.

All children were examined and submitted to evaluation using the CAMBRA Protocol (Dental caries risk assessment form, recommended by the American Academy of Pediatric Dentistry (American Academy of Pediatric Dentistry, 2016). It is divided into four columns. In the first column there are three risk factors: biological, protective and clinical findings. The second, third and fourth column shows the risk classification (high, moderate and low risk) (Chart 1 and 2) and CAST index (instrument that was developed and tested for use in epidemiological surveys and that covers the entire diagnostic spectrum of carious lesions, from sound surfaces of teeth to teeth with abscess or fistula) (Chart 3) only initial assessment of the oral health condition was performed. Items 1 (Mother/main caregiver has active caries) and 12 (The child has high levels of *Streptococcus mutans*) of the CAMBRA questionnaire were not used in the assessment.

Data were collected in public daycare centers in the municipality of São Gonçalo, the form was used in a simplified way. Of the 14 items that make up the caries risk assessment form for children aged 0 to 5 years, 2 items were excluded. Therefore, the form was composed of 5 biological factors, 4 protective factors and 3 clinical findings. The child's risk rating (low, moderate or high) is obtained by circulating the conditions that apply to a specific patient as well as the factors that contribute to or protect against tooth decay.<sup>10</sup>

Chart 1. Caries Risk Assessment Form based on the CAMBRA for 0 to 5-Year-Old Children (American Academy of Pediatric Dentistry).

Factors	High Risk	Moderate Risk	Low Risk
<b>Biological</b>			
Mother/primary caregiver has active caries	Yes		
Parent/caregiver has low socioeconomic status	Yes		
Child has >3 between meal sugar-containing snacks or beverages per day	Yes		

Child is put to bed with a bottle containing natural or added sugar	Yes	
Child has special health care needs		Yes
Child is a recent immigrant		Yes
<b>Protective</b>		
Child receives optimally-fluoridated drinking water or fluoride supplements		Yes
Child has teeth brushed daily with fluoridated toothpaste		Yes
Child receives topical fluoride from health professional		Yes
Child has dental home/regular dental care		Yes
<b>Clinical Findings</b>		
Child has >1 decayed/missing/filled surfaces	Yes	
Child has active white spot lesions or enamel defects	Yes	
Child has elevated <i>Streptococci mutans</i> levels	Yes	
Child has plaque on teeth		Yes

Chart 2. Classification of caries risk (CAMBRA) (Kerry, 2019).

<b>Low Risk</b>	No clinical finding, the risk factors do not outweigh the protective factors
<b>Moderate Risk</b>	One clinical finding, risk factors outweigh protection factors
<b>High risk</b>	More than one clinical finding, several risk factors are present, exceeding the protective factors

Chart 3. Caries Assessment Spectrum and Treatment (CAST). Adapted from Frencken et al., 2015.

Characteristic	Code	Description
Sound	0	No visible evidence of a distinct carious lesion is present
Sealant	1	Pits and/or fissures are at least partially covered with a sealant material
Restoration	2	The cavity was restored with an indirect or direct restorative material, currently without caries injury or signs of fistula/abscess.
Enamel	3	Distinct visual change in enamel. Clear discoloration related to caries is visible, including localized enamel breakdown without visual signs of dentin involvement.
Dentine	4	Caries related to dentin discoloration. The lesion appears as discolored dentin shadows visible through the enamel that may or may not have visible localized cavitation.
Dentine	5	Distinct cavitation in dentin. No pulp involvement.
Pulp	6	Pulp chamber involvement. Distinct cavitation has reached the pulp chamber, or only fragments of roots are present.
Abscess/ fistula	7	An injury with pus containing or not swelling, or sinus tract releasing pus related to a tooth with pulp involvement due to tooth decay.
Lost	8	The tooth has been removed due to dental caries.
Other	9	Does not correspond to any of the other descriptions (White spot lesions)

With the individual forms of each child filled in, the collected data were tabulated in an Excel spreadsheet (Microsoft, Inc, Redmond, Wash., USA), statistical analyzes were performed using the IBM SPSS 22 software (IBM Corporation, Armonk-NY, U.S). Due to the nature of the variables (dichotomous or counting), nonparametric tests were used to assess differences between groups and correlations. For differences by sex and responses to the risk questionnaire, Fisher's exact test was used. Correlations were made with the Spearman coefficient between questions and age. For all analyzes, a significance level of

5% ( $p < 0.05$ ) was considered. For nominal variables, the association between variables was assessed using Pearson's chi-square test or Fisher's exact test, following the criterion proposed by Cochran (1963).<sup>11</sup> Regarding correlations between nominal variables and quantitative or ordinal variables, the significance of the correlation was assessed using the Student's t-test coefficient or the Mann Whitney U test, depending on the normality and homogeneity of the variances.

