Original Research
Cariology

Consensus for teaching dental caries in the Portuguese Language at Brazilian dental schools

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Abstract: The aim of this paper was to present a summary of the process of developing and preparing the final documents of the national consensus for teaching undergraduate Brazilian dental students the dental caries curriculum in the Portuguese language. The final document was developed in three steps: a) The ABENO and LAOHA cariology group invited experts from all five regions of Brazil to participate in the discussion. The theoretical support for crafting the first draft of the consensus was based on two publications: National Curriculum Guidelines of the Dentistry graduation in Brazil, Ministry of Education (2021) and the competences described in the European Core Curriculum for Cariology (ORCA-ADEE, 2011); b) The group of experts was divided into 5 working groups: G1-Domain, Main and Specific Competences, G2-Essential knowledge, G3-Life course perspective, G4-Social determinants and dental caries, G5- Glossary. The document was finalized by thoroughly reviewing the process using Delphi methodology; c) The 5-chapter document (one from each working group) was submitted to three open public consultations in 2022 (May-June, August, and October) using Google-forms. The suggestions (content/wording) were discussed within the group as: totally accepted, partially accepted, and rejected. A total of 192 suggestions were registered from 31 dental schools in all regions of Brazil. The number of suggestions received per Group were: 84, 28, 26, 24, 30 suggestions for G1, G2, G3, G4 and G5, respectively. The majority of suggestions were totally accepted by the group of experts (n = 172, 89.6%), 15 were partially accepted (7.8%), and 5 were rejected. Conclusion: The final document could be considered to be the first national consensus for teaching the dental caries curriculum in Brazil.

Keywords: Education, Dental; Dental Caries; Dentistry.

Introduction

Dental caries is defined as a dynamic, multifactorial, non-communicable, biofilm-mediated, diet-modulated disease resulting in the loss of minerals from the hard tissues of the tooth.[1] It is considered the most prevalent chronic non-communicable disease in the world that can occur throughout an individual's life, and is a cause for concern in babies, children, young people, adults, and the elderly. The prevalence

of untreated caries in primary and permanent teeth is high in many parts of the world, including Latin American and Caribbean (LAC) countries.[2] This disease, determined by biological, behavioral, psychosocial, and environmental factors, affects thousands of Brazilians.

Teaching dental caries in Schools of Dentistry is always a challenging task since this is a complex disease with no single causation pathway and there are an increasing number of strategies for managing the caries processes and outcomes.[3,4] In the majority of circumstances, cariology is the main discipline to organize and provide the best evidence for a consistent and systematic education on the subject of dental caries. Therefore, in 2010, the European Organization for Caries Research developed a workshop for proposing a Core Curriculum in Cariology, which has influenced many dental schools all over the world.[5-9]

In 2013, only 15% of the Brazilian dental schools had a specific discipline denominated "Cariology".[8] In the following year, the Brazilian Association of Dental Education (ABENO) began to support workshops and discussions focused on the introduction of cariology in the curriculum of undergraduate dental courses in Brazil. A few years later, 32% of the Brazilian dental schools offered cariology as a discipline in their curriculum and 85% of the dental schools responded that they would support a national curriculum of cariology. The increasing interest in teaching cariology, however, occurred with evident geographical regional differences, and most importantly, with the observation of low impact of this discipline on the dental clinical practice of the curriculum.[10] In other words, in many cases, cariology was restricted to the initial phase of the curriculum as a theoretical fragmented or isolated framework that was disconnected from the main purpose of the process of dental education.

In 2021, publication of the National Curriculum Guidelines (DCN) on graduation in Dentistry in Brazil, presented the coordinators, lecturers, and dental students with new challenges. This document sets the guidelines for the graduation course, bachelor's degree, to be followed for elaborating the curriculum of Higher Education Institutions (IES) in the country. These guidelines established the principles, foundations, and purposes of dental education, and had to be applied on a national scale in the organization, development, and evaluation of the pedagogical projects of undergraduate courses in Dentistry within this year.[11] Meanwhile, the Latin American Oral Health Association (LAOHA), created a cariology group for discussing dental caries in Latin American and Caribbean (LAC) countries. As a result, a caries consensus for the region was accomplished with several recommendations including the need for rethinking the curriculum of cariology in this part of the world.[2] Considering that there were over 500 dental schools in the country in 2021, a national workshop to discuss cariology teaching in Brazil was indeed an impossible project. Hence, an ABENO-LAOHA task force was formed for thinking about, planning, and preparing a national consensus for guiding the teaching of a dental caries curriculum in Brazilian dental schools.

It is of significant importance to point out that the present guidelines were prepared with focus on "dental caries" and not in "cariology" due to the profile of graduates' (bachelor) in Dentistry demanded by the DCN: "*generalist, endowed with solid technical-scientific grounding, active and permanent construction of their knowledge; humanist and ethical, caring about the person's dignity, individual and collective needs, promoter of integral health, and transformer of the reality in favor of society; capable of performing teamwork in an interprofessional, interdisciplinary, and transdisciplinary manner, as a proactive, entrepreneur, with and attitude of leadership; communicative, able to express themselves clearly; critical, reflexive, and active dentistry practice at all levels of health care; aware of and participative in social, cultural, economic, environmental policies, and technological innovations*".[11] Moreover, the DCN supported emphasis on the "*health-disease process of the individual, family, and population in the different life cycles, referred to in the epidemiological and professional reality*".

The main and supporting competencies for teaching a dental caries curriculum in this Brazilian consensus proposal were based on the ORCA consensus for teaching cariology. Small modifications to focus

on the teaching of dental caries were done.[5] This emphasis should not be interpreted as a fragmentation or dissociation of dental caries from other health problems, clinical situations, or other fields of knowledge. On the contrary, the objective was to overcome the limits of the "cariology" curricular component so that "dental caries" would become a transversal topic across the entire undergraduate course. Moreover, this approach can contribute to a transdisciplinary educational concept to be included in the curriculum.

