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Early Childhood Caries Among Overweight and Obese Children

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ABSTRACT

Dental caries and obesity are both global public health issues that can have an impact on overall systemic health. Despite numerous studies investigating the link between dental caries and obesity, the findings remain inconclusive. This review aimed to determine the relationship between overweight, obese and ECC, as well as the impact of other potential risk factors. Research articles were searched using electronic databases such as Pubmed and Scopus. The selection of studies was following the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) protocols. The initial phase of searching for articles in databases yielded 1176 results. There were twenty-three articles that received full-text appraisals, and fourteen studies were eliminated for not meeting the eligibility criteria. Finally, the study included nine articles. Only one of the nine articles considered in this review was a cohort study. The years of publishing range from 2019 to 2023. The majority of the study settings (n=5) were in high-income countries. Five of the studies reviewed found no association between overweight or obesity and ECC, whereas four identified a significant association. Based on the findings of this review, the association between overweight, obesity, and ECC appears undetermined. The differences in the findings of the studies included in this review could be attributed to the various BMI indicators employed to define the nutritional status of children. Other risk factors such as family socioeconomic status, parental educational level, and parental awareness of oral hygiene and dental visits may influence the association between overweight, obesity, and ECC.

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1. INTRODUCTION

Early childhood caries (ECC) is defined as caries found in the deciduous teeth of children at the age of 71 months and younger (under 6 years). The prevalence of ECC has been reported in different regions around the world, ranging from 12% to 90% [1]. Although dental caries has been known to be multifactorial, dietary factors are one of the primary causes of ECC [2].

Sugar plays a crucial role in the development of caries. Previous study reported that children with ECC consume sweetened food and beverages more frequently than those who are caries-free [3]. ECC is also prevalent in children who drink milk at night and eat snacks between meals without cleaning their teeth [4]. The awareness of parents and caregivers about oral cleanliness, sugar intake, and dental attendance has a significant impact on children's oral health [5]. Untreated dental caries has a negative effect on a child's quality of life because it causes discomfort, lowers nutrition intake, and interferes with appropriate growth and development [6].

Dental caries has been related to childhood obesity because they share risk factors such as a sugary diet, sedentary lifestyle, and low socioeconomic level [7]. Dental caries and obesity are both global public health issues that can have an impact on overall systemic health. Despite numerous studies

investigating the link between dental caries and obesity, the findings remain inconclusive. According to Alshihri et al. (2019), 11 of 26 studies indicated an inverse relationship between dental caries and obesity in children and adolescents, 9 studies found a positive association, and 5 studies found no correlation [8]. These disparities were suggested to be attributed to differences in study locations, nutritional status classification, and sample size [9].

Despite numerous previous studies that investigated the relationship between dental caries and ECC, the current review focused on research involving children younger than 71 months (6 years). The purpose of this review was to determine whether children who were overweight and obese were at a higher risk of having ECC, as well as the impact of other potential risk factors on the relationship between excess body weight and ECC.

2. METHOD

This review was conducted in April-May 2023. The inclusion criteria of studies that included in this review were articles in English and published in 2019-2023. Articles that were not available in full text, review articles, articles from conference proceedings or book sections, and animal studies were excluded.

Formulation of research question

The research question was identified using PICO (Patient/Population, Intervention, Comparison, Outcome):

- Population : children younger than 71 months (6 years) in any regions worldwide, any gender, and any race/ethnicity.
- Intervention : obese nutritional status
- Comparison : underweight and normal nutritional status
- Outcomes : early childhood caries

Source of databases and study selection

Research articles were searched using electronic databases such as Pubmed and Scopus. The combination of keywords used were ((“obesity” OR “obese”), AND (“caries” OR “early childhood caries”), AND (“children” OR “child”)). The selection of studies was following the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) protocols as showed in Figure 1.

Data extraction and analysis

Data extraction were conducted using Microsoft Excel 2016 (Microsoft Corp, Version 16.0. Redmond, WA). The information extracted from the articles included the author's name, year of publication, setting, target population, study design, and findings. Data were presented in tabular form and descriptively analyzed.

3. RESULTS AND DISCUSSION

The initial phase of searching for articles in databases yielded 1176 results. Because they did not fall within the study's time frame (2019-2023), 764 papers were excluded. There were twenty-three articles that received full-text appraisals, and fourteen studies were eliminated because they did not report the required causal relationship between ECC and obesity or included a sample of children over the age of 71 months. Finally, the study included nine articles. Figure 1 depicts the process of literature selection using PRISMA.