### 3 RESULTS

Of the 507 participants, 250 were male (49.3%) and 257 female (50.7%), aged 2 to 5 years (mean age = 3 years). 12 factors were considered to classify the risk of caries injuries and formed the scale for identifying the Caries Risk Assessment factors. To calculate the scale score, biological factors and clinical findings were scored when present in the high risk column at +2, when present in the medium risk column +1, indicating the risk of caries injuries. In the protection factors, there was an inversion in the score, that is, when these factors are not present, it was scored with -1. The inversion in the protection items to its opposite causes these items when not present to indicate the lack of protection against caries lesions in the variable. The scale score can vary from a maximum of 13 to a minimum of -4 points (Kerry, 2019).<sup>10</sup>

Of the 507 children evaluated, 199 had 7 risk factors (39%), 107/5 factors (21.1%), 94/6 factors (18.5%), 80/4 factors (15.8%), 12/9 factors (2.4% ), 7/11 factors (1.4%), 6/8 factors (1.2%), 2/10 factors (0.4%). Among the children evaluated, 55.4% had moderate risk and 44.6% high risk.

When added the scores attributed by the risk factors, the children evaluated did not present low risk, 281 (55.4%) of the children presented medium risk and 226 (44.6%) high risk.

Our findings showed that when the CAMBRA protocol (Chart 3) was applied in the whole group from 2 to 5 years old, a moderate risk was predominant, while for the sample segmented by age group, the group from 2 to 3 years old presented the predominance of high risk, being considered the polarization group for which the conventional preventive treatment is not enough to avoid the appearance of caries (Table 1).

Table 1. Description of the sample risk x age (2 to 5 years old).

Risk	2	3	4	5	Total
Moderate	28 (27.8%)	79(36.9%)	98 (94.2%)	76 (97.4%)	281 (55.4%)
High	78 (72.2%)	138 (63.1%)	8(5.8%)	2 (2.6%)	226 (44.6%)
Total	106 (100%)	217(100%)	106(100%)	78 (100%)	507 (100%)

#### 4 DISCUSSION

The risk factors studied are diverse and their identification is of fundamental relevance for the development of targeted strategies in order to reduce the incidence and prevalence of caries in the studied population. In view of these evidences, a protocol for attendance and treatment to preschoolers in the city of São Gonçalo-RJ was elaborated, to guide the professional, with examples of the treatments that can be performed (professional topical treatment every 3,6,12 months). according to the risk, application of fluorotherapy, gel and varnish), behavioral change (diet guidelines, brushing frequencies), minimally invasive care (application of sealants), adequacy of the parents' oral environment with 1% chlorhexidine gel, the same protocol will be suggested to the municipal departments of Education in School Health and Oral Health in order to guide the activities of promotion, protection and maintenance of oral health.

The evaluation of risk of caries is effective in identifying individuals who need preventive services and in managing risk factors. Each of the described parameters that make up the risk protocols are variable according to age, socioeconomic and culture patterns, as well as variables in the prediction model.<sup>12,13,14</sup>

On the other hand, other authors believe that, in order to obtain accuracy, risk protocols must be developed based on biological, protective factors and clinical findings, age, population characteristics and disease levels.<sup>15</sup>

In the territory covered by the public nurseries of São Gonçalo, where the research was carried out, the CAST index (number of decayed deciduous teeth, with indicated extraction, missed due to caries or filled/restored) presented 10.6% teeth with a history of the disease, numbers lower than the average found in other studies at national level (48%).<sup>16,17</sup> Also, when compared with the southeast region, the present study disagrees with the data from SB Brasil 2014,<sup>18</sup> in which the average of 2.62 of five-year-old children have caries lesions.