Finally, the objective of this paper was to present a brief report about the development of the project and final documents (in five chapters) of the national consensus for teaching undergraduate Brazilian dental students the dental caries curriculum in the Portuguese language.

Methodology

The ABENO and LAOHA cariology group invited experts in different fields (Cariology, Operative Dentistry, Pediatric Dentistry, Public Health, and Dental Education) and from all five regions of Brazil - to guarantee geographical representativeness – to participate in the process. The theoretical support for crafting the first draft of the consensus was primarily based on the combination of two publications: The Ministry of Education's National Curriculum Guidelines on Graduation in Dentistry in Brazil and the competences described in the European Core Curriculum for Cariology ORCA-ADEE.[5,11] Other documents were also used for supporting the idea of focusing on dental caries integrated into the National Health System (SUS) and standardization of terminologies of dental caries and dental caries management.[4,12,13]

The team of experts was divided into 5 working groups: G1-Domain, Main and Specific Competences, G2-Essential knowledge, G3-Life course perspective, G4-Social determinants and dental caries, G5-Glossary. The background document created was finalized by submitting it to a thorough review procedure using Delphi methodology. Finally, the 5-chapter document was submitted to three open public consultations in 2022 (May-June, August, and October) using Google-forms on ABENO´s homepage. Dental associations and institutions were invited to collaborate by e-mail and official letters. The suggestions could be made in two categories: for content and/or wording. Finally, all suggestions and comments were subsequently discussed within the group of experts, classified as: totally accepted, partially accepted, and rejected.

Results

As stated, the final document was structured in five chapters, one for each working group: Chapter 1-Domain, Main and Specific Competences, Chapter 2-Essential knowledge, Chapter 3-Life course perspective, Chapter 4-Social determinants, and dental caries and Chapter 5-Glossary. In this report, emphasis will be laid on Chapter 1 due to its direct relations with the understanding, requirements and planning of a curriculum for teaching dental caries in five domains, in a manner similar to that of the European Core Curriculum in Cariology.[5]

A total of 192 suggestions received from 31 dental schools in all regions of Brazil were registered. The numbers were: 84, 28, 26, 24, 30 suggestions for Groups G1, G2, G3, G4 and G5, respectively. The majority of suggestions were totally accepted by the group of experts (n = 172, 89.6%), 15 were partially accepted (7.8%) and only 5 were rejected.

Chapter 1. Domain, Main and Specific Competences

The present document was structured from general to the more specific topics for all sections. Each category or domain had a list of articles linking the text to the National Curriculum Guidelines (DCN) of graduation in Dentistry program in Brazil. Moreover, all direct indications for other dental hard tissue conditions were removed (*e.g.*: fluorosis, MIH, dental erosion, and many non-carious lesions).

Domain I: Basic Knowledge

This domain described the fundamental knowledge required for domains II to IV. To reach appropriate levels of competence, it was necessary to deepen different levels of knowledge and understanding of basic knowledge.

Major Competence

Apply knowledge and understanding of biological, health, basic and clinical sciences to recognize dental caries and other changes in dental tissues and make decisions about controlling dental caries at the individual and population levels (DCN Art. 11-I, Art. 11-III, Art. 11-IV, Art. 17, Art. 18, Art. 22, Art. 23, Art. 24- I).

Supporting Competences

Relative to the development, growth, and structure of tissues of the oral cavity, the graduate must:

Have essential knowledge about:

1.1 Normal development, growth and structure of dental tissues and the oral cavity (teeth, pulp, and salivary glands) at the macro/microscopic and molecular levels (DCN Art. 23).

Be familiar with:

1.2 Disorders of the development of dental tissues and the oral cavity at the macro/microscopic and molecular levels (DCN Art. 23).

Supporting Competences

In relation to the etiology, pathogenesis and modifying factors related to caries and other dental tissue disorders, the graduate must:

Be competent at:

1.3 Describing and discussing the mechanisms and dynamic processes involved in states of health at the macro/microscopic and molecular levels (DCN Art. 11-IV, Art. 23 , Art. 24-I).

Have essential knowledge about:

1.4 Role played by biofilm, diet, nutrition, saliva and other host factors, fluoride and behavioral/social factors related to dental caries and other dental tissue disorders.

1.5 Biochemical events in biofilm, saliva, and dental tissues.

1.6 Production of acids and bases, buffering properties and the effects of mineral saturation levels in saliva and biofilm (DCN Art. 18, Art. 23).

Be familiar with:

1.7 Role of environmental factors, medications, systemic diseases related to caries and other dental tissue disorders. (DCN Art. 11-III, Art. 23, Art. 25-III).

Supporting Competences

In relation to the detection, evaluation and diagnosis of dental caries, the graduate must:

Have essential knowledge in:

1.8 Physical and biological bases of changes in dental tissues related to the detection and evaluation of caries and other disorders of dental tissues.

1.9 Biological and physical aspects of radiographic examination related to the detection and evaluation of caries and other dental tissue disorders, including radioprotection problems.

1.10 Principles for evaluating the performance of diagnostic methods applied to caries and other dental tissue disorders (DCN Art. 5-VI, Art. 11-V, Art. 23, Art. 25-VII).

Be familiar with:

1.11 Mechanisms of action and limitations of emerging methods for detection, evaluation and diagnosis of caries and other dental tissue disorders (DCN Art. 6-I, Art. 25-VII).