Table 1 displays the results of data extraction. Only one of the nine articles considered in this review was a cohort study. The remaining publications were cross-sectional studies. The years of publishing range from 2019 to 2023, with 2022 having the highest number of publications (n=3). The majority of the study settings (n=5) were in high-income countries. Five of the studies reviewed found no association between overweight or obesity and ECC, whereas four identified a significant association. All of the included studies have a large sample size.

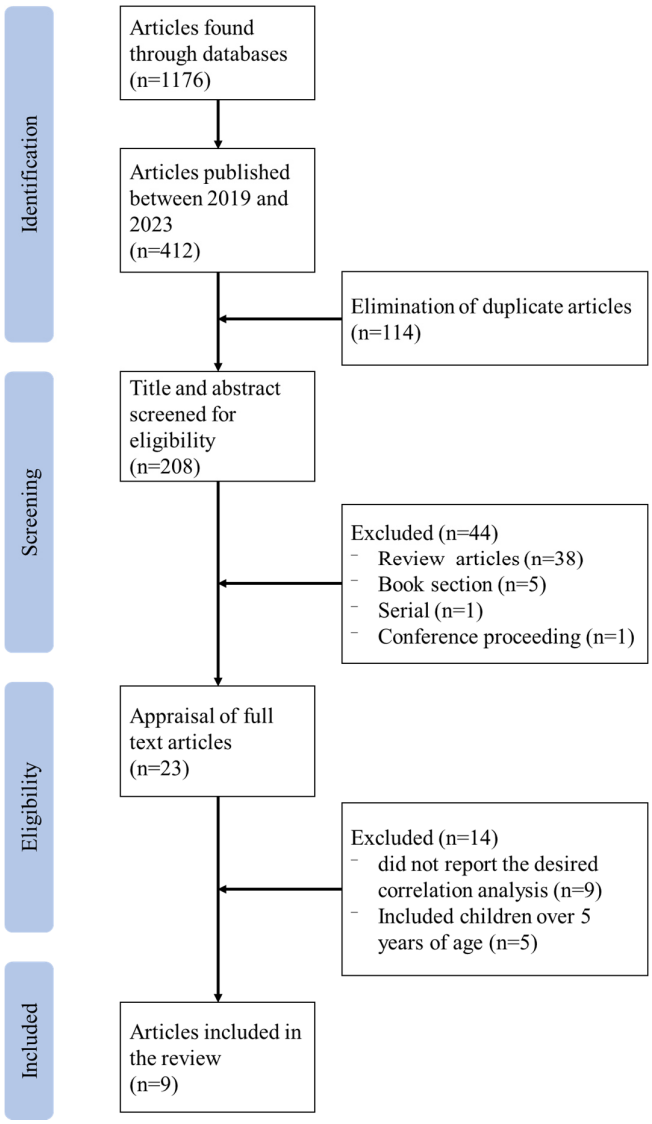

Figure 1. Process of literature search and selection using PRISMA

Table 1. The Results of Data Extraction

Authors	Study Setting	Target Population	Study Design	Findings
Fraiz et al., (2019) [10]	Curitiba, Brazil	686 children aged 4 to 5 years	Cross-sectional study	- Overweight and obesity were not significantly correlated with dental caries - A parental restriction for children's snack eating were negatively associated with the rate of dental caries
Folayan et al., (2020) [11]	Sub-urban Nigerian	1439 children aged 6–71 months	Cross-sectional study	- Overweight and obese were not significantly associated with ECC - Various types of malnutrition were associated with various forms of enamel defects

