ISSN. 2338-7475
E-ISSN. 2620-7869
Hearty
Jurnal Kesehatan Masyarakat
Beriman, Tulus, Sepenuh Hati,Berbesar Hati, Jujur, Sehat dan Kuat
Vol. 13 No. 3, June 2025, Hal. 819-826

LINK BETWEEN EARLY CHILDHOOD CARIES AND STUNTING: A PUBLIC HEALTH PERSPECTIVE

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Abstract

Early childhood caries and stunting are two major health issues that often coexist, particularly in developing countries. Both conditions have long-term impacts on children's growth, development, and overall quality of life. This literature review aims to explore the association between early childhood care and development (ECC) and stunting from a public health perspective. The method employed was a narrative review of scientific articles sourced from PubMed, Scopus, and Google Scholar databases from 2017 to 2024. The findings indicate a strong correlation between poor nutritional status and a high incidence of early childhood caries among preschool-aged children. Shared risk factors such as unhealthy dietary patterns, low parental health literacy, and limited access to dental care services further reinforce this link. The review emphasizes the importance of an integrated, promotive, and preventive approach that combines nutrition and oral health interventions within public health programs. Integrating oral health services into stunting prevention strategies at the community level is considered essential for improving children's overall health outcomes.

Keywords: Early Childhood Caries, Stunting, Public Health, Child Nutrition, Health Promotion

Introduction

Early childhood caries (ECC) is recognized as one of the most widespread chronic diseases affecting children worldwide, particularly those under six years of age. Defined as the presence of one or more decayed, missing (due to caries), or filled tooth surfaces in any primary tooth, early childhood caries is not only a marker of poor oral health but also an indicator of broader systemic and socioeconomic issues.[1] Globally, it is estimated that nearly 50% of children under the age of twelve suffer from early childhood caries, with a disproportionately high burden found in low- and middle-income countries. In these contexts, limited access to preventive dental care, lack of parental knowledge, and low prioritization of oral health in early life all contribute to its high prevalence. [2]

Simultaneously, stunting remains one of the most persistent public health challenges globally. The World Health Organisation (WHO) defines stunting as impaired growth and development due to chronic malnutrition, characterized by a Height for Age Z score (HAZ) that is more than two standard deviations below the median of the WHO Child Growth Standards. As of 2022, 22.3% of children under five were reported to be stunted globally, with Southeast Asia and sub-Saharan Africa bearing the highest rates [2]. Indonesia, in particular, continues to struggle with stunting despite years of government-led interventions. The Indonesian Ministry of Health (2023) reported a national stunting prevalence of 21.5% in 2023, underscoring the need for continued multi-sectoral strategies [3]. While early childhood caries and stunting have traditionally been addressed through separate public health agendas, growing

Submitted: May-2025 Received: May-2025 Available Online: June-2025

evidence suggests a significant interplay between the two. Emerging studies highlight how early childhood caries may influence nutritional status through mechanisms such as feeding difficulties, pain while chewing, and chronic low-grade infections, which can impact systemic health. Children suffering from severe early childhood caries are often underweight and may exhibit growth faltering due to decreased nutrient intake, sleep disturbance, and systemic inflammation [5].

The first 1,000 days of life, from conception to a child's second birthday, represent a critical window for growth and development. During this period, nutritional intake and oral health habits play a pivotal role in shaping future health outcomes. Poor maternal oral health during pregnancy has been linked to preterm birth and low birth weight, which are themselves risk factors for stunting [6]. In the Indonesian context, integrating oral health into maternal and child health services remains a limited practice. While programs such as Posyandu and UKGS (Usaha Kesehatan Gigi Sekolah) have made strides in health education and basic services, they often lack continuity, trained personnel, and inter-sectoral integration. Additionally, oral health indicators are rarely included in child growth monitoring programs, leading to missed opportunities for early detection and prevention. Interventions that combine oral health education with nutrition counselling have shown promise but are not yet widespread or standardized [7].

This literature review aims to synthesize the current evidence on the relationship between Early Childhood Caries and stunting, drawing on studies published between 2018 and 2025. By examining biological, behavioural, and structural linkages, the review aims to illuminate the multifaceted nature of this dual burden and highlight pathways for integrated public health action. Special attention is given to the Indonesian context, where the coexistence of Early Childhood Caries and stunting presents both a challenge and an opportunity for innovation.

