

SYSTEMATIC REVIEW

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# Role of nutrition in prevention of dental caries in children and adolescents: a systematic review

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## Abstract

The main purpose of this review is to present an overview in prevention of dental caries in children and adolescents and the relationship with nutrition. The role of nutrition on avoiding dental caries (DC) in children is examined in this systematic review, which highlights the disease's complex character. It emphasized how crucial it is to cut back on sugar consumption and how complex relationships exist between oral health (OHT), nutrition, and other variables when developing preventative measures. Using the PICO framework and PRISMA recommendations, this study investigated how nutrition affects the prevention of DC in children. A thorough search turned up 12 pertinent studies that fitted the inclusion requirements. The results demonstrated the relationship between diet and the epidemiology, pathophysiology, and management approaches of DC. A balanced, low-sugar diet is crucial, as this systematic study emphasized the link between DH and children's frequency of DC. In an effort to address gaps in vulnerable populations, comprehensive solutions advocating for community-based treatments and legislative changes are put forth to enhance nutrition and OHT.

**Keywords** Dental caries, Nutrition, Prevention

## Introduction

Dental caries (DC) is a complex disorder that is impacted by a range of variables, such as environmental, behavioral, psychological, and biological aspects. It is described as a non-communicable disease that is diet-modulated, biofilm-mediated, and causes a progressive loss of minerals from tooth-hard tissues. The result of this dynamic process is the development of caries lesions [1–3].

Acidity brought on by sucrose encourages the growth of cariogenic bacteria such as mutans streptococci, which in turn causes enamel demineralization [4–6]. This process increases plaque porosity, decreases necessary ions for enamel remineralization, and modifies the makeup of the plaque [7–9]. Extracellular polysaccharides intensify these effects by raising the adhesion of bacteria and

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decreasing the pH of the saliva, which promotes the development of DC [10–12].

DC in childhood remains one of the most prevalent chronic diseases worldwide [13–16].

While DC can impact individuals throughout their lifespan, children are particularly vulnerable due to factors such as dietary habits (DH), oral hygiene (OH) practices and the developmental stage of their teeth [17–19]. Early childhood caries (ECC) is characterized by the early onset and quick advancement of DC in young children, which frequently results in significant damage to permanent teeth [20–22]. According to epidemiological definitions, any primary tooth in a kid under six years old that has one or more decaying, missing, or filled surfaces is diagnosed with ECC [1, 23–26].

The WHO identifies DC as a significant public health challenge, focusing the work on the tendency of increasing sugar intakes [27–30]. The frequency of DC in children is still a worry despite improvements in preventative measures and dental care, as it can have a negative impact on oral health (OHT), general wellbeing, and quality of life [31–34].

The development and maintenance of OHT are significantly influenced by nutrition, which has a direct and indirect impact on a person's susceptibility to DC [35–37]. Oral microbiota, host factors, and nutritional factors interact to create a complicated etiology of DC in children [27, 38–40]. Comprehending the complex correlation between dental health and nutrition is crucial for executing efficacious preventative strategies and advocating for ideal OH habits among younger demographics [41–45].

Limiting sugar intake plays a significant influence in avoiding DC, underscoring the importance of doing so [46–48]. Research suggests that there is still a chance of cavities even with fluoride's preventive benefits, highlighting the significance of sugar reduction initiatives and evaluation techniques to improve OHT and lessen the burden of dental illness [49–52].

For children to grow and develop as physically and cognitively as possible, a balanced diet is crucial [53–55]. This can lower the risk of several non-communicable diseases, such as diabetes, obesity, cardiovascular disease, some malignancies, and OHT issues. The Australian Dietary Guidelines advise against giving children who are 12 months old or younger more than one item per day from the five "core" food groups (fruit, vegetables, and legumes, meat and alternatives, cereals, dairy products, and substitutes) and to drink lots of water [56–58]. Discretionary foods that are high in calories and low in nutrients, like soda, cakes, and biscuits, should be consumed in moderation [59–61]. According to current studies, a diet high in discretionary foods and beverages while a child is young is linked to a higher risk of obesity

and DC. Maintaining a healthy mouth requires not only diet but also the development of appropriate OH practices early in life [62–64]. Early indications of DC have been observed in infants as early as six–twelve months of age, and current statistics reveal that children with age between five to six had at least one decaying tooth, despite the condition being mainly preventable [65–67].