Kennedy et al., (2020) [12]	Winnipeg, Manitoba. Canada	150 children under the age of 72 months	Prospective cohort study	- There was no significant association between BMI and S-ECC. - Poverty was a significant confounding variable.
Aung et al., (2021) [13]	Northern New Zealand	27333 children aged 5 years	Population-based cross-sectional study	ECC is highly prevalent in children with higher BMI
Hung et al., (2021) [14]	Hanoi, Vietnam	234 obese children and 234 normal children aged 36 to 71 months	Cross-sectional study	- Obese children had a greater rate of ECC than normal children, although the difference was not statistically significant. - The consumption of soft drink. milk at night, and sweet marshmallows were all correlated to ECC in obese children.
Mohamed et al., (2022) [15]	Taif City, Makkah City, Saudi Arabia	1250 preschool children (698 girls, 552 boys) under the age of 71 months	Cross-sectional study	Significant association between ECC and obesity
Piovesan É et al., (2022) [16]	United State of America	2775 children aged 2-5 years	Cross-sectional study	- The link between obesity and dental caries in US children aged 2 to 5 years varied depending on the indicators of obesity and dental caries used. - The association was found between dental caries and obesity which defined using the obesity indicator by the International Obesity Task Force (IOTF). However, after adjusting for family socioeconomic level and child sugars intake, the association was fully attenuated.
Rizzardi et al., (2022) [17]	Bragança Paulista, Brazil	391 children aged 3-5 years	Cross-sectional study	Obesity (BMI ≥19.96) had a positive significant association with ECC.
Schulter et al., (2023) [18]	Aotearoa, New Zealand	572523 children aged 4-5 years	Cross-sectional study	4-year-old children with nutritional statuses of at risk of overweight, overweight and obese having increased rates of dental caries.

Obesity and dental health have a close relationship because they share several risk factors. Both have significant implications on overall health. Consumption of unhealthy foods such as soft drinks, snacks, and sugary foods causes a variety of oral diseases and weight gain [19]. Obesity, even in the absence of other major risk factors such as diabetes, hyperlipidemia, and hyperglycemia, can set a negative course for dental health [20].

According to the findings of this review, the variance in the outcomes of the studies included is quite substantial. The majority of research found no association between overweight, obesity and ECC [10-12, 14, 16], while the others identified a significant association [13, 15, 17, 18]. There are some hypotheses that can be advanced to explain this instance.

The indicator used to assess the nutritional status and ECC in children may affect its correlation. Body mass index (BMI) is an established measurement used to assess nutritional status and to categorize overweight and obesity. BMI is determined by dividing body weight by height squared. Obesity is classified differently in children and adolescents because body composition and density change during growing, whereas for adults, body composition (height and weight) is relatively stable. The assessment of overweight and obesity in children and adolescents uses the BMI indicator according to age (BMI-for-age) [21].

The most common classification of BMI-for-age is Z-scores according to WHO Child Growth Standard [21], which was utilized by six studies included in this review. Other BMI categories utilized were those defined by the Centers for Disease Control and Prevention (CDC) (n=3), Herbish et al. [22] (n=2), and the International Obesity Task Force (IOTF) (n=1). In a couple of studies, more than one indicator was employed. Previous research compared the BMI category using several indicators and discovered that, in relation to the CDC and IOTF criteria, the WHO standards had the highest prevalence of overweight in children [23]. Then it possible to expect that using different BMI indicators will result in distinct outcomes.

The family socioeconomic status may also be the confounding variable on the relationship between obesity and the prevalence of ECC [12]. Most of the studies included in this review is in high income countries setting. Lower family income has been reported to be positively associated with overweight and ECC [24, 25]. Children from low-income households frequently have a diet that is low in nutrients and high in carbohydrates and fats, which predisposes them to the development of dental caries and obesity [26]. A low socioeconomic status is also associated with fewer dental visits [27].

Parents also have a significant role in the development of ECC and excessive body weight. Lower parental education, weaker parental restriction for children's sugar intake, and poorer parental monitoring of oral hygiene routines have all been associated with an increase in dental caries [5, 10, 28, 29]. Furthermore, parental weight status is substantially connected with their children's weight status, and obese parents tend to have children with excess weight [30].

Although dietary intake is one the leading etiology of ECC, the development of ECC is also affected by a variety of other factors. This leads to the complexity of the relationship between overweight, obesity, and ECC. The consideration of other factors beside the dietary intake and nutritional status is very important in delivering education regarding the development of ECC.

4. CONCLUSION

Based on the findings of this review, the association between overweight, obesity, and ECC appears undetermined. The differences in the findings of the studies included in this review could be attributed to the various BMI indicators employed to define the nutritional status of children. Since dental caries is a multifactorial disease, other risk factors such as family socioeconomic status, parental educational level, and parental awareness of oral hygiene and dental appointments may influence the association between overweight, obesity, and ECC.

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