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A Scoping Review of the Literatures on the Relationship Between Childhood Stunting and Dental Caries

Anggun Rafisa *, Felisha Febriane Balafif, Nuroh Najmi, Faisal Kuswandani
Department of Oral Biology, Faculty of Dentistry, Universitas Padjadjaran, Indonesia

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*** Corresponding author:**
Anggun Rafisa
e-mail: anggun.rafisa@unpad.ac.id

Abstract:

Stunting, as an indicator of chronic malnutrition, can affect a variety of body systems, including the development of various dental diseases and disorders. The objective of this study is to map the scope of existing research on the relationship between stunting and dental caries. This scoping review utilized two database search engines (Scopus and PubMed) using the keywords "stunting" and "caries". The article selection process was performed following the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) protocol. Following an assessment of titles, abstracts, and full-texts, 23 articles were identified as relevant to the study objective and were included in this review. The majority of the studies (69.6%) used a cross-sectional design and examined more than 500 samples (47.8%). Most studies were conducted on the Asian and African continents, examined caries in primary teeth, and used WHO growth standards to define stunting. The study findings on the correlation between stunting and caries in primary and permanent teeth revealed varying results depending on study design, sample size, and settings. All of the studies included in this review were performed in lower-middle income countries (LMICs). The publication regarding the correlation between childhood stunting and caries in permanent teeth is still lacking, mainly because the utilization of cross-sectional research design. Other risk factors, as well as the use of different research methods, could explain the variations in the findings of the studies included in this review.

Keywords: *stunting, children, caries, scoping review.*

Introduction

Stunting is a form of malnutrition in children that is characterized by shorter stature compared to other children of the same age (de Onis & Branca, 2016). Stunting is a global public health challenge, with 22.3% of under-fives suffering from this condition in 2022, and the majority of these children living in Asia (UNICEF/WHO/The World Bank, 2023). Elimination of stunting is one of the Sustainable Development Goals (SDGs) on the 2030 global agenda. Accelerating the reduction of stunting to 14% by 2024 is one of the targets that Indonesia anticipates to achieve through the 2020-2024 National Medium-Term Development Plan (RPJMN), which is in line with the SDGs of "zero hunger" (Bappenas, 2020).

Nutrition is an important aspect of health. Stunting, as an indicator of chronic malnutrition, can affect a variety of body systems, including the growth and development of oral cavity, as well as various dental diseases and disorders (Naidoo & Myburgh, 2007). Several studies have found that children with stunting condition are

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more likely to develop dental caries (Delgado-Angulo et al, 2013; Dimaisip-Nabuab et al., 2018). Other studies also discovered that dental caries in children lead to malnutrition, such as stunting and wasting (Tanner et al, 2021). Dental caries is the most common noncommunicable disease in the world, affecting more than half of the global population (James et al., 2018).

Studies on the relationship between stunting and dental caries in children has attracted the attention of many researchers, especially in dentistry. It is critical to conduct research on this topic in order to enhance the involvement of dentists in achieving the SDGs by preventing stunting and dental caries. The objective of this study is to map the scope of existing research on the relationship between stunting and dental caries. This review is intended to serve as a reference for future research on this topic.

Materials and Methods

This scoping review was conducted in March-May 2023. Articles in English published in the last ten years (2019-2023) that discussed the relationship between stunting and dental caries in children aged 0-18 years were eligible for inclusion. Articles that were not accessible in full text, letter to editor, review articles, and animal studies were excluded.

This study utilized two database search engines (Scopus and PubMed) using the keywords "stunting" and "caries". The article selection process was performed following the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) protocol. Duplicate articles were excluded. The inclusion and exclusion criteria were employed to select articles that were relevant to the study objectives.

The author, year of publication, sample size, research design, settings, growth indicators used to determine stunting, types of dentitions, and research results were all collected during the data extraction process. Research settings were categorized by country and continent. Types of dentitions were classified based on their stages of development, which refers to primary and permanent teeth.