DC have a detrimental effect on children's growth and nutritional status [68–70].

Some research identified a link between DC and underweight, poor height for age, and failure to thrive, while other investigations discovered a link between DC and overweight [71–74].

Research from low- and middle-income countries, where DC severity is prevalent, is the main source of evidence for a connection between DC and underweight [75–79]. Significantly lower Body Mass Index (BMI) for their age were found in children with high DC levels in both their primary and permanent dentition, and treating badly decaying teeth has been linked to a higher rate of weight gain [80–84]. A counterargument is that undernutrition chronic malnourishment has been linked to irregularities in dental growth, such as hypoplasia and delayed primary tooth eruption [85–89]. For example, in Southeast Asia, DC prevalence among six years old children ranges from 79 to 98%, making it one of the highest worldwide [90–92].

The aim of this systematic review was to analyze the available data from multiple sources to investigate the impact of nutrition in preventing DC in children.

## Materials and Methods

### PICO question

The PICO approach is rather used to evaluate the effect of an intervention on a specific condition, in this case the relationship between nutrition and prevention of DC.

In children and adolescents (P), do specific dietary patterns or nutritional interventions (I), compared to no intervention or standard dietary habits (C), reduce the incidence or progression of DC (O)?

(Population: In children and adolescents; Intervention: specific dietary patterns or nutritional interventions; Comparison: no intervention or standard dietary habits; Outcome: reduction of the incidence or progression of DC).

### Protocol and registration

Our search was performed following the method of Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) [93] guidelines and registered in the International Prospective Register of Systematic Review Registry guidelines and registered in the International Prospective Register of Systematic Review Registry guidelines (PROSPERO ID: CRD420250541451).

### Search processing

The electronic databases PubMed, Scopus and Web of Science were searched to find papers that matched our topic dating from 1 January 2014, up to 15 March 2024. The Medical Subject Headings (MESH) terms entered in search engines were: “dental caries” AND “nutrition” AND “prevention” (Table 1).

### Inclusion and exclusion criteria

The inclusion criteria were the following: (1) English-language; (2) any type of observational study, i.e., retrospective cohort, prospective cohort, case–control, cross-sectional, and randomized controlled trials (RCT); (3) open access; (4) articles concerning the association between nutrition and prevention of DC (5) only human subjects with an age between one to 18 years and of any gender.

The exclusion criteria were the following: (1) other languages except English; (2) reviews and meta-analysis; (3) off-topic articles; (4) animal models; (5) in vitro studies.

### Data processing

The reviewers (A.F., S.C. and C.C.) screened the records according to the inclusion and exclusion criteria. Doubts have been resolved by consulting the senior reviewer (F.I.). The selected articles were downloaded into Mendeley.

## Results

### Study selection and characteristics

A total of 676 records were identified using the keywords “nutrition” AND “prevention” AND “dental caries”. When applicable, the automatic filters entered were only in English, only clinical studies, only humans, no reviews, free full text. The consulted databases were Pubmed (329), Scopus (162) and Web of Science (185).

During the phase of screening, the inclusion and exclusion criteria were applied based on the analysis of the title and the abstract. Only studies that focused the association between nutrition and prevention of DC were included, as regards epidemiology, pathogenesis and treatment.

After screening, 151 duplicated articles were excluded. Then 343 articles were excluded by the analysis of title and abstract, leading to 68 records assessed for eligibility.

After eligibility, 12 studies (Table 2) were included in the final analysis. The process is summarized in Fig. 1.

### Quality assessment and risk of bias of included articles

The risk of bias in the included studies is reported in Table 3.

