



Analysis of the influence of sports drinks on premature oral aging syndrome: literature review

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SUMMARY

Premature Oral Aging Syndrome (PEOS) is characterized by accelerated deterioration of oral structures in young individuals, resulting from intrinsic factors such as stress and sleep disorders, and extrinsic factors such as acidic diets and inadequate hygiene. Among the most relevant factors is the frequent consumption of sports and energy drinks, whose low pH and high acidity favor dental erosion and salivary alterations, requiring greater attention from the dentist for diagnosis and prevention. Objective: To evaluate, through a literature review, the contribution of sports drinks to the occurrence of PEOS, correlating the dietary habits of young people with dental wear and highlighting the role of dentists in the prevention and treatment of associated alterations. Methodology: Integrative review conducted between May 2024 and August 2025, in the SciELO, PubMed, Virtual Health Library, and LILACS databases. Articles published between 2015 and 2025, without language restrictions, addressing SEBP, risk factors, clinical signs, and management strategies were included. Studies focused on senile aging, duplicated studies, and publications without scientific support were excluded. After screening, 13 articles met the criteria and comprised the analyzed sample. Conclusion: A significant increase in the consumption of sports and energy drinks was observed, associated with oral health problems such as tooth erosion, cavities, and deterioration of restorations. To reduce these risks, it is recommended to intensify oral health promotion and education actions, especially among athletes, providing guidance on proper hygiene, reduced consumption of acidic substances, and regular dental checkups. These integrated measures can help prevent the progression of SEBP.

Keywords: premature oral aging syndrome, tooth wear, sports drinks, dental erosion, carbohydrate gels.

ABSTRACT

Premature Oral Aging Syndrome (POAS) is characterized by accelerated deterioration of oral structures in young individuals, resulting from intrinsic factors such as stress and sleep disorders, and extrinsic factors such as acidic diets and inadequate hygiene. Among the most relevant factors is the frequent consumption of sports and energy drinks, whose low pH and high acidity promote tooth erosion and salivary changes, requiring greater attention from dentists for diagnosis and prevention. Objective: to evaluate, through a literature review, the contribution of sports drinks to the occurrence of SEBP, correlating the eating habits of young people with tooth wear and highlighting the role of the dentist in the prevention and treatment of associated changes. Methodology: integrative review conducted between May 2024 and August 2025, in the SciELO, PubMed, Virtual Health Library, and LILACS databases. Articles published between 2015 and 2025 were included, without language restriction, that addressed SEBP, risk factors, clinical signs, and management strategies. Studies focused on senile aging, duplicate works, and publications without scientific support were excluded. After screening, 13 articles met the criteria and included the analyzed sample. Conclusion: There

was a significant increase in the consumption of sports and energy drinks, associated with oral damage such as tooth erosion, caries, and deterioration of restorations. To reduce these risks, it is recommended to intensify oral health promotion and education actions, especially among athletes, providing guidance on proper hygiene, reduced consumption of acidic substances, and regular dental visits. These integrated measures can contribute to preventing the progression of PAMS.

Keywords: premature oral aging syndrome, tooth wear, sports drinks, dental erosion, carbohydrate gels. Keywords.

1. INTRODUCTION

Today's lifestyle with suboptimal nutritional capacity and food consumption high-carbohydrate synthetics such as sports drinks, energy bars and gels have contributed for the increase in diseases that impact oral health (Needleman et al., 2018; Dimopoulou et al., 2023).

Premature oral aging syndrome (PEOS) is a multifactorial clinical premise observed due to aged oral structures, whether muscles, teeth, pulp or bones, which do not correspond to age physiological of individuals (Soares *et al.*, 2023). This concept is quite comprehensive, formed by the accelerated degeneration of oral structures in young individuals (Ribeiro, 2018).