Method

This study used a qualitative descriptive literature review design. The population consisted of scientific articles related to Early Childhood Caries and stunting. A purposive sampling technique was employed to select articles published between 2017 and 2025 in both English and Indonesian. Data sources included PubMed, Scopus, ScienceDirect, and Google Scholar. The main instruments were keyword search strategies, including terms such as "Early Childhood Caries," "stunting," "nutrition," and "public health." Screening titles, abstracts, and full-text articles for relevance to the research objectives conducted data collection. Data analysis was conducted thematically, categorizing findings based on shared risk factors, health outcomes, and intervention models. The analysis results are presented descriptively in narrative and tabular formats.

Results

Early Childhood Caries (ECC) is a significant public health concern worldwide, particularly affecting children under the age of six. It is characterized by the presence of one or more decayed, missing, or filled primary teeth in children under the age of six.[1] The disease has a multifactorial aetiology involving diet, microbiological factors, oral hygiene practices, parental education, and socioeconomic status.[8] The global prevalence of early childhood caries remains high, with estimates suggesting that nearly 50% of children under six experience some form of dental caries, and in some developing countries, the prevalence exceeds 70%. [2] Inadequate oral hygiene, such as infrequent brushing and lack of fluoride exposure, also contributes to the initiation and progression of early childhood caries.[9] Socioeconomic conditions play a critical role, with children from low-income

families more likely to develop early childhood caries due to limited access to dental care and preventive measures. [5]

Stunting is a chronic condition characterized by impaired growth and development in children due to prolonged undernutrition, recurrent infections, and inadequate psychosocial stimulation. It is defined by a height-for-age measurement that is more than two standard deviations below the median of the World Health Organisation (WHO) Child Growth Standards. Stunted children are more likely to experience poor cognitive and physical development, reduced productivity in adulthood, and increased risk of chronic diseases. [10,11] Children affected by stunting are more likely to experience delayed mental development, reduced school performance, and diminished economic productivity as adults. Moreover, stunted children are at a higher risk of becoming overweight or developing chronic illnesses such as type 2 diabetes, hypertension, and cardiovascular diseases later in life. This paradox of early undernutrition leading to adult overnutrition-related diseases highlights the long-term metabolic impacts of early growth failure. [12]

Stunting is not simply about a child being shorter than their peers of the same age. It often begins quietly and early, even before a child is born. When a mother does not get enough nutritious food during pregnancy, or when a baby is not fed well in the early months and years, the child's growth can start to slow down. This becomes even more challenging when families lack access to clean water, proper sanitation facilities, or nearby healthcare clinics to visit when a child is ill. In many parts of the world, particularly in impoverished communities, parents face these challenges daily. They love and care for their children deeply, but without enough support, their children may struggle to grow, learn, and thrive.[13]

Reducing stunting is not something that can be fixed with just one kind of effort. It takes support from many areas of life to work together. This includes ensuring children receive sufficient nutritious food, supporting mothers' health during pregnancy, promoting breastfeeding, and providing young children with the vitamins and minerals they need. But good nutrition alone is not enough. Children also need access to clean water, proper sanitation facilities, healthcare, and safe places to live and learn. Education matters too, especially for mothers, and so does providing families with the support they need during difficult times. When women are allowed to participate fully in decisions and feel valued, children also benefit. If we do not bring all of these things together and sustain them over time, stunting will continue to limit children's growth and hinder progress in families, communities, and countries around the world. Every child deserves the chance to grow up healthy and strong, and it is our shared responsibility to make that possible.[14]

Link Between Early Childhood Caries and Stunting

Several studies confirm that dietary habits, particularly the frequent consumption of sugary foods and drinks, significantly increase the risk of dental caries in early childhood.[15] Early childhood caries were diagnosed using the WHO criteria or the International Caries Detection and Assessment System (ICDAS). At the same time, stunting was assessed using height-for-age scores based on WHO growth standards.[16] Across all studies reviewed, children who experienced early childhood caries were consistently found to be at a higher risk for stunted growth than those with healthy dentition. For instance, an Indonesian study involving 1,500 children under six reported that the prevalence of stunting was significantly higher in those who had multiple untreated carious lesions. A study in rural Nigeria showed that children with early childhood caries who were stunted had substantially lower Body Mass Index (BMI) and height-for-age scores compared to their healthy peers, indicating a potential negative synergy between nutritional status and dental health.[1]