Regarding the bias due to confounding (D1) most studies had some concerns. The bias arising from measurement (D2) is a parameter with mostly some concerns and low risk of bias. Many studies had high risk of bias due to bias in selection of participants (D3). Bias due to post exposure (D4) could not be very precisely calculated due to high heterogeneity, but had a majority of low risk and some concerns. The bias due to missing data (D5) had mainly some concerns and low risk. Bias arising from measurement of the outcome (D6) was low. Bias in the selection of the reported results (D7) was low in more than half of the studies. The final results (Overall) showed that six studies have low risk of bias, five have some concerns and only one has high risk of bias [106].

## Discussion

### Nutrition

Van Meijeren-van Lunteren A.W. et al., in a cross-sectional study, demonstrated that adherence to dietary recommendations is associated with a reduced risk of severe dental caries (DC). Their results emphasized the value of a balanced eating pattern low in processed and sugar-rich products, in combination with appropriate oral hygiene (OH) measures such as toothbrushing and regular dental visits. Socioeconomic and ethnic factors were found to strongly influence both diet and oral health outcomes, with children from disadvantaged settings being more exposed to disease due to limited access to nutrient-rich foods and professional care. Expanding preventive dental services, together with educational and policy initiatives, could therefore substantially contribute to lowering caries prevalence [104].

In a study of Chinese children aged 2–5, Wang X. et al. highlighted the link between diet quality and early childhood caries (ECC). Children diagnosed with ECC and severe ECC were more likely to consume unbalanced diets, characterized by excess intake of grains, limited food variety, and poor consumption of vegetables. Such nutritional imbalance not only increased susceptibility to ECC but also raised concerns regarding general health. Interestingly, refined grains were associated with a higher caries risk, while whole grains provided protective benefits due to their nutritional density. Vegetables appeared to have an independent protective role—likely related to their fiber content and cleansing effect on teeth—whereas fruit intake showed no significant association. A diverse and balanced diet was thus considered essential for both oral and systemic health. The authors stressed the

**Table 1** Articles screening strategy

Articles screening strategy	KEYWORDS: A:“dental caries”; B:“nutrition”; C: “prevention” Boolean Indicators:“A” AND “B” AND “C” Timespan: from January 1, 2014 to March, 2024 Electronic Databases: Pubmed, Scopus and Web of Science
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**Table 2** Descriptive summary of item selection