Our data were collected from oral health assessments carried out in preschoolers in public daycare centers in São Gonçalo, similar to other studies,<sup>19,20</sup> though the CAST index was used instead of the dmft index (WHO), which made the discussion difficult because it is a new index with only few published studies. The sample size (507 individuals) was larger

when compared to other studies.<sup>5,6,21</sup> Contrastingly with Utreja et al. 2010 and Custodio-Lumsden et al. 2016, who evaluated larger samples, similar studies of risk assessment of ECC, in a low-income Hispanic population, the sample was 108 children aged two to six years.<sup>22,23</sup>

Some variables (risk indicators for dental caries) were analyzed to characterize our sample, such as "the child goes to bed with a baby bottle containing natural or added sugar" and "the child has teeth brushed daily with toothpaste with fluoride", questioned because the beginning of oral hygiene and the use of fluoride toothpaste are critical factors in the prevention of ECC.<sup>1,3</sup>

In the studied population, only 35.9% of the children had teeth brushed with fluoride toothpaste, and 64.1% of the children did not perform any type of oral hygiene, unlike the paper published by Toumba et.al 2019 that confirmed by other authors.<sup>23,24</sup> The effectiveness of brushing teeth with fluoride toothpaste in prevention of carious injuries, highlighting that this daily care should be strongly advised, respecting the amount of toothpaste by age.<sup>25</sup>

The average age of the children evaluated in this study was 36 months and a high risk in this age group (67.1%) was detected. This age range is an ideal period for dental consultations and the introduction of healthy eating habits. Twetman (2016)<sup>26</sup> agrees, arguing that every child has their care and values received from the family. Thus, we must modify the risk factors to avoid the development of caries lesions, always seeking prevention, but all these changes require efforts from the family unit, which is not always aware of the repercussions that caries lesions can cause. This is corroborated by Custodio-Lumsden et al.<sup>27</sup> who defends the importance of health professionals who care for children, know how to recognize and modify the risk factors that can lead to the development of carious lesions, since events that occur in childhood can impact adult life by determining the child's future condition. Naidu et al.<sup>28</sup> believe that regardless of the development of caries injuries, the prevention performed in dental care should aim not only to prevent the installation of caries injuries, but also to provide sources to avoid harmful consequences when the caries injury is already installed, limiting the damage.<sup>1,2,20</sup>

Other variables related to caregivers were also collected, such as socioeconomic level and guidance on oral hygiene. All of them had low socioeconomic status and had not received proper guidance on oral hygiene. As it is a public daycare center, many caregivers/teachers had not yet received guidance on oral hygiene from a professional. Despite the family health strategy program provides at least one dental care to each pregnant



woman, perhaps this model needs adjustment in order to make parents/guardians sufficiently motivated and oriented towards this activity.

Considering the findings on caries experience and caries risk classification, most children did not experience caries according to CAST index 10.6%, while with regard to caries risk, most children (55.4%) were classified as moderate risk and 44.6% with high risk, which can be due to the fact that several risk factors present absence of variability, according to factors found in the field. No similar studies were found to compare these data.

Some studies have evaluated the reliability of caries risk assessment tools, and Gao et al.<sup>6</sup> showed that the tools Cariogram and CAMBRA presented high sensitivity, despite its low specificity in the prediction of caries in children (83.7 and 62.9%). In the present study, the risk protocol used was considered a good predictor of factors of risk to dental caries, as it presented high sensitivity and moderate/good specificity, corroborating with Ribeiro et al.<sup>12</sup> Thereby, it is necessary to identify the polarization group as a whole, which needs a more effective preventive treatment, identifying among the risk factors those who need adequate strategies to reduce the incidence and prevalence of dental caries in the population studied.

## 5 CONCLUSIONS

Our data allows to conclude that 55.4% of children evaluated had a moderate risk, and 44.6% a high risk of developing dental caries, being the medium risk sufficient if considering the total sample aged from 0 to 5 years, but when segmenting the ages, it evidences a high risk in the age range from 0 to 3 years old (67.1%). The risk factors studied are diverse and their identification is of fundamental relevance for the development of targeted strategies in order to reduce the incidence and prevalence of caries in the studied population