Results

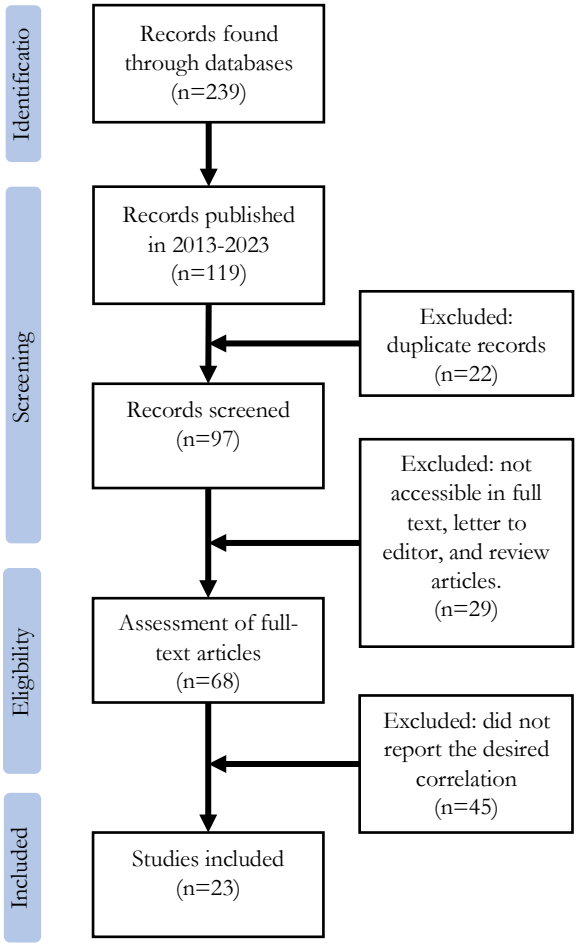

Figure 1. The PRISMA Flow Diagram of Study Selection Process

Figure 1 depicts the article selection process using the PRISMA protocol. The initial database search using predetermined keywords yielded 239 articles. A total of 119 records were published between 2013 and 2023. Following an assessment of titles, abstracts, and full-texts, 23 articles were identified as relevant to the study objective and were included in this review.

Table 1. The Characteristics of the Included Studies

Characteristics	Frequency	Percentage
Year of publication		
2013	1	4.3%
2016	2	8.7%
2018	3	13.0%
2019	1	4.3%

2020	8	34.8%
2021	4	17.4%
2022	4	17.4%
Study design		
Longitudinal	6	26.1%
Cross-sectional	16	69.6%
Case-control	1	4.3%
Sample size		
<100	5	21.7%
101-500	7	30.4%
>500	11	47.8%
Country		
Peru	1	4.3%
Nigeria	5	21.7%
Ecuador	1	4.3%
Uganda	1	4.3%
Korea	1	4.3%
Indonesia	4	17.4%
Malaysia	2	8.7%
India	1	4.3%
China	1	4.3%
Nepal	1	4.3%
Egypt	1	4.3%
Tanzania	1	4.3%
Cambodia	1	4.3%
Vietnam	1	4.3%
Multi settings	1	4.3%
Continent		
Americas	2	8.7%
Africa	8	34.8%
Asia	13	56.5%
Growth standards utilized to define stunting		
WHO Growth Standard	18	78.3%
Korean Children and Adolescent Growth Standard	1	4.3%
More than one standard	1	4.3%
Not mentioned	3	13.0%
Types of dentitions		
Primary only	15	65.2%
Permanent only	2	8.7%
Primary and permanent	6	26.1%

Findings on the correlation between stunting and caries in primary teeth (Figure 2) and permanent teeth (Figure 3) revealed varying results depending on study design, sample size, and settings. The frequency of articles using a case-control design was very low when compared to other observational research designs, and there were no studies using this design that investigate the relationship between stunting and permanent teeth. The vast majority of studies in Africa found that stunting is not significantly correlated with caries in primary or permanent teeth. On the other hand, the majority of studies conducted in Asia discovered that stunting is significantly associated with caries in both primary and permanent teeth.

Discussion

The settings of the studies discussed in this review varied, but all of them belong to lower-middle income countries (LMICs). A previous study on the prevalence of growth failure in children under the age of five in 105 LMICs found that stunting is the most common and widespread indicator of malnutrition, affecting more than a quarter of the population (Kinyoki et al., 2020). The estimated prevalence of stunting in children under the age of five in LMICs in 2022 was 28.1%. This rate is considered high since it is more than three times the prevalence of stunting in upper-middle-income countries and seven times the prevalence of stunting in high-income countries. (UNICEF/WHO/The World Bank, 2023). Furthermore, untreated caries cases in LMICs continue to be an issue due to the nutritional transition to a high-sugar diet and the inability to afford oral healthcare facilities (Peres et al., 2019; Susarla, Trimble, & Sokal-Gutierrez, 2022).