Authors and years	Type of study	Sample size and age	Aim	Materials and methods	Outcomes
Ab-bass M.M.S. et al., 2019 [94]	Cross-sectional study	369 three-18yo	The aim of this study was to assess the prevalence of DC among Egyptian children and adolescents in correlation with age, gender, BMI, socioeconomic status, parental education, biological risk factors and DH	Socio-demographic data, OH measures and DH for children were recorded. Dental status was analyzed using dmft and DMFT index	The research revealed that factors such as age, gender, socioeconomic status, and parental education had notable correlations with the DC indices in Egyptian children. The regularity of tooth brushing by parents and children was linked to lower caries rates
Almasi A. et al., 2015 [95]	Cross-sectional study	698 10-12yo	The aim of this study was to assess the associations between nutrition and DC in permanent dentition among schoolchildren	The study was based on the data obtained from the questionnaire containing information on nutritional habits and the outcome of DMFT index. The association between predictors and DC was modeled using the Zero In-flated Generalized Poisson regression model	The article underscored the significance of maintaining a balanced diet and practicing good OH to decrease the risk of severe DC, especially among disadvantaged children. It highlighted that implementing effective interventions, including education and policy modifications, was essential to fostering healthier DH and enhancing overall OHT
Choi S.E. et al., 2021 [96]	Cross-sectional study	Undefined total sample two-18yo	This study aimed to identify the impact of restricting sugar-sweetened beverage purchases with Supplemental Nutrition Assistance Program (SNAP) benefits on children's consumption and health	SNAP participation and dietary data of children (aged 2–19 years) in the National Health and Nutrition Examination Survey (2009–2016) Microsimulation model was constructed to assess expected changes of 2019 U.S children over a 10-year period	Restricting sugary drink purchases within SNAP was projected to lead to a considerable reduction in daily consumption, which would have resulted in a substantial decrease in both BMI and obesity rates. Additionally, substituting sugary drinks with healthier options such as fruit juice or milk could have further enhanced these benefits
Doi-chi-nova L. et al., 2015 [97]	Observational cross-sectional study	100 children, six-12 years old	It assessed the food habits in healthy children aged 6 to 12 years and their effect on the children's OHT risk profile	It was observed the food habits of children aged 6 to 12 years and assessed their OHT risk profile based on their dietary intake and DMFT index values	The study emphasized that children had imbalanced diets, lacking protective foods like milk and fruits while consuming excess meat and sugary items, increasing the risk of DC
Khanh LN et al., 2015 [98]	Cross-sectional analysis	Children one-six years	It examined the connections between oral pain, ECC, and nutritional status in kids ages one to six	Five kindergartens and preschools in Ho Chi Minh City and Da Nang yielded a total of 593 parent-child pairs for recruitment. In addition to children receiving dental exams and anthropometric assessments, parents answered surveys regarding their children's eating habits, OH routines, and experiences with mouth pain	Decreased weight and BMI were linked to the severity of ECC. Significantly lower height-for-age, weight-for-age, and BMI-for-age z-scores were associated with the presence of pulp-involved caries. Lower BMI-for-age z-scores were associated with mouth pain
Park S. et al., 2015 [99]	Longitudinal cohort study	1274 Six years old	It investigated the association between sugar-sweetened beverage (SSB) intake during infancy and the prevalence of DC by age six	Data from the 2005–2007 Infant Feeding Practices Study II and the 2012 Follow-up Study at six years of age were utilized Maternal-reported SSB intakes during infancy, and average frequency of SSB intake during 10–12 months of age	The study found that frequent intake of sugary drinks during the 10–12 month period significantly increased the likelihood of having DC, while any sugary drink intake or the timing of introduction did not show a significant association
Pit-chika V. et al., 2020 [100]	Observational cohort study	915–996 10-15yo	This study examined whether sugar-sweetened drinks intake is associated with higher caries experience in 10- and 15-year-olds	Participants from the Munich study centre of two birth cohorts with data on non-cavited caries lesions, caries experience DMFT index, overall caries burden DMFT+ and non-cavited caries lesions, and sugar-sweetened drinks intake	The study showed a significant increase in DC burden and sugar-sweetened drink consumption from the 10-year to the 15-year follow-up. Higher sugar intake was linked to more caries at the 10-year follow-up, but this association was less pronounced by the 15-year follow-up

**Table 2** (continued)

Au- thors and years	Type of study	Sample size and age	Aim	Materials and methods	Outcomes
Sokal-Gutierrez K. et al., 2016 [101]	Cross-sectional study	1,575 children, birth-age six	It investigated the relationship between ECC and malnutrition in a community setting, focusing on a preventive OHT and nutrition intervention	The study explored the link between ECC and malnutrition in a rural Ecuadorian community, involving a preventive OHT and nutrition intervention	Children had reported high rates of junk food consumption, ECC, oral pain, and stunting. A two-year intervention that included education and dental care significantly reduced caries and malnutrition
Sudersana-das K. et al., 2023 [102]	Cross-sectional study	60 two-five years old	This study aimed to find the relationship of nutritional status and OH practices on Dmft scores of preschool children	Semi-structured and self-administered questionnaires were used to assess the demographic and diet related data. Anthropometric measurements of the preschoolers were taken following universally accepted protocols	The study found that preschool children in Riyadh with poor nutritional status and inadequate oral hygiene practices had higher Decayed Missing Filled (Dmft) scores, indicating more severe DC. It was observed that high sugar consumption, prevalent among children in this region, significantly contributed to the increased incidence of DC
Tsang C. et al., 2019 [103]	Cross-sectional study	836 children six months-six years old	It assessed the nutrition and OHT of children and their families in rural and urban Nepal	In order to evaluate OHT and nutrition, interviews and dental exams were made in both urban and rural parts of Nepal	Urban areas had higher rates of DC and junk food consumption. There had been a correlation between maternal and child nutrition, with indicators of starvation and tooth decay being particularly associated in rural areas
van Meijeren-van Lunteren AW et al., 2023 [104]	Cross-sectional observational study	2,911 children, eight-13years	It investigated the association between adherence to Dutch dietary guidelines and DC among children	The study was conducted using data from the Generation R Study in Rotterdam, Netherlands, focusing on dietary intake and DC. Dietary intake was assessed at age eight using a food frequency questionnaires and DC at age 13 using intra-oral photographs	Higher adherence to Dutch dietary guidelines at age eight was associated with a lower risk of developing DC by age 13
Wang X et al., 2022 [105]	Cross-sectional study	150 children, two-five years old	The aim of the study was to investigate the association between diet quality and ECC (ECC) among two- to five-year-old Chinese children	Diet quality was assessed using the Dietary balance index for children and was performed to assess the association between diet quality indicators and ECC risk	Children with DC had less supervision in toothbrushing. Dietary analysis showed excessive grain intake and limited food diversity. Grains intake increased DC risk, while vegetables intake showed a protective effect