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## REFERÊNCIAS

1. Dye BA, Hsu KL, Afful J. Prevalence and measurement of dental caries in young children. *Pediatr Dent*. 2015;37(3):200-16.
2. Glick M, Williams D. A New Definition of Oral Health: Executive summary. *FDI World Dent Fed*. 2020;1:1-4.
3. Edelstein BL, Ng MW. Chronic disease management strategies of early childhood caries: Support from the medical and dental literature. *Pediatr Dent*. 2015;37(7):281-7.
4. Simón-Soro A, Mira A. Solving the etiology of dental caries. *Trends Microbiol*. 2015;23:76-82.
5. Yoon RK, Smaldone AM, Edelstein BL. Early childhood caries screening tools: A comparison of four approaches. *J Am Dent Assoc*. 2012;143:756-63.
6. Gao X, Di Wu I, Lo EC, Chu CH, Hsu CY, Wong MC. Validity of caries risk assessment programmes in preschool children. *J Dent*. 2013;41(9):787-95.
7. Bradshaw DJ, Lynch RJM. Diet and the microbial aetiology of dental caries: new paradigms. *Int Dent J*. 2013;63(2):64-72.
8. Januário BS, Figueiredo MC, Faustino-Silva DD. Avaliação de protocolos de manejo de cárie em crianças de 0 a 3 anos de idade baseada no risco. *Stomatos*. 2017;23:14-27.
9. Frencken JE, De Amorim RG, Faber J, Leal SC. The Caries Assessment Spectrum and Treatment (CAST) index: Rational and development. *Int Dent J*. 2011;61(3):117-23.
10. Kerry KC. *Cambra: A Comprehensive Caries Management Guide for Dental Professionals*, 2019, Cda Cambra Guide.
11. Cochran W. *Sampling Technique*. 2nd ed. John Wiley and Sons Inc. 1963.
12. Ribeiro LGM, Maltz M, Hashizume LN. Effect of different 1% chlorhexidine varnish regimens on biochemical composition of the dental biofilm. *Rev Odonto Cienc*. 2011;26:30-4.
13. Featherstone JDB, Crystal YO, Chaffee BW, Zhan L, Ramos-Gomez FJ. An Updated CAMBRA Caries Risk Assessment Tool for Ages 0 to 5 Years. *J Calif Dent Assoc*. 2019; 47(1):37-47.
14. Mejåre I, Axelsson S, Dahlén G, Espelid I, Norlund A, Tranæus S, Twetman S. Caries risk assessment. A systematic review. *Acta Odontol Scand*. 2014;72(2):81-91.
15. Fontana M. The Clinical, Environmental, and Behavioral Factors That Foster Early Childhood Caries: Evidence for Caries Risk Assessment. *Pediatr Dent*. 2015;37:217-25.

16. Leal SC, Ribeiro APD, Frencken JE. Caries Assessment Spectrum and Treatment (CAST): A Novel Epidemiological Instrument. *Caries Res.* 2017;51:500–6.
17. Ionta FQ. et al. Changes in oral health-related behavior of infants following a preventive program of continuing education directed to their parents. *Pesqui Bras Odontopediatria Clin Integ.* 2015;15(1):31–9.
18. Ministério da Saúde. Pesquisa Nacional de Saúde Bucal (SB BRASIL 2010). 2014.
19. Albino J, Tiwari T. Preventing Childhood Caries: A Review of Recent Behavioral Research. *J Dent Res.* 2016;95:35–42.
20. Huong DM. et al. Prevalence of early childhood caries and its related risk factors in preschoolers: Result from a cross sectional study in Vietnam. *Pediatr Dent J.* 2017;27(2):79–84.
21. Chaffee BW, Cheng J, Featherstone JDB. Baseline Caries Risk Assessment as a Predictor of Caries Incidence. *J Dent.* 2015;43(5):518–24.
22. Eden E. Evidence-based caries prevention. 1st ed. Springer 2016.
23. Rocha NB, Moimay SAS, Garbin AJI, Saliba O, Garbin CAO. Relationship between perception of oral health, clinical conditions and socio-behavioral factors of mother-child. *Brazilian Res Pediatr Dent Integr Clin.* 2015;15(1):113–21.
24. Walsh T, Worthington HV, Glenny AM, Marinho VC, Jeroncic A. Fluoride toothpastes of different concentrations for preventing dental caries. *Cochrane Database Syst Rev.* 2019;3(3):CD007868.
25. Divaris K. Predicting Dental Caries Outcomes in Children. *J Dent Res.* 2019;95(3): 248–54.
26. Twetman S. Caries risk assessment in children: how accurate are we? *Eur Arch Paediatr Dent.* 2016;17:27–32.
27. Custodio-Lumsden CL, Wolf RL, Contento IR, Basch CE, Zybert PA, Koch PA, Edelstein BL. Validation of an early childhood caries risk assessment tool in a low-income Hispanic population. *J Public Health Dent.* 2016;76(2):136-42.
28. Naidu R, Nunn J, Donnelly-Swift E. Oral health-related quality of life and early childhood caries among preschool children in Trinidad. *BMC Oral Health.* 2016;16(128):1-9.