Supporting Competences

In relation to behavioral sciences, the graduate must:

Have essential knowledge of:

1.12 Behavioral sciences including principles of psychology and sociology, considering interpersonal Competences, communication and behavior modifications. (DCN Art. 7-I, Art. 8-IV, Art. 24-I, Art. 24-IV)

Supporting Competences

Relative to prevention and management, the graduate must:

Have essential knowledge of:

1.13 Mode of action, composition, properties, limitations and side effects of frequently available

materials, and techniques for the non-restorative (non-invasive) and restorative (invasive) management of caries and other dental tissue disorders, at individual, group, and community levels (DCN Art. 5-VI, Art. 25-VI)

Be familiar with:

1.14 Theoretical bases of emerging strategies and materials for the prevention and management of caries and other dental tissue disorders (DCN Art. 6-II, Art. 11-VI)

Supporting Competences

In relation to epidemiology and research methodology, the graduate must:

Have essential knowledge in:

1.15 Bases of epidemiology

1.16 Principles of risk assessment

1.17 Scientific methodology and its limitations, including experimental designs, sampling, biases, and statistics (DCN Art. 9-II, Art. 11-VIII, Art. 23-II, Art. 24-VI).

Domain II: Risk Assessment, Diagnosis, Synthesis

This domain is a bridge between basic knowledge (Domain I) and decision-making regarding non-restorative and restorative options for controlling dental caries. Competences in synthesis and decision-making are necessary to obtain evidence- based information and appropriate decisions for clinical and public health practice.

• Risk assessment

Major competence

Identify and estimate the probability of a patient developing new carious lesions or progression of existing lesions during a given period. The graduate is required to have in-depth knowledge and understanding of the aforementioned competences so that he or she can collect, record and analyze clinical data reliably, thus allowing him or her to classify patients into different groups or categories of risk for dental caries (DCN Art. 11-IV, Art. 25-I, Art. 25-II).

Supporting Competences

2.1 Obtain information from risk factors/indicators (if/when applied): patient history (medical, dental), social and economic aspects; oral health behavior (oral hygiene, knowledge, preferences, dietary habits and intraoral biological factors); caries experience, use of fluorides; systemic health conditions; consider new risk factors validated in accordance with scientific evidence.

2.2 Communicate the results of the risk analysis to patients/guardians/caregivers and provide recommendations that allow the patient to reduce the risk of developing new lesions or progression of existing lesions – see domains III and IV (DCN Art. 7-I, Art. 11-III, Art. 11-IV, Art. 24-I).

Have essential knowledge in:

2.3 Evaluating emerging information on risk factors and indicators (DCN Art. 6-II).

• Diagnosis

Major Competence

The graduate must be competent in diagnosing caries at the patient level and at lesion level by means of data collection and analysis, integration of information about signs and symptoms, assessment of the lesion status of activity on the tooth surface, and identification past or present occurrence of caries disease. (DCN Art. 11-IV, Art. 23, Art. 25-I)

Supporting Competences

The graduate must:

2.4 Recognize "normal" and "abnormal" dental tissue; perform differential diagnosis between carious and non-carious changes and abnormalities in dental tissues, coronal and root surfaces.

2.5 Collect and record information about the presence of different stages of the carious process (signs and symptoms).

2.6 Determine the activity of the lesion in its different stages. (DCN Art. 11-IV, Art. 23, Art. 25-I).

Have essential knowledge in:

2.7 Evaluating current and emerging methods for detecting and assessing the extent of carious lesions,

assessing carious lesion activity, and be capable of using this information to guide decision making.

(DCN Art. 6-II, Art. 11-VI , Art. 25-I).

Be familiar with:

2.8 Different types of developmental abnormalities and differentiate these conditions from caries (DCN Art. 23).

• Synthesis

Major Competence

Ensure ongoing and appropriate management of dental caries at both the patient and lesion levels and combine and interpret information obtained from risk analysis, the processes of diagnosis and decision making; assessing the patient's needs, preferences and interests; and monitor, review and re-evaluate patient-centered and patient-shared information (DCN Art. 5-V, Art. 6-II, Art. 11-IV, Art 11. VI, Art. 11-X, Art. 25- I, Art.25-II).

Supporting Competences

The graduate must:

2.9 Identify and assess patients' needs, preferences, and interests in relation to the management of dental caries.

2.10 Incorporate, when necessary, information on monitoring, review and reassessment of caries in decision making (DCN Art. 5-V, Art. 6-II)

Be familiar with:

2.11 Treatment options, including when to refer for specialized treatment (medical/dental) for rare dental tissue disorders or for medical conditions that are causing dental tissue disorders (DCN Art. 5-II, Art. 5-III, Art. 10- II, Art. 11-III, Art. 11-IV, Art. 11-IX, Art. 25-III).

Domain III: Decision-making and preventive non-restorative therapies

This domain is related to the control of caries and other disorders of the hard dental tissues with an emphasis on long-term preventive care and maintenance. It involves the application of the principles of primary and secondary prevention. These Competences must be applied differently, from the perspective of respecting the course of life.

• Communication with patients, families, and communities in different healthcare environments

Major Competence

The graduate must be competent in communicating aspects of prevention in an effective, interactive, and reflective manner to patients of all ages, their families and caregivers. The communication style must be appropriate to the age and social circumstances of the patient/community and the setting in which he/she operates. The term "patient" will be used to refer to families and caregivers when appropriate (DCN Art. 7-I, Art. 7-II, Art. 7-III, Art. 7-IV, Art. 7-V, Art. 24-IV, Art. 24-V).

Supporting Competences

The graduate must be competent in:

3.1 Establishing a trusting professional-patient relationship.

3.2 Identifying the patient's expectations, desires, competence to collect, interpret and synthesize all information, values, attitudes, needs and demands for preparing the preventive treatment plan.

3.3 Identifying psychological, physical, cognitive and social factors that can influence patient adherence and consequently the results of implemented and advised preventive measures.