The majority of the studies in this review involved participants from Asia and Africa. This could be due to the high prevalence of stunting on both continents. In 2022, 95% of children with stunting under the age of five lived in Asia and Africa, with 52% in Asia and 43% in Africa. (UNICEF/WHO/The World Bank, 2023).

The cross-sectional design dominates the research method used by the articles included in this review, which examines both the outcome and the exposure at the same time. Since stunting is a major concern for children under the age of five, cross-sectional studies on the correlation between childhood stunting and dental caries tend to focus solely on primary teeth (early childhood caries).

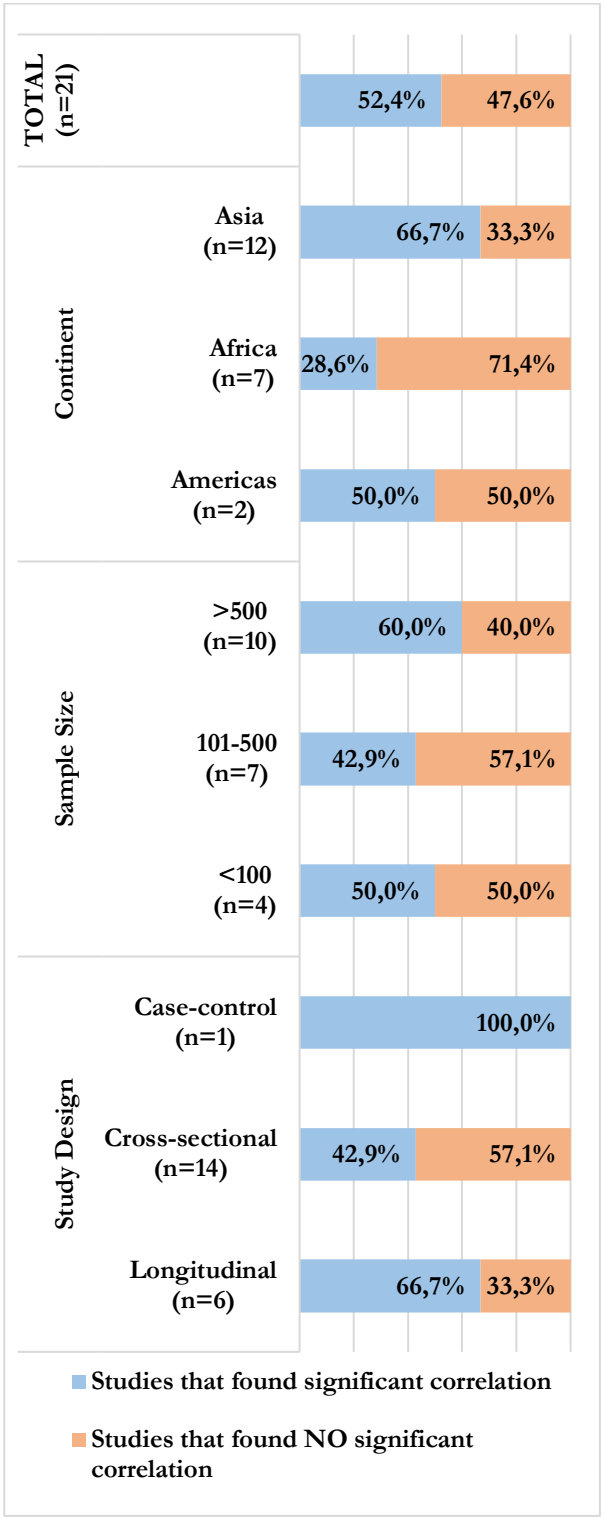

Figure 2. The Proportion of Studies That Explored the Relationship Between Childhood Stunting and Dental Caries in Primary Teeth Based on Their Findings