The factors that lead to this aging range from intrinsic ones such as sleep disorders, stress or parafunctional habits and extrinsic factors such as acidic diets and abrasion from inadequate brushing using too much force and a more abrasive whitening paste than normal. (Burriss *et al.* 2010).

A supply of liquids and carbohydrates is of utmost importance for perfect performance, but the incidence of diseases such as carious lesions and dental erosion ends up becoming a risk factor and periodontal diseases. (Broad, Rye, 2015). Currently, the increase in the consumption of acidic drinks industrialized, associated with the current lifestyle, has made dental erosion more prevalent, (Santana *et al.*, 2018) which has required a more clinical approach from dentists for this circumstance. (SB Ministry, 2010).

Drinks with erosive potential have a pH lower than 5, such as energy drinks, isotonic, industrialized and even some natural juices. (Marroquin et al., 2019). The greatest risk of demineralization of hydroxyapatite crystals present in teeth are in drinks as the pH is higher low. (Cavalcanti et al., 2010), the exposure time that these drinks remain on tooth enamel also is a determinant for the occurrence of dental erosion. (Barac R et al., 2015).

In non-carious lesions (NCL), we can observe dental erosion caused by acids that dissolve the mineral content of teeth without bacterial involvement. (Schluter et al., 2020).
from the above, it is considered that research represents an important ally in the search for information to identify the current factors that contribute to premature oral aging, given the increase in consumption of foods with high erosive potential by young people.

It is essential to analyze the effects of consuming a sports diet associated with the use of isotonic, energetic in the development of pathologies that make oral aging syndrome early age increasingly present today, therefore it is important to make a critical analysis of the factors associated with the impacts, aiming to propose strategies to control the evolution of this aging and thus generating the promotion of oral health.

2 THEORETICAL FRAMEWORK

2.1 PREMATURE ORAL AGING SYNDROME

From birth, the aging process begins. It is uninterrupted, progressive and deleterious, being inevitable in the lives of living beings. Especially human beings, who go through through this process as a phenomenon considered social, psychological and biological (Chagas, Rocha 2012).

Premature oral aging is a very broad definition, which is established by a rapid degradation of the oral cavity in young individuals, which together with pulp aging promotes lifelong tooth sensitivity. (Ribeiro, 2018)

An individual's daily behaviors and choices can have positive effects on health or, on the contrary, favor the development of diseases. In addition, occupational habits, lifestyle and the frequent ingestion of acidic drinks causes irreversible damage to the oral structures that tend to worsen with the continuation of this habit. (Soares *et al* , 2018.)

An increasingly present factor in society is the premature aging of the teeth, where young people are prematurely wearing down their teeth and damaging their stomatognathic system, causing sensitivity and pain in the masticatory muscles, headache and TMD, thus affecting the craniofacial complex (Castroflorio T et al. 2017), becoming a syndrome (Carvalho et al., 2022).

2.2 SPORTS DRINKS CONSUMPTION AND ORAL HEALTH

Studies have found yet another worrying cause that interferes with premature aging. oral, is sports dentistry, which is associated with topics such as eating habits and stress-related stress excessive, furthermore, there are still recent sports isotonic used that have a relevance with the LNC, because the pH is below the critical limit of dental integrity. (Teles et al., 2020). Global advances led to the manufacture of several industrialized chemical products that harm the oral health of population.

Although the low pH and acidity of energy and sports drinks favor erosion of the tooth enamel, these products are often sold without specific instructions on tooth care. oral health. This increases athletes' vulnerability to developing cavities and enamel wear. and changes in salivary composition. These factors, combined, significantly increase the risk of oral problems. (Malsagova KA et al,2021).

Furthermore, today's lifestyle is more hectic and stressful, affecting some of the periods oral problems that did not occur so frequently before. (Soares et al., 2023). Excessive training (Overtraining) make it necessary to drink liquids, have a diet rich in carbohydrates and constantly use of energy and isotonic drinks (Cavalcanti et al, 2010), causing an unintentional occurrence in tissues hard, soft and mucous membranes (Thomás DM; Mirowsk K. G, 2010). Nutrition is individual for each athlete which will depend on the type of sport, frequency, physical preparation and energy expenditure that he must have, the habits Food intake is essential for good performance (Panza et al., 2007).