3.4 Identify factors in health services that make it difficult for patients to understand and access dental treatment (oral health literacy)

3.5 Involve patients so that they understand the disease in order to improve their cooperation in relation to individual/professional preventive measures.

3.6 Obtain informed consent from patients/guardians for all aspects of preventive care.

3.7 Work together with other members of the health team in a collaborative manner and recognize the role and responsibility of each of them in the production of oral health care.

3.8 Appropriately share information and professional knowledge with other healthcare professionals and know when to refer patients at high risk of caries to secondary care

3.9 Stimulate supported self-care, seeking to empower people to self-manage their condition, through knowledge of the signs of their health condition, self-assessment of health status, agreement on goals, development of person-centered care plans and monitoring continuous. (DCN Art. 5-III, Art. 5-IV, Art. 5-V, Art. 5-VII, Art. 7-I, Art. 7-II, Art. 8-II, Art. 24-IV, Art. 24-V).

Have essential knowledge in:

3.10 Behavioral factors that facilitate the implementation of preventive care.

3.11 Patient-related factors that influence the outcomes of preventive counseling, e.g., expectation, adherence over time, and manual dexterity.

3.12 Non-verbal communication competences, e.g.: intonation, body language, eye contact.

3.13 Behavioral interventions, such as motivational interviewing

3.14 Enable the patient to recognize the association between the oral cavity and systemic diseases (DCN Art. 7-IV, Art. 8-IV, Art. 11-III, Art. 24-I, Art. 24-IV).

Be familiar with:

3.15 Behavioral differences related to cultural aspects (DCN Art. 5-IV, Art. 24-I, Art. 24-IV)

• Decision making for non-restorative preventive therapies.

Major competence

The graduate must be competent to collect, interpret and synthesize all relevant information necessary for developing treatment options that can be presented to and discussed with the patient, to obtain a shared decision and person-centered treatment plan.

This includes preventive care strategies according to needs, risks and possibilities of adherence at the individual, family and community levels. Non-restorative management must consider not only the site/tooth, but also patient-related factors. This requires recognizing the potential for changes in risk factors and monitoring caries damage over time. In addition, the graduate must be competent in systematically evaluating all results of preventive treatment in follow-up consultations and formulating alternative plans when necessary (DCN Art. 5-IV, Art. 5-V, Art. 6-II, Art 11-IV, Art. 25-I, Art. 25-II).

Supporting Competences

The graduate must be competent in:

3.16 Decision making based on the synthesis described in domain II.

3.17 Educate patients regarding the etiology of dental hard tissue diseases and encourage them to take responsibility for their own oral health.

3.18 Educate patients regarding dietary habits relevant to oral health.

3.19 Teach patients how to properly perform oral hygiene procedures.

3.20 Consider the needs of certain risk groups (elderly, patients with special needs or systemic/psychiatric illnesses).

3.21 Perform professional dental prophylaxis.

3.22 Apply sealants.

3.23 Administer preventive agents (fluorides) appropriately.

3.24 Monitor the effects of mechanical and chemical control of dental biofilm (DCN Art. 5-V, Art. 5-VI, Art. 6-I, Art. 6-II, Art. 8-IV, Art. 11-III, Art 11-VI, Art. 25-III, Art. 25-VI, Art. 25-X- Art. 25-XI)

Have essential knowledge in:

3.25 Mechanisms of action of caries-preventive agents, their means of use and administration.

3.26 Limitations and adverse/side effects of agents/products used in preventive care.

3.27 Protective and destructive role of diet in dental caries (DCN Art. 5-VI, Art. 23, Art. 25-VI)

Be familiar with:

3.28 Critical assessment of new technologies/developments and how to integrate them into clinical activities (DCN Art. 6-II).

Domain IV: Decision-making and restorative therapies

This domain concerns the control of dental caries and other disorders of the hard tissues of dental elements with an emphasis on restorative treatment and maintenance (accompanied by continued

preventive care - domain III). This domain involves application of the principles of preserving dental hard tissues in line with other aspects of restorative dentistry, endodontics, and prosthetics. Furthermore, it involves performing the restoration and carrying out restorative treatment plan. It is recognized that the restorative option should be considered when control of the disease process is unsuccessful, or for the purposes of protecting the dentin-pulp complex, reestablishing tooth form and function, facilitating mechanical removal of biofilm, strengthening the remaining teeth or for aesthetic reasons.

• Decision making for the purpose of applying restorative therapy.

Major competence

The graduate must collect, interpret, and synthesize all relevant information necessary to develop treatment options that can be presented and discussed with the patient in order to obtain a shared decision for the individualized treatment plan.

This requires the ability to decide when restorative intervention should be used (for caries and other tooth conditions) and understand the consequences and prognosis of these decisions (DCN Art. 5-VI, Art. 6-I, Art. 6-II, Art. 11-IV, Art. 25-I, Art. 25-II).

Supporting Competences

4.1 Select the most appropriate treatment option based on the broad knowledge of non-restorative and restorative treatment possibilities available.

4.2 Recognize, understand and manage consequences of restorative intervention.

4.3 Continuous assessment/reflection of the decision-making process as well as the results of the restorative intervention (DCN Art. 5-VI, Art. 6-I, Art. 6-II, Art. 11-VI, Art. 25-VI).

Have essential knowledge in:

4.4. Reactions of the dentin-pulp complex to the carious process and restorative procedures (DCN Art. 11-VI, Art. 23)

Be familiar with:

4.5. Restoration success/failure rates (DCN Art. 6-I, Art. 6-II, Art. 25-VI)

• Restorative therapies

Major Competence

The graduate must be competent in carrying out the appropriate restorative treatment to treat caries while preserving the tooth structure. The graduate must be competent in restoring lost dental tissue with regard to form, function and esthetics, and at the same time, establish and promote oral health (DCN Art. 6-II, Art. 11-VI, Art 25-III, Art. 25-VI).