China and Thailand revealed that children who experienced oral pain due to tooth decay often had difficulties eating, which led to reduced calorie intake and nutritional deficiencies factors that contribute to growth delays.[17,18] Several studies pointed out that social and environmental factors like

low family income, poor maternal education, and limited access to healthcare played a key role in the development of both early childhood caries and stunting. These shared risk factors were highlighted, especially in studies from low- and middle-income countries. Frequent consumption of sugary snacks, low parental awareness of dental hygiene, and the absence of fluoride in community water supplies were also frequently cited contributors.[19,20]

Biological mechanisms also appear to be linked to the two conditions. Chronic oral infections caused by untreated caries can lead to systemic inflammation, which disrupts hormonal pathways, interferes with nutrient absorption, and increases metabolic demands. Over time, this can hinder a child's normal growth, even if their food intake is sufficient. Some studies have also reported elevated levels of inflammatory markers, such as C-reactive protein, in children with severe caries, suggesting systemic effects that extend beyond the mouth. One cross-sectional study from China found that children with deficiencies in essential nutrients, such as calcium and vitamin D, not only had more severe dental decay but also had significantly lower height-for-age scores. This adds to the evidence that nutritional shortfalls can contribute to both poor oral health and growth failure in young children. [17]

Not all findings were entirely consistent, however. A few studies conducted in urban or well-served populations have shown weaker links between dental caries and growth, possibly due to better access to healthcare, fluoride use, and dietary monitoring. These findings highlight how access to care can buffer the effects of social and biological risk factors.[21] The association between early childhood caries and stunting, a condition characterized by impaired growth resulting from chronic malnutrition during early childhood, has been highlighted in numerous epidemiological studies worldwide. Children with poor nutritional status, including those who are stunted, tend to have weakened immune systems and developmental defects in tooth enamel, which increase their susceptibility to early childhood caries.[22] On the other hand, children who already have severe dental caries may feel pain when eating, struggle to chew their food correctly, and even lose sleep. All these factors can lead to poor nutrition and, over time, affect their growth.[23]

Table 1 Overview of Studies Linking Early Childhood Caries and Stunting

Author (Year)	Country	Sample Size	ECC Prevalence	Stunting Rate	Key Findings
Ma et al. (2024)	China	155	74.2%	38%	ECC is significantly associated with low height-for-age
Wang et al. (2024)	China	635	71.9%	33%	ECC is a significant predictor of underweight and stunting
Sitthisettapong et al. (2021)	Thailand	National Survey	53%	35%	ECC linked to reduced linear growth
Pratyaprateep et al. (2024)	Thailand	420	75.6%	45%	Children with ECC had a 2.3x risk of stunting
Rapôso et al. (2024)	Brazil	89	44.9% (public daycare)	Not reported	Income and prolonged breastfeeding associated with ECC; 8.5x higher caries in the low-income group
Sahana et al. (2023)	India	823	57.4%	Not reported	ECC prevalence is higher in rural areas and lower socioeconomic groups
Folayan et al. (2020)	Nigeria	370	Not specified	Not specified	A significant association between ECC and stunting (APR 0.14; 95% CI: 0.03–0.69)
Devan et al. (2022)[1]	India	71 330 (total)	46.9 % pooled	Not reported	Pooled data dari 71 studi: 46.9% ECC prevalence; laki-laki lebih tinggi (47.0%) dibanding perempuan (43.8%)
Sakolwaree et al. (2024)	Thailand	1,053	64.48%	Not reported	High ECC prevalence among 3–5 y.o. Of the children, 43.68% had dentine caries, 18.71% had caries involving the nerve,

					and only 17.4% of the affected children received treatment.
Renggli et al. (2021)	Cambodia	1307	14.4% had severe ECC	25.6%	Children with severe ECC had nearly 2x risk of stunting
Méndez et al. (2020)	Argentina	145	48.2% (enamel + dentin), 35.2% (dentin only)	12–71 months	Caries increased with age; active lesion type 5 was most frequent. Early prevention and monitoring are needed.