According to Marcotte H.Lavoie MC, salivary pH is directly linked to the oral microbiota, which depending on the type of food consumed, it promotes the growth of aciduric species. Consumption Frequent consumption of these foods and drinks at short intervals increases the risk of premature damage. (Stephano). Normal saliva benefits dental professionals because it is rich in calcium and phosphate. (Moynihan, Peterson) Normal for an unstimulated salivary flow is above 0.1 ML/Min, composition and flow are the main determinants of a physiological salivary pH (Humphrey SP; Williamson R.,2001).

The consumption of sports drinks results in low salivary pH values, as these drinks contain acids (citric, phosphoric, ascorbic, mal, tartar and carbonic acid), electrolytes and minerals, which when reaching a pH value of 5.5 initiates the dissolution of tooth enamel. (Tadakamandla J, et al., 2014), In Under normal circumstances, the elimination of acidic fluids occurs within 10 minutes (Cochrane NJ et al, 2012). Sports practitioners who frequently consume these drinks experience a decrease in salivary flow, an increase in

particularity of saliva or that reduces the buffet and defensive properties of saliva up to 2 hours after the exercise. (Tenoweo J.; RekolaM, 1968)

2.3 DENTAL EROSION CAUSED BY SPORTS DRINKS

Sports drinks are effective resources for rehydrating athletes subjected to different intensities and durations of physical effort. However, despite the widespread popularization of these products, their use must be guided by specific guidelines, based on the degree of wear physiological and the time of practice of the sporting activity. Proper prescription is essential for your consumption safely and effectively meets the hydroelectrolytic demands imposed by exercise. (Clapp et al., 2019). Thus, when drinking isotonic drinks after physical exercise, the athlete can present a decrease in salivary flow. Consequently, frequent consumption of liquids with potential erosive during prolonged physical activity can also compromise the natural cleansing action of the saliva. (Venables et al., 2005).

Prolonged exposure to acidic substances can make enamel dissolution irreversible. Initially, the erosive process manifests itself through the weakening of the enamel, gradually progressing for the loss of volume of the dental tissue, leaving only a thin layer on the resting surface. Which further favors the advancement of dental erosion. (Angelin ML et al., 2023).

Dental erosion is the result of a pathological, localized, chronic and asymptomatic loss of teeth. dental structures through chemical attack by acid without the involvement of bacteria (Imfeld, 1996). The erosion lesions commonly present with no defined boundaries and a matte appearance. (Toffenetti et al, 1998) the erosive process is rarely limited to the cervical region of the teeth, also affecting other surfaces. (Hara et al., 2005) There are many factors that influence the onset of progression and worsening dental erosion.

Saliva is an important protector against erosion with its buffering capacity and formation of acquired biofilm, but in situations of constant acid exposure, saliva has no effect against the erosive challenge. Non-invasive loss of dental tissue is physiological and occurs throughout life (Flint, Scully, 1998), but can be considered pathological when it causes functional and/or aesthetic problems and sensitivity. (Bishop et al., 1997).

2.4 CLINICAL APPROACHES OF THE DENTIST

The progression of tooth loss, not associated with tooth decay, has become a growing problem in dentistry. As people keep their natural teeth longer, they are exposed to etiological factors. Therefore, it is essential that the dentist has knowledge of these factors to make a correct diagnosis and enable treatment and intervention, even preventing tooth fractures (Xavier m. et al., 2012).

Regarding prevention against diets with a high acid content, it is essential that the dentist identify the causative factors of SEPB in advance. After understanding eating habits, the patient's daily routine and oral hygiene care, he must guide him on the need for reduce the frequency and duration of exposure to these foods and drinks. The goal is to prevent damage to oral health and increase the durability of dental treatments. This preventive process involves, primarily, the adoption of new behaviors and, if necessary, referral to monitoring with other health professionals (Macedo *et al*, 2023).