Supporting Competences

The graduate must be competent in:

4.6 Deciding when, how and to what extent the decayed tissue should be removed before placement of a restoration, in order to preserve tooth structure and pulp vitality.

4.7 Select and manipulate restorative materials, considering their physical and chemical properties, biocompatibility and longevity.

4.8 Select and execute operative techniques that are appropriate for the material used and the case in question (DCN Art. 6-II, Art. 25-VI).

Have essential knowledge in:

4.9. Impact of restorative procedures on mucosa, periodontal tissues, occlusion and oral function (DCN Art. 5-VI, Art. 6-II, Art. 25-VI).

Be familiar with:

4.10 New methods of removing decayed tissue, identifying/detecting what actually needs to be removed/ "state of the art" in removing decayed tissue.

4.11 Restorative techniques and materials.

4.12 Biomechanics of restorations (DCN Art. 6-II).

• Follow-up of restorative therapy

Major Competence

The graduate must be competent in the follow-up process (stages and return times for periodic observations of a treatment), in diagnosing caries around restorations, and restorative failures in follow-up consultations. The graduate must be competent in decisions about the maintenance, repair or replacement of a restoration, and in guiding/ instructing the patient to prevent damage to the

restoration (DCN Art. 5-V, Art. 6-II, Art. 7-I, Art. 8-IV, Art. 25-I, Art. 25-II, Art. 25-III).

Supporting Competences

The graduate must:

Have essential knowledge in:

4.13. Evaluating and monitoring treatment results over time.

4.14. Extending the longevity of the restoration (DCN Art. 6-II, Art. 25-VI).

Be familiar with:

4.15. Economic aspects of surgical/restorative therapy (DCN Art. 6-I, Art. 6-II, Art. 25-VI).

Domain V: Evidence-informed cariology in clinical practice and public health

This domain deals with the Major Competences of evidence-informed clinical practice in undergraduate Dentistry, which supports the double facet of cariology (directed particularly towards individuals) and public health cariology (directed at groups of individuals/ populations). Public health cariology requires additional competences in addition those listed in domains II-IV. Major competencies of evidence-informed Dentistry, which are generic skills in the undergraduate curriculum as a whole and not just for teaching about caries, are fundamental for the constant development of competences. The competences of clinical cariology in the assessment and control of caries at the individual level are addressed in domains II-IV, and for public health cariology they are presented in this domain in close relationship with the principles of evidence-based Dentistry. It is important that these topics are emphasized by including practical experiences in the clinic as well as in the public health setting.

• Public Health in Relation to Teaching Dental Caries

Major Competence

The graduate must be competent in the prevention and control of dental caries (and other changes in the hard tissues of dental elements) at individual, group and community levels. This requires understanding epidemiology and preventive and health promotion strategies in a multidisciplinary and integrated manner with the National Health System (SUS), and with other general health and nutrition strategies, considering the socioeconomic context (DCN Art. 5-I, DCN Art. 5-II , Art. 5-III, Art. 5-IV, Art. 5-V, Art. 5-VI, Art. 6-II)

Supporting Competences

The graduate must be competent in:

5.1 Promoting the prevention of dental caries in groups of individuals.

5.2 Assessing health-related behaviors including patterns of change.

5.3 Stimulating health promotion in a multidisciplinary manner as a strategy to prevent dental caries and other diseases.

Have essential knowledge in:

5.4 Management of issues related to both human rights, and interests, responsibilities and professional rights.

5.5 Record dental caries using appropriate indices for different levels of severity in the public health environment.

5.6 Indices for different oral problems associated with the differential diagnosis for dental caries.

5.7 Concepts of oral health and more specifically dental caries and quality of life.

5.8 Descriptive epidemiology of dental caries in relation to different independent variables, such as age, general health and socioeconomic status.

5.9 Identification of individuals, groups of individuals and populations at risk of developing dental caries.

5.10 Assessing the need for treatment from a public health perspective.

5.11 Interaction of levels of organization for prevention (individual, groups of individuals and populations).

5.12 Interaction between dental caries and other health problems.

5.13 Organization of oral health care for the individual and for collective oral health.

5.14 Role of different health professionals and their interactions with public health.

Be familiar with:

5.15 Application of epidemiological methods in public health.

5.16 Trends in oral health patterns and treatment needs.

5.17 Oral health promotion and prevention for populations as part of general health promotion.

5.18 Concepts of general public health in populations.

5.19 International approaches to oral health care systems.

5.20 Health economic aspects of oral health programs.

• Teaching Dental Caries informed by Evidence.

Major Competence

Graduates must understand the benefits of evidence-informed clinical practice at both the individual and collective health levels. Graduates must also have good knowledge and Competences in these areas and apply them in the prevention and management of dental caries (DCN Art. 5-III, Art. 6-II, Art. 11-III, Art. 11-VI, Art. 11 -VII, Art. 25-III).

Supporting Competences

The graduate must be competent in:

5.21 Promoting the prevention of dental caries in groups of individuals, ensuring the particularity of each person.

5.22 Formulating research questions with potential answers and search for scientific evidence using appropriate resources.

5.23 Seeking and using the most appropriate clinical guidelines.

5.24 Critically assessing scientific evidence concerning diagnostic methods, caries detection and their therapies.

5.25 Assessing scientific evidence concerning new therapeutic strategies for dental caries with a view to making decisions about their implementation.