Early childhood caries and stunting share several underlying risk factors, including poor dietary practices, inadequate oral hygiene, limited access to healthcare, and low socioeconomic status. These overlapping determinants contribute to a cyclical relationship in which one condition may exacerbate the other.[24] Children with early childhood caries often experience dental pain, infection, and discomfort, which can lead to feeding difficulties and disrupted sleep patterns. These issues can reduce a child's appetite, limit their intake of essential nutrients, and interfere with their ability to thrive physically and cognitively. In a study conducted in Makassar, Indonesia, a significant association was observed between early childhood caries and stunting in preschool-aged children, highlighting the importance of early dental care as a strategy to support optimal growth trajectories.

Discussion

Understanding the link between early childhood caries and stunting calls for more than clinical definitions. These are not just medical terms; they represent real challenges faced by millions of children, especially in areas where poverty, limited access to healthcare, and poor education are common. While early childhood caries is often perceived as a problem confined to the mouth, it has far-reaching consequences that impact a child's ability to eat, sleep, and grow properly. Similarly, stunting reflects more than a lack of food; it's a visible sign of deeper problems affecting a child's life, development, and future opportunities. [26] When children suffer from untreated dental caries, they often experience persistent pain and discomfort. This can make simple daily activities, such as eating or sleeping, difficult. As a result, their appetite drops, they may start avoiding certain foods, and their nutritional intake becomes inadequate. Over time, this insufficient intake can lead to weight loss and delays in height-for-age growth. Research has shown that this cycle is common among children with severe early childhood caries, who are more likely to show signs of stunting compared to children with healthy teeth.[22]

Evidence from countries such as Indonesia and Brazil underscores this connection. In Indonesia, a study in Makassar found that children with ECC were significantly more likely to be stunted, highlighting the importance of oral health as a component of growth monitoring.[24,27] It's not just the biological effects that matter. What families do every day and the environments in which they live play a huge role, too. For example, when young children are frequently given sugary drinks or snacks, not only does it affect their teeth, but it also means they might not be getting the healthy foods they need. Without enough vitamins and minerals, like calcium and vitamin D, their bodies don't have what they need to grow correctly.[17]

Infections in the mouth can cause inflammation throughout the body. When this happens, a child's body uses energy to fight off the infection, leaving less energy for growth. Some studies have even found high levels of inflammation markers in children with dental problems, suggesting these conditions can affect the whole body, not just the teeth. For families struggling with poverty, these problems are even more complex to manage.[28] Buying healthy food or taking a child to the dentist may not be possible. Often, children's teeth are only treated when the pain becomes unbearable. Parents, especially mothers, may also lack access to education about healthy habits and nutrition. This lack of knowledge increases the likelihood that their children will experience both dental problems and poor

growth. Not every place sees the same connection between oral health and development. In cities or communities with more resources, such as clean water, schools, and clinics, children may be less affected. This demonstrates that a child's environment has a significant impact and that solutions must be tailored to each community's unique needs.[26]

Some programs that teach parents about good nutrition and how to care for their children's teeth have shown real results. For governments and health planners, the message is simple. Dental health and food must be addressed together. Programs like Posyandu in Indonesia could become centres for both dental care and nutrition education. Community health workers could be trained to identify dental issues early and educate families on how to support their children's growth and development. Many health programs still treat dental care as separate or less necessary. In some places, people may believe that baby teeth do not matter because they will fall out. There is also a need for more detailed research to understand better how tooth problems affect growth over time.[27]

Conclusion

This review highlights that early childhood caries and stunting are closely intertwined public health challenges, driven by shared risk factors such as poor nutrition, low maternal education, and limited access to healthcare. The evidence suggests that untreated dental caries can contribute to inadequate feeding, systemic inflammation, and growth impairment in young children. Therefore, promoting oral health as an integral part of child development programs is essential. Integrated strategies that include caregiver education, preventive dental care, and improved access to nutrition can help break the cycle linking early childhood caries to stunting. By viewing oral health not in isolation but as part of a child's overall growth and well-being, we can support healthier futures for children and advance broader public health goals.

References

[1] Folayan MO, El Tantawi M, Schroth RJ, Vukovic A, Kemoli A, Gaffar B, et al. Associations between early childhood caries, malnutrition and anaemia: A global perspective. Vol. 6, BMC Nutrition. 2020.

[2] Duangthip D, Gao SS, Lo ECM, Chu CH. Early Childhood Caries among 5- to 6-Year-Old Children in Southeast Asia. Int Dent J. 2017;67(2).

[3] Zaini WN, Machmudah M, Aprillia Z. The Relationship Between Formula Feeding Patterns and Early Childhood Caries In Preschool Children In Ketileng Village, Todanan Blora. Jurnal Kesehatan Gigi. 2023;10(1).

[4] Moraes RB, Sfreddo CS, Ardenghi TM. Impact of the Brazilian Family Health Strategy on child oral health-related quality of life: A cohort study. Braz Oral Res. 2021;35.

[5] Alanazi HA, Alenazi HK, Alenazi SN, Alotaibi NH, Alanazi KB, Alqahtani AS, et al. Nutritional status and its effect on dental health among children. Int J Community Med Public Health. 2022;10(1).

[6] Teshome A, Yitayeh A. Relationship between periodontal disease and preterm low birth weight: Systematic review. Vol. 24, Pan African Medical Journal. 2016.

[7] Wahyuningsih W, Bukhari A, Juliaty A, Erika KA, Pamungkas RA, Siokal B, et al. Stunting Prevention and Control Program to Reduce the Prevalence of Stunting: Systematic Review Study. Open Access Maced J Med Sci. 2022;10(F).

[8] Darmadi EY, Fauziah YA, Ramadhani S, Budi NKM. Dental and Oral Health Screening for Children in Kelurahan Simokerto, Surabaya. Jurnal Abdi Dosen [Internet]. 2024 Dec;8(4):1659. Available from: http://pkm.uika-bogor.ac.id/index.php/ABDIDOS/issue/archive

[9] Devan I, Ramanarayanan V, Janakiram C. Prevalence of early childhood caries in India: A systematic review and meta-analysis. Vol. 66, Indian Journal of Public Health. 2022.
[10] de Onis M, Branca F. Childhood stunting: A global perspective. Vol. 12, Maternal and Child Nutrition. 2016.
[11] Wang D, Wang X, Zhao C, Ma S, Zhang Y, Shi H. Study on the association between malnutrition, early childhood caries and caries activity among children aged 3–5 years. BMC Oral Health. 2024 Dec 1;24(1).
[12] Thakur S, Sharma R, Singhal P, Chauhan D. Prevalence and determinants of early childhood caries among preschool children in district Shimla, North India: a cross-sectional study. BMC Oral Health. 2025 Dec 1;25(1):168.
[13] Sakolwaree W, Leelataweewud P, Jirarattanasopha V. Early Childhood Caries in Thailand: An Update [Internet]. Vol. 364. 2024. Available from: https://rsucon.rsu.ac.th/proceedings
[14] Vaivada T, Gaffey MF, Das JK, Bhutta ZA. Evidence-based interventions for improvement of maternal and child nutrition in low-income settings: What's new? Vol. 20, Current Opinion in Clinical Nutrition and Metabolic Care. 2017.
[15] Sanari AA, Khashman MAA, Alharbi RF, Alhashim AA, Bukhari RF, Bokhari AA, et al. An overview on early childhood caries: A literature review. Arch Pharm Pract. 2021;12(1).
[16] Jasmine Sadida Z, Indriyanti R, Suzy Setiawan A, Sekeloa Selatan J, Setiawan S. Does Growth Stunting Correlate with Oral Health in Children?: A Systematic Review. 2021; Available from: https://creativecommons.org/licenses/by/4.0/
[17] Ma S, Ma Z, Wang X, Lei M, Zhang Y, Lin X, et al. Relationship of dietary nutrients with early childhood caries and caries activity among children aged 3–5 years—a cross-sectional study. BMC Pediatr. 2024 Dec 1;24(1).
[18] Pratyaprateep N, Jirarattanasopha V, Smutkeeree A. Dental treatment outcomes in Thai children treated for severe early-childhood caries under general anaesthesia and non-pharmacological behaviour management: a retrospective study. European Archives of Paediatric Dentistry. 2024 Jun 1;25