To prevent non-carious lesions (NCLs) caused by the biocorrosive action of acidic beverages in the oral environment, some measures have been recommended, including rinsing the mouth with water serving as a buffer for salivary pH, that is, a biocorrosion protector, avoid the consumption of these drinks during meals, reduce the frequency and time of exposure of acidic substances to the teeth and prefer consumption at cooler temperatures. Furthermore, it is recommended not to brush your teeth immediately after ingestion, use the appropriate amount of toothpaste. (Lins *et al*, 2022).

It is the dentist's role to emphasize that after consuming these sports drinks, there should be no brushing should be carried out immediately as this promotes the weakening of hydroxyapatite crystals, dental erosion (Eccles, 1979). Laboratory studies have revealed that the high concentration of calcium in water gaseous minerals was able to inhibit the dissolution of hydroxyapatite (Perry et al., 2001). Although the addition of calcium can increase the demineralization of tooth enamel, other mechanisms cannot be ruled out that act in this protection, which can range from changes in the properties of the dental surface, such as integument, films and dental plates (Grenby, 1996).

To ensure greater effectiveness in the management of dental erosion (DE), restorative treatment must be associated with preventive strategies and is not indicated in isolation. This type of treatment aims to main purpose is to restore the aesthetics and function of teeth, in addition to stopping the progression of lesions and relieve dentin hypersensitivity, which can cause pain and discomfort. The choice of materials restorative and rehabilitation techniques must be carefully planned, considering the

particularities of each athlete and the specific demands of the sport practiced. (Nunes et al., 2020; Vidal et al., 2017). It is necessary to highlight that if EPB is not diagnosed and treated because it is progressive, there may be rapid evolution of the syndrome (Lobbezoo, 2018).

3. MATERIAL AND METHOD

This research is an integrative literature review, a method that allows gathering and synthesize relevant studies on a specific topic, with the aim of understanding the current state knowledge, identify gaps and support clinical practices with scientific evidence.

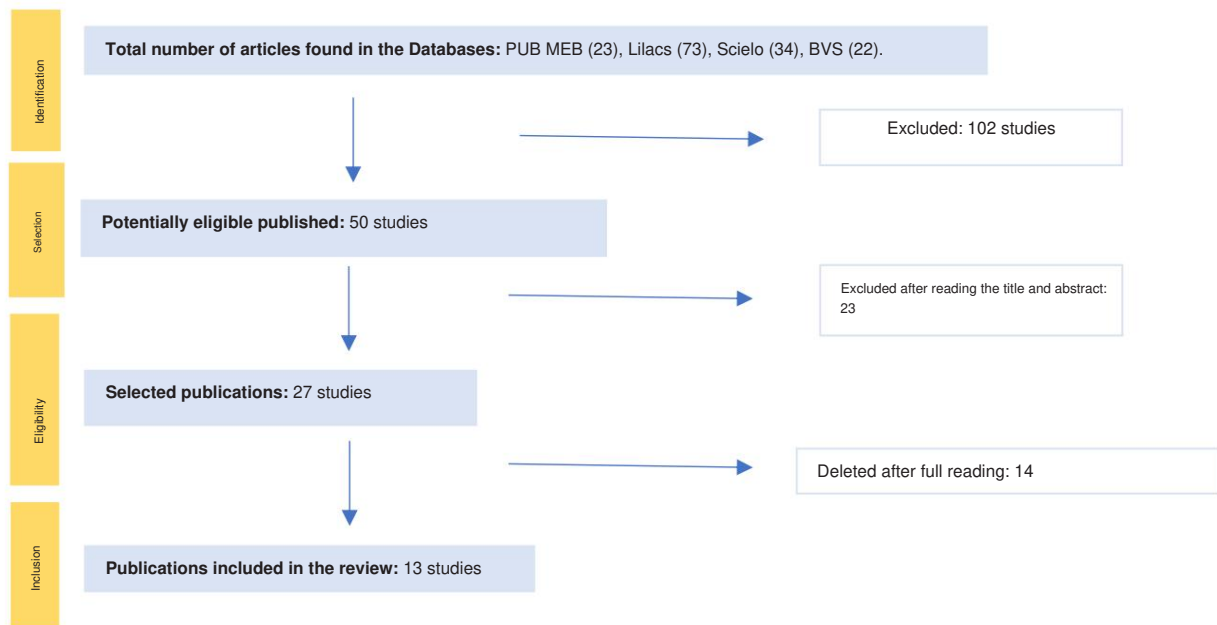
According to Mendes, Silveira and Galvão (2019), the integrative review is defined by the incorporation of evidence in clinical practice, aiming to group and synthesize research findings related to a specific topic or problem. This approach is especially relevant to the study of Premature Oral Aging Syndrome (SEPB), as it is a multifactorial condition, still little consolidated in traditional dental literature, but with a growing number of publications on general and oral health.