5.26 Recognizing the limitations of research methodology and clinical guidelines.

Have essential knowledge in:

5.27 Principles of evidence-informed dentistry and the hierarchy of evidence.

5.28 Methods of communicating scientific evidence to individuals, groups of individuals and populations.

5.29 Advantages and disadvantages of clinical guidelines.

5.30 Translating research findings into clinical practice at the individual and collective levels.

Be familiar with:

5.31 Research principles including study design, sampling, biases, and biostatistics (related to Domain I).

Chapter 2. Essential knowledge for teaching dental caries

The National Curriculum Guidelines (DCN) of the Dentistry graduation in Brazil focus on the curricular contents of dental sciences organized from a course of life perspective. This approach allows the teaching of caries to be divided into a series of curricular components, simultaneously throughout the undergraduate course. In addition, it provides students with the opportunity to connect basic knowledge with its application to individuals and populations.

Therefore, the essential content for teaching dental caries in undergraduate dentistry courses was also designed and structured in this way. For better didactic organization, these contents were grouped into three sets, namely: (I) Dental caries: initial approach, (II) Dental Caries: health promotion and disease control in individuals and (III) Dental caries: health promotion and disease control in populations. Although there is a natural didactic sequence between them, with greater emphasis on basic knowledge related to the etiology and pathology of caries at the beginning of graduation (set I), then nourishing the theoretical framework necessary for conscious clinical action (set II) and an effective approach to populations (set III), there is also ample possibility of flexibility and intersection between these sets, in accordance with the Pedagogical Project and the curricular organization of each educational institution. For example, we mention students going to the field at the beginning of their degree to develop health promotion activities in population groups (set III), with adequate guidance and supervision from the teacher/tutor. An example or guide for the distribution of these three sets of

content throughout the undergraduate course, with possible intersections, can be seen in Figure 1.

The adoption of a teaching model connected with scientific evidence, which largely supports the philosophy of minimal dental intervention, requires some transformations, even in the way of evaluating and valuing the procedures performed by students in the clinical setting. A difficult, deep, and comprehensive debate on what is happening in dental schools is necessary to move from a classic restorative model to a minimally invasive model. After this critical thinking process the group listed twelve questions, including: how teaching about caries is being taught, whether in a purely theoretical way, or applied to practice; whether all instructors/lecturers of clinical disciplines are committed to non-operative treatment; and whether non-operative/invasive procedures are scored and valued in the same way as operative/invasive procedures.[14]

From different intersections, Caries Teaching must cover the ground from basic knowledge to its applicability in clinical practice and field work for population care. In this way, teaching will occur gradually and cumulatively, going through stages. As the theoretical and practical complexity of these stages advance, they involve basic knowledge in Cariology (fundamentals) to support decision-making, whether intervention or non-intervention, in addition to techniques of treatment itself. Health maintenance is also considered in all preventive or curative actions.

All these aspects are relevant to the teaching of caries at the clinical level of care for individuals and must be considered when establishing a guiding principle for the teaching of caries throughout the undergraduate course.

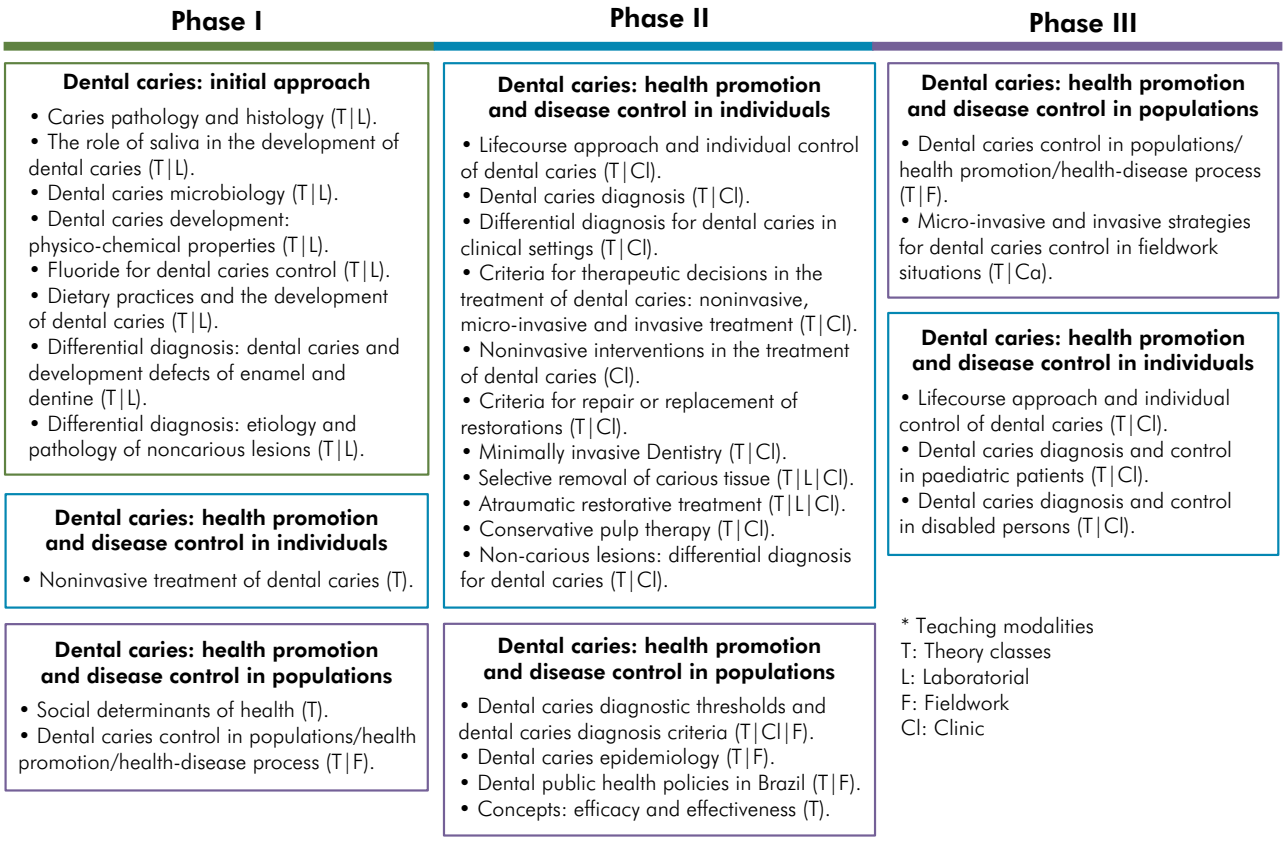

Figure 1. Essential content for teaching dental caries in the undergraduate dentistry course: distribution in three phases according to the timeline of the course.

Chapter 3. Dental caries from a course of life perspective

The approach to health from the perspective of continuing throughout the course of an individual's life considers the etiology of chronic non-communicable diseases, such as dental caries, in the long term, throughout life. Thus, it is understood that the conditions to which individuals are exposed throughout their lives may be related to the occurrence of these diseases.[15] Epidemiological studies using a life course approach have sought to improve understanding of the determinants for the experience of dental caries throughout life.[16,17]

Considering the recommendations of the DCN for the construction of a comprehensive essential curriculum, which contemplates individuals in their different life course perspectives and its relevance to the necessary skills required of dentists, the objective of the present chapter was to present recommendations for teaching the dental caries disease in undergraduate Dentistry courses in Brazil based on the care of individuals from their different life course perspectives.

The first stage was pregnancy, and the importance of prenatal dental care and the window of opportunity during the baby's first 1000 days was included for providing guidance and adoption of healthy habits.18 For babies (0 to 24 months), the period of dietary transition and consumption of free sugars were emphasized as important etiological factors for tooth decay. In children (2 to 9 years old) and adolescents (10 to 19 years old), we focused on the negative impact on the quality of life of the individual and their families, such as emotional and esthetic involvement and school absenteeism. In adults (20 to 59 years old), relevant points were emphasized such as the prevalence of gingival recessions, root exposures, and risk factors for the development of dental caries on exposed root surfaces. In the elderly (60 years or over), the greater need for support and support to perform oral hygiene was included, with attention to the etiology of ingesting medications containing sugar and those that can reduce salivary flow. For people with physical and/or cognitive disabilities, factors related to the individual's life approach must be taken into account.

Figure 2 provides one example of the recommendations for children from birth to 24 months.

Chapter 4. Caries as a marker of social inequity

This chapter focused on dental caries as a marker of social inequities and the implications for teaching this condition in Dentistry courses.

The social, economic, and cultural conditions of a population can reveal and also interfere in different epidemiological profiles between social groups. Living conditions, environment and health conditions generate an inseparable triad of etiological factors with multiple and complex interactions. The National Commission on Social Determinants of Health (2008) stated that the socioeconomic, cultural, and environmental conditions of a population generated the stratification of individuals and population groups, thus giving them different social positions, which were directly related to the conditions of health.[19]

According to Bernal Alvarez (2000), dental practice must provide construction, reaffirmation, and confrontation with theory.[20] Hence, theory and practice must be permanently interrelated, to provide spaces for creation, integration, and critical thinking.

This is one of the challenges to generalist training, as it needs to bring technical and scientific knowledge closer to the skills and competencies of the health professional who knows how to assess risks, has a solid basis in the etiology of the disease, in microbiology and therapy. In addition to isolated knowledge, it is important for the undergraduate student to be capable of understanding illness in a social matrix, in the structure of society, with its wide cultural and economic variations, and its different values.

Finally, the authors supported the suggestion from Ringel and co-workers (2000) that the Dentistry curriculum matrix must be based on learning under real conditions.[21] This model must include: 1. *Community-oriented teaching* – Knowledge of the oral health of human groups by recognition of the social context and its epidemiological reality, linking it with the clinic; 2. *Patient/user-centered teaching* –

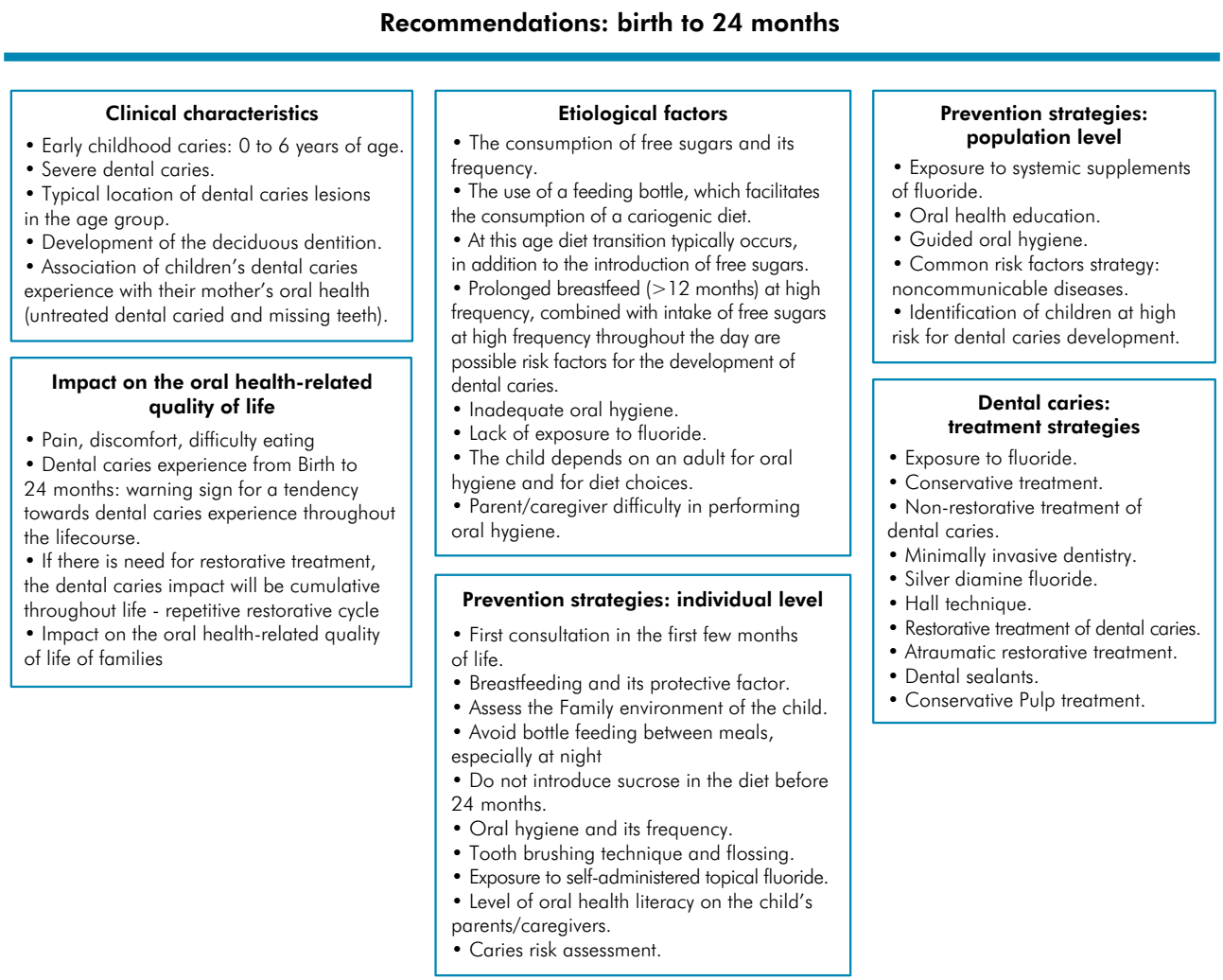

Figure 2. Recommendations for children from birth to 24 months.

Teaching in which therapeutic proposals are carried out based on the needs of the patient/user and not on the needs of the Curricular Unit and 3. *Student-centered teaching* – Training that integrates knowledge of the reality and resources offered to Dentistry, with the objectives of the teaching-learning process and graduate profile. It should allow students to be trained through self-motivated teaching, solving problems arising from the reality of the clinic and oral pathologies.

Chapter 5 - Glossary

The fifth chapter of the final document is a glossary that presents the main terms and definitions that are commonly reported in papers and publications about dental caries in recent years. The health descriptors (DeCS/MeSH) from BIREME - Regional Library of Medicine – Latin American and Caribbean Center for Health Sciences Information (https://decs.bvsalud.org/) were taken as a basis and, when possible, the identification number has been included. Likewise, the terms contained in the document "Consensus of Terminologies for Caries and Caries Management" proposed by the mixed committee of ORCA (European Organization for Caries Research) and the cariology group of IADR (International Association for Caries) were also listed.[13] Considering this ORCA-IADR publication, only terms with more

than 80% consensus among experts were included in this glossary. Finally, several other publications were used for crafting the list of terms of the final document.[1,2,4]

Conclusion

The National Curriculum Guidelines (DCN) of the Dentistry graduation in Brazil promoted a clear shift moving from the minimal curriculum to an essential curriculum. This is regarded as a significant step towards a high-quality and consistent integral dental education. It is also important to highlight its power as a resolution, which in practical terms is motion that must be adopted by all dental faculties/ schools (Higher Education Institutions) within the Brazilian territory. [11]

The National Curriculum Guidelines (DCN) in Brazil can raise two different positions simultaneously. On the one hand there is the power of the law. On the other, it is undeniable that this resolution is an opportunity that can open a large window for new approaches to teaching Dentistry.

This consensus for teaching dental caries may be criticized for taking an approach focused only on caries disease when the recent concept of cariology has been interpreted as the science that deals with all disturbances of the mineralized tissues of the teeth. Hence, its concept goes beyond the concept of solely studying "dental caries". The field has been expanded to incorporating other conditions (e.g.: fluorosis, MIH, tooth wear, and many non-carious lesions). However, the curriculum based on guiding pathways (e.g.: caries, periodontal diseases, edentulism, oral cancer, among others) allows a true integration for teaching the health-disease process of the individual, family, and population in many perspectives. It is obvious that consensuses of these guiding pathways must be prepared. However, it might be easier since they can all have a similar structure: domains, major and supporting competences; knowledge related to the disease or condition, the relationship between the condition in a life course perspective, and the social determinants.

Brazil is undergoing a disorganized process of expansion of Dentistry courses.[22] To date, there are 619 active dental courses, most of them from the private sector (90%).[23] This expansion took place in recent years and poses a real challenge. It is expected that this consensus could be a good instrument for promoting a better understanding of the National Curriculum Guidelines (DCN) and a facilitator for implementing a comprehensive curriculum based on a humanistic teaching-learning process on dental caries.[11,24]

Conversely to the National Curriculum Guidelines (DCN) resolution this consensus for teaching dental caries in Portuguese language for Brazilian dental schools is not a body of rules that have been laid down from top to bottom. Consequently, it is does not have the power of law and must be taken as a guideline. Hopefully, other Portuguese speaking countries can use the original version for building up their own consensus for teaching dental caries, or cariology depending on their regulations.

Finally, we hope that new consensuses promote interdisciplinary teams working together for an inclusive-humanistic curriculum that articulates social, biological, dental knowledge and supports the principles of transdisciplinary and transversality in education.

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