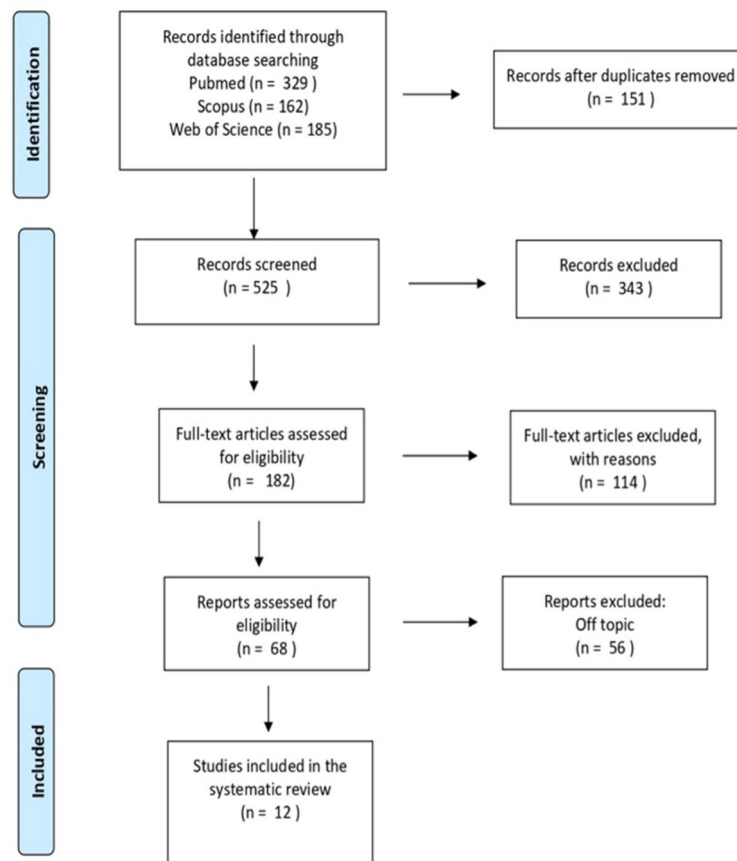
importance of early nutrition education to counteract caries risk, recommending further research and community-based interventions to reinforce healthy food habits [105].

Almasi A. et al., in a cross-sectional analysis of school-aged children, reported that girls were more frequently affected by DC compared to boys, suggesting that prevention strategies may need to consider gender-related differences. Regular consumption of sugary beverages and snacks emerged as a major contributor to DC prevalence. School-based initiatives—such as restricting access to cariogenic foods, integrating oral health education into curricula, and raising awareness among parents and teachers—proved to be effective in reducing risk. Overall, the study reinforced the importance of nutritional habits in shaping oral health outcomes [95].

### Incidence of caries

The relationship between diet, oral health, and overall development has been widely documented, especially among underserved groups. In Ecuador, Sokal-Gutierrez K. et al. studied indigenous children and found that both caries and malnutrition were highly prevalent. A community-driven program integrating oral health promotion with maternal and child health services significantly reduced both conditions, particularly when initiated early. These findings support the adoption of holistic, community-level interventions to tackle oral health disparities [101].

Policy-driven measures may also be effective. Choi S.E. et al. evaluated the potential consequences of restricting the purchase of sugary beverages with Supplemental Nutrition Assistance Program (SNAP) benefits in the



**Fig. 1** PRISMA [93]

United States. Their projections suggested that such limitations could reduce consumption of sugar-sweetened drinks, improve dietary choices, and consequently lower the risk of caries and obesity, particularly in children from low-income families [96].

Tsang C. et al. focused on urban and rural differences, reporting that children living in cities had easier access to unhealthy foods. Although many mothers recognized the harmful effect of sugar on teeth, awareness of other dietary risks was limited. Caries severity was strongly linked to the intake of unhealthy snacks, especially in urban environments. The authors recommended expanding maternal education programs as part of maternal-child health services to increase awareness and improve dietary practices [103].

### Recommendations

Doichinova L. et al. described the high prevalence of unbalanced diets in children and their direct contribution to caries risk. They stressed the responsibility of dental professionals in encouraging healthier eating, while also emphasizing the need for large-scale public health initiatives aimed at shaping children's dietary patterns [97].

In Vietnam, Khanh L.N. et al. explored the relationship between poor OH, malnutrition, and diet. Their model suggested that untreated caries and oral pain can aggravate malnutrition, underlining the importance of integrated family-based strategies addressing both nutrition and oral hygiene [98].

A study by Sudersanadas K. et al. assessed preschoolers' nutritional status, oral health, and caries prevalence through dmft scores and anthropometric measurements. They observed trends of malnutrition emerging in later preschool years and suggested a potential connection with higher dmft values. Although BMI and nutrient supplementation did not show significant correlations with caries, routine dental check-ups consistently appeared protective [102].

Abbass M.M.S. et al. investigated Egyptian children and adolescents, reporting a caries prevalence of 74%. The study found that dental decay was associated with age and specific dietary habits, while higher parental education, socioeconomic status, and brushing frequency were protective. These findings highlighted the multifactorial origins of caries, shaped by both behavioral and socioeconomic determinants [94].

**Table 3** Risk of bias [94–106]

Authors (year)	D1	D2	D3	D4	D5	D6	D7	Overall
Abbass M.M.S. et al. (2019) [94]	+	-	-	+	+	+	+	+
Almasi A. et al. (2016) [95]	-	-	×	?	-	+	+	-
Choi S.E. et al. (2021) [96]	-	+	×	+	×	+	+	+
Doichinova L. et al. (2015) [97]	×	+	×	+	-	+	+	+
Khanh L.N. et al. (2015) [98]	×	+	×	+	-	+	+	+
Park S. et al. (2015) [99]	-	-	×	?	?	-	×	-
Pitchika V. et al. (2020) [100]	×	-	+	-	-	-	-	-
Sokal-Gutierrez K. et al. (2016) [101]	×	+	-	-	+	+	+	+
Sudersanasadas K. et al. (2023) [102]	×	-	×	×	+	+	-	×
Tsang C. et al. (2019) [103]	-	-	+	-	-	+	-	-
van-Meijeren-van Lunteren A.W. et al. (2023) [104]	-	×	×	×	?	-	-	-
Wang X. et al. (2020) [105]	-	+	-	?	+	+	+	+

Domains:	
D1: Bias due to confounding.	
D2: Bias arising from measurement of the exposure.	● Very High
D3: Bias in selection of participants into the study (or into the analysis).	● High
D4: Bias due to post-exposure interventions.	● Some Concerns
D5: Bias due to missing data.	● Low
D6: Bias arising from measurement of the outcome.	● No information
D7: Bias in Selection of the Reported Result	

A longitudinal U.S. study by Park S. et al. showed that nearly 40% of six-year-olds had dental caries, with early sugar-sweetened beverage consumption identified as a key risk factor. The authors recommended focusing preventive strategies on limiting such drinks during infancy [99].

Pitchika V. et al. analyzed caries development in relation to SSB intake in 10- and 15-year-olds. While consumption was clearly linked to caries at age 10, this relationship was less evident by age 15, despite higher overall consumption and caries burden. These results suggest that preventive education targeting children and caregivers should be implemented early to achieve lasting benefits [100].

**Protective food groups**

Several food groups have been consistently associated with a protective effect against dental caries. Dairy products, including milk, yogurt, and cheese, represent one of the most important sources of calcium and phosphate, which are essential for enamel remineralization. Casein proteins and the stimulation of salivary flow induced by cheese consumption further contribute to plaque pH buffering and protection against demineralization. In addition, high-fiber fruits and vegetables play a dual role: mechanically, by promoting mastication and salivary stimulation, and nutritionally, by supplying vitamins and micronutrients that support gingival and dental health. Whole grains, when compared to refined counterparts, provide fiber, minerals, and antioxidants, reducing their cariogenic potential while improving overall diet quality. Other food categories such as legumes, nuts, and polyphenol-rich products (e.g., tea, cocoa) have also been linked to antibacterial and anti-inflammatory effects in the oral environment. Collectively, these findings suggest that the promotion of foods with protective properties should complement the reduction of free sugar intake in caries-preventive strategies [96–100].

**Socioeconomic implications**

Socioeconomic status is a critical determinant of both dietary behavior and oral health outcomes. Children from lower-income families are more frequently exposed to low-cost, energy-dense, and sugar-rich products, while facing structural barriers in accessing preventive dental services and oral hygiene resources. These conditions result in a disproportionate burden of dental caries among socially disadvantaged groups, perpetuating health inequalities. Parental education and health literacy further modulate this relationship, as families with higher educational attainment tend to adopt healthier feeding practices and more effective oral hygiene routines [95]. Conversely, limited awareness of nutritional and oral health principles is associated with frequent consumption of sugar-sweetened beverages and processed foods. Systematic evidence indicates that interventions

targeting these disparities must operate on multiple levels: public health campaigns adapted to vulnerable populations, school-based initiatives integrating nutrition and oral health promotion, and policy strategies aimed at improving accessibility to healthy foods while reducing exposure to cariogenic products. Addressing socioeconomic inequalities is therefore fundamental to achieving equitable improvements in oral health [104–106].

#### **Dietary protective factors**

The relationship between body mass index (BMI) and dental caries is multifactorial and has been reported with variable patterns. Overweight and obese children may have a higher caries prevalence due to increased intake of cariogenic foods and beverages associated with excessive caloric consumption. Conversely, underweight children may also exhibit elevated caries risk, potentially as a consequence of nutritional deficiencies that compromise enamel quality, salivary function, and immune defense mechanisms. This dual vulnerability suggests that both extremes of BMI can negatively influence oral health. In addition, untreated caries and associated pain may interfere with food intake, leading to alterations in nutritional status and growth. Evidence therefore supports a bidirectional association between BMI and caries, in which diet quality and nutritional balance play central roles. Preventive strategies should integrate dental health with broader nutritional and pediatric care, promoting balanced diets that support both healthy weight trajectories and caries prevention. Including BMI monitoring within oral health assessments may allow for more comprehensive identification of at-risk children and better targeted interventions [101–103].

#### **Conclusion**

Food practices and the frequency of DC in children were positively correlated, according to the systematic research. It called for a well-balanced diet low in processed sugars to reduce the incidence of severe DC and highlights the crucial impact dietary recommendations play in this regard. Furthermore, the analysis underscored the relationship between poor diet quality (characterized by an abundance of refined grains and sugary foods) and an increased risk of DC, especially in populations that already most vulnerable. As a potential approach to improving nutritional status and dental health in marginalized populations, community-based interventions are incorporated into mother–child health programs.

Reducing the prevalence of DC and changing children's eating habits were achievable goals of policy interventions like banning the purchase of sugary drinks with SNAP benefits, particularly for low-income households. Promoting dental hygiene habits and establishing healthy eating habits in kids, parents, and other caregivers is greatly aided by education. It was clear that one of

the best ways to equip people with the information and resources they need for preventative care was to incorporate OHT education into curricula in schools and maternal-child health services.

Essentially, the review highlighted the intricate relationship that exists between OHT, nutrition, and children's general well-being. It advocated for comprehensive strategies that target dietary inequalities and encourage early dental care to successfully prevent DC and reduce related health concerns, especially for poor groups. To confirm these results and create customized caries prevention strategies, further studies are needed to investigate the role of nutrition in prevention of DC, with a special emphasis on underprivileged and early childhood populations.

The main limitations of the article are: the study included only 12 selected studies, which may not fully represent the global population. The inclusion criteria also focused on English-language and open-access studies, potentially excluding relevant research in other languages or paywall-protected journals. Many of the included studies were cross-sectional, which limits the ability to establish causal relationships between nutrition and DC. Longitudinal studies would be more effective in understanding causality. The included studies varied widely in design, sample size and methodologies, making it difficult to draw consistent conclusions. This heterogeneity may lead to difficulties in comparing and synthesizing results. Studies did not uniformly take into account the different socioeconomic and cultural contexts that may influence DH and dental health. This variation may affect the applicability of the results to different populations. There is a risk of selection bias due to dependence on specific databases (PubMed, Scopus, Web of Science) and the use of automated filters. Furthermore, the use of self-reported DH in some studies may introduce recall bias. The focus on children between the ages of one and 18 years may overlook important dietary and oral health factors relevant to other age groups, such as children under one year and adults, which could provide a more complete understanding of the problem. The study focused mainly on nutrition and did not explore in depth other preventive measures, such as the use of fluoride, dental sealants and oral hygiene practices, which also play a significant role in the prevention of DC. The study did not provide sufficient long-term data on the sustainability of dietary interventions and their impact on DC over time. Long-term studies are needed to understand the lasting effects of dietary changes. Different studies used different methods to assess dietary intake and quality, which may lead to inconsistencies in data interpretation and results. The practical implementation of dietary interventions and ethical considerations of restricting certain foods in vulnerable populations were not adequately addressed, which may limit the feasibility of proposed recommendations.

## Abbreviations

BMI	Body Mass Index
DC	Dental Caries
DH	Dietary Habits
Dmft	Decay Missing Filled Teeth primary dentition
DMFT	Decay Missing Filled Teeth permanent dentition
ECC	Early Childhood Caries
OH	Oral Hygiene
OHT	Oral Health
PICO	Population, Intervention, Comparison, Outcome
S-ECC	Severe Early Childhood Caries
SNAP	Supplemental Nutrition Assistance Program
SSB	Sugar-Sweetened Beverage
WHO	World Health Organization

## Authors' contributions

Conceptualization, G.D., F.I., A.M.I., A.D.I., A.F., S.C. and C.C.; methodology, F.I., G.D., A.M.I., A.D.I., F.C.T., A.P., A.F., S.C. and C.C.; software, A.F., S.C. and C.C.; validation, F.I., A.F., S.C.; formal analysis, A.F., S.C. and C.C.; resources, A.F., S.C. and C.C.; data curation, A.F., S.C. and C.C.; writing—original draft preparation, A.F., S.C. and C.C.; writing—review and editing, A.F., S.C., C.C. and F.I.; visualization, G.D. and F.I.; supervision, G.D. and F.I.; project administration, F.I., A.D.I., A.M.I. and G.D. All authors have read and agreed to the published version of the manuscript.

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## Data availability

No datasets were generated or analysed during the current study.

## Declarations

### Consent for publication

Not applicable.

### Competing interests

The authors declare no competing interests.

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