The selection of materials was carried out between May 2024 and August 2025, at the bases SciELO, PubMed, Virtual Health Library, and LILACS databases. Articles were used published between 2015 and 2025, without language restrictions, with access to the full text.

The inclusion criteria included scientific articles that dealt directly or indirectly with the SEPB, its risk factors (such as acidic diet, erosion, use of isotonic drinks and energy gels), signs clinical and prevention or management strategies. Studies that addressed the impact of these factors on young patients. Articles with an exclusive focus were excluded from the review in senile oral aging, animal studies, duplicated work, isolated case reports, monographs, unpublished theses and publications without scientific support or outside the scope of the topic proposed, studies in which dental erosion is mentioned only as a secondary outcome or an incidental observation, without detailed analysis or significant relevance to research on sports drinks and oral health, exclusion of studies that exclusively address other conditions oral problems in premature oral aging not related to dental erosion caused by consumption from sports drinks, such as tooth decay or periodontal disease.

The keywords used for the search were: premature oral aging syndrome, tooth wear, sports drinks and dental erosion, carbohydrate gels and oral health, and erosion dental, combined using the Boolean operators “AND” and “OR”.

Figure 1. Representative diagram of the article selection procedure for systematic analysis.



Source: Own Authorship.

4. RESULTS AND DISCUSSION

After applying the search descriptors (inclusion and exclusion by reading the title, abstract and article in the full text), a total of 13 (thirteen) articles were reached that respond to the topic in question, which were entered in the table below:

TABLE 1: Summary matrix of included articles.