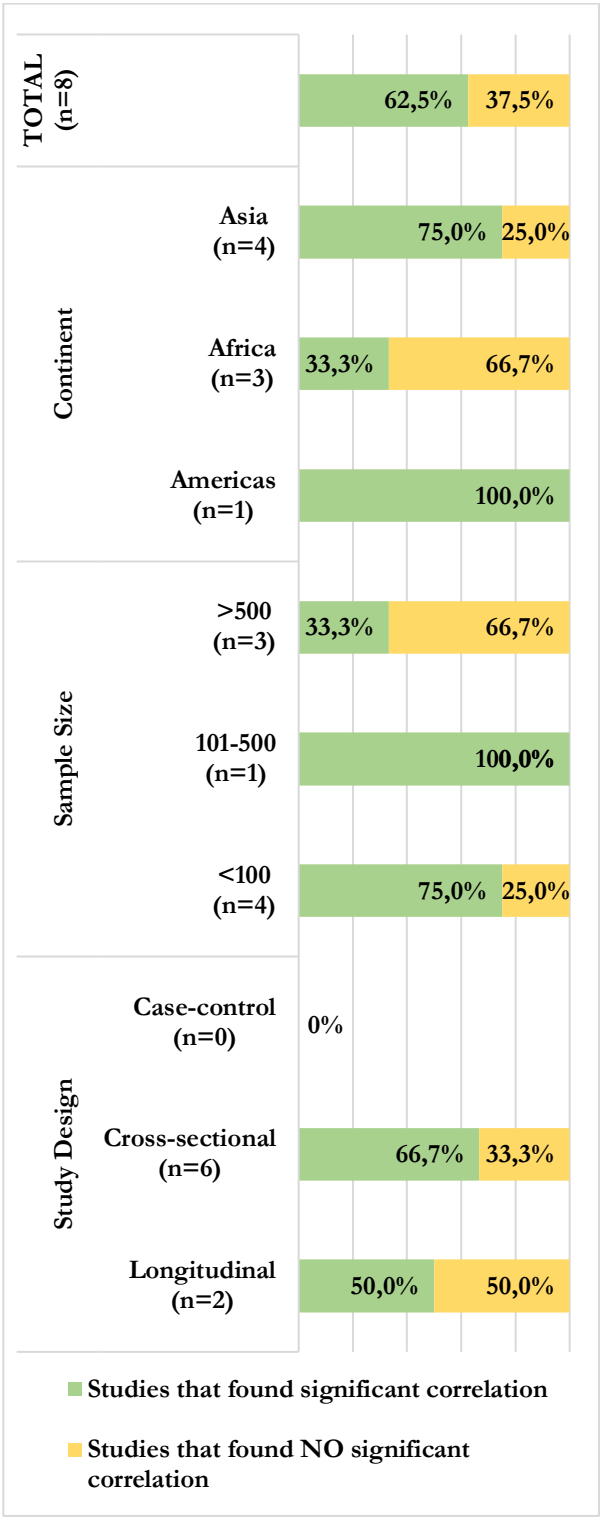

Figure 3. The Proportion of Studies That Explored the Relationship Between Childhood Stunting and Dental Caries in Permanent Teeth Based on Their Findings

The number of studies examining the relationship between childhood stunting and permanent teeth is still relatively small, this can be a source of concern for future research. Furthermore, the use of a longitudinal research design may be an option for providing an overview of the increasing severity of caries in children with stunting. (Delgado-Angulo et al., 2013; Sokal-Gutierrez, Turton, Husby, & Paz, 2016).

As stated in the results section, study findings on the significance of the relationship between childhood stunting and dental caries vary greatly. Childhood stunting and caries are both caused by a complex interaction of risk factors, including low parental education, poor diet quality, and a low family socioeconomic status (Cianetti et al., 2017; Habimana & Biracyaza, 2019; Wicaksono & Harsanti, 2020). These factors can become confounding variables and must be adjusted in future research to remove their impact on correlation between stunting and caries.

The research methodology undoubtedly has an impact on the study results. The WHO child growth standards were utilized to define stunting in the majority of the studies. There was only one study that used CDC growth charts, and also one study that used Korean Children and Adolescent Growth Standards. Previous studies discovered that different growth standards detect a different prevalence of malnutrition. It was found that the WHO growth charts detected a higher prevalence of stunting than the CDC (Onis, Garza, Onyango, & Borghi, 2007; Peinado & Bedriñana, 2013). In addition to international growth standards developed by WHO and the CDC, national growth charts that are more appropriate for the population of a specific country have also emerged. The Korean Children and Adolescent Growth Standard is one such example (Choi et al., 2022).

Conclusion

This review provides an overview of the existing studies that investigated the relationship between stunting and dental caries. All of the studies were performed in LMICs, particularly in Asia and Africa. The publication regarding the correlation between childhood stunting and caries in permanent teeth is still lacking, mainly because the utilization of cross-sectional research design. The significance of the correlation between childhood stunting and dental caries was found to vary greatly across studies. These disparities may be influenced by a variety of other risk factors as well as the use of different research methods.

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Conflict of interests

No conflict of interest.

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