AUTHOR/ YEAR	TITLE	OBJECTIVE	CONCLUSION
Alves et al., (2017)	Dentistry in sports: knowledge and habits of football athletes and basketball on oral health.	Assess and compare the degree of knowledge, attitudes and habits of male athletes, football and basketball confederations, on the interrelationship between oral health and sport.	There is a need to publicize the importance of oral health in the sports environment to maintain systemic health and improve sports practice.
Damo et., al (2018)	Erosive Potential of Sports Drinks on Human Enamel "In Vitro".	To evaluate the Vickers microhardness of human enamel exposed to sports drinks.	It was concluded that with the exception of the isotonic Powerade, all sports drinks tested caused a reduction in the microhardness of human dental enamel.
Khan K al., and (2022)	Sports and Energy Drink Consumption, Oral Health Problems and Impact Performance among Elite Athletes.	To assess the consumption of sports and energy drinks, oral health status, and impacts on daily activities and sports performance among elite athletes in Pakistan.	Regression analyses revealed a significant association between periodontal disease and its impact on both daily activities and sports performance. To our knowledge, this is the first study reporting that high-prevalence sports and energy drink consumption and oral health problems among elite athletes in Pakistan negatively impact daily activities and sports performance.
Li et al, (2023)	Diagnosis of sports and nutritional fatigue intervention in athletics.	Study the relationship between fatigue sports and nutritional intervention in athletics.	Research shows that after high-intensity exercise, the diagnosis of sports fatigue in track and field athletes is of great importance in judging the physical function of athletes, and scientific nutritional intervention plays a role important in the excessive physical function of athletes, improving their sports ability and alleviating sports fatigue
Luiz et al, (2023).	Assessment of the Erosive Potential of Acidic Drinks	To evaluate, in vitro, the erosive potential of acidic beverages on tooth enamel, commonly ingested by the population and frequently found in commerce in the greater Florianópolis, SC, Brazil. Method: the measurement of the erosive potential of the beverages was carried out by detecting the hydrogen potential (pH) and acidity titratable (AT).	All beverages in the study were considered imminently erosive to tooth structure.
Macedo and al, (2023).	Premature oral aging syndrome: a bibliographic review.	The purpose of this present study was to carry out a bibliographic review about the Syndrome premature oral aging, its diagnosis, clinical manifestations, prevention and treatment.	SEPB is the clinical manifestation of accelerated aging of the oral cavity and the system stomatognathic, presenting a state of clinical non-normality of the oral structures, with characteristics incompatible with the individual's physiological (chronological) age, caused by systemic diseases of different origins, influence of new habits and/or lifestyle change.
Oliveira al, et 2024.	Influence of acidic diet on syndrome I got old ment early oral.	Review of the effects of an acidic diet on aging early oral cavity, the aim is to understand the potential for biocorrosion in dental structures; identify non-cariou diseases caused by frequent contact with	This research contributed to a better understanding of the effects that frequent consumption of acidic foods can have on oral health, as well as the measures that can be taken to reduce the damage caused to teeth, thus preventing premature oral aging.

		acidic diet; and propose measures to prevent and control these effects resulting from eating habits.	
Pastore and al, (2017).	Sports dentistry - an innovative proposal.	To definitively insert dentistry into the context of high-performance sports, with the firm purpose of establishing a common language with sports medicine.	When educational activities are incorporated into sports practices from childhood, we will certainly see fewer oral health problems, with more preventive needs than curative ones. We suggest that youth teams and athletes in training include a pediatric dentist in sports clubs, as a key healthcare professional.
Rius-Bonet et al, (2024)	Diagnostic accuracy of clinical signs to detect erosive wear of teeth in its initial phase.	To determine the accuracy of clinical signs for diagnosing erosive tooth wear in a general population of young adults.	The most accurate clinical signs for detecting early erosive tooth wear were blunt surface, flattened convex areas, and preservation of the enamel cuff.
Schulze A et al, (2024).	Sports Diet and Oral Health in Athletes: A Comprehensive Review	Help athletes, dentists, and nutritionists understand the intricate connections between sports diet, oral health, and oral health care to develop mitigation strategies to reduce the risk of nutrition-related dental disease.	Routine six-monthly checkups, educational interventions, and personalized dental care instructions are necessary for athletes to improve their oral health and reduce the risk of oral and dental diseases resulting from a sports diet.
Silva et al, (2002)	Dental erosion due to the consumption of sports and isotonic drinks: literature review	Identify the relationships between the use of sports drinks and isotonic drinks. case and the presence of dental erosion, available in national and international scientific literature	Sports or isotonic drinks can cause erosions dental, but they are not the only determining factor. More studies are needed carried out in order to further discuss the topic, which has been on the rise, as well as to discuss about the implications that certain habits and different sports can have cause in the oral cavity.
Spier et al, (2023)	Premature oral aging syndrome: diagnosis, prevention and treatment.	Demonstrate through a literature review, how to diagnose, prevent and treat Premature Oral Aging Syndrome.	The dentist must have a multidisciplinary approach, as Premature Oral Aging Syndrome is deals with a multifactorial disease that encompasses several personal aspects of the patient that must be treated according to their individualities, often covering several areas dental and various areas of health. The authors also emphasize that it is necessary further studies and research on the topics reported in this work and their relationship with the Premature Oral Aging Syndrome.
Teles et al., (2020)	Intake of isotonic drinks during sports practice and its influence on non-cardiac cervical injury. osa.	Evaluate through literature review the influence of isotonics on non-carious cervical lesions.	The low endogenous pH of isotonic drinks is a significant factor to dissolve hydroxyapatite crystals from dental structures, presenting a factor extrinsic for the formation of non-carious cervical lesion.

According to Spier et al. (2023), it was observed that, in several cases, the professional focuses only in solving the immediate problem, failing to consider the underlying cause. For a adequate planning of care, the dentist must adopt a more comprehensive perspective on the factors that contribute to the development of the disease, and may even act in collaboration with other health professionals. In this context, it becomes essential that the surgeon-



dentist has knowledge about the aspects of oral health related to premature aging, in order to promote both the prevention and treatment of this syndrome.

Teles et al (2020), stated that there are still few scientific publications that address, in a specifically, the harmful effects of isotonic drinks on tooth enamel. However, it is considered that the reduced endogenous pH of these products, often below the critical limit for maintenance of dental integrity, represents a relevant factor in the dissolution and weakening of crystals hydroxyapatite. This condition is characterized as an extrinsic agent that can contribute to the development of non-carious cervical lesions.

Oliveira et al (2024), observed in their research the effects of a diet with a high acidity content on the development of SEPB, highlighting its negative influence on the mechanisms of demineralization and dental remineralization. Both concluded that this type of diet weakens progressively the dental structure, accelerating the loss of essential minerals and favoring processes of biocorrosion. The study also identified preventive and therapeutic alternatives capable of minimizing damage associated with these eating habits. Among the recommended measures, rinsing with water immediately after eating acidic foods to balance oral pH, the use of remineralizing solutions rich in minerals, and the inclusion of foods that are sources of calcium and phosphate in the diet. Additionally, the habit chewing sugar-free gum has been shown to be beneficial for stimulating salivation, helping in the protection and mineral recovery of teeth.

The study of the chemical characteristics associated with the erosive potential of acidic beverages, widely ingested in today's society, provides subsidies for the dentist to act in a preventive against tooth erosion. In this scenario, the dental professional can develop educational actions aimed at guiding patients about the risks of frequent consumption of beverages with high erosion potential (Luiz *et al*, 2023).

Pastore et al. (2017) and Alves et al. (2017) highlight the importance of the insertion of dentistry in health teams of sports clubs, federations, confederations, and associations in the country, given the growing demands of the current sports landscape. It is necessary to structure an oral health policy focused to sport, which includes the participation of the dentist and encourages greater integration multidisciplinary approach among different health professionals, both in high-performance sports and in physical activity practices in general.

However, it is noteworthy that there is still a shortage of clinical studies and in-depth reviews that consolidate the understanding of the mechanisms involved in this process. Therefore, it is necessary

new research that expands the available scientific base in order to validate current evidence and provide more robust subsidies for preventive and therapeutic dental practice.

FINAL CONSIDERATIONS

There is an exponential increase in the sale of sports and energy drinks. The consumption of these beverages has harmful effects, often leading to tooth erosion, tooth decay and progressive deterioration of restorative materials.

Taking this into consideration, it is essential to reinforce oral health promotion activities, raising awareness among the population, especially athletes, about the impacts of consuming certain drinks on the health of teeth and gums. To minimize these risks, it is recommended to adopt good oral hygiene practices, carrying out periodic dental evaluations every six months, in addition to educational interventions and personalized guidance. These actions, when integrated, contribute to improve oral health and reduce the likelihood of developing diet-related oral diseases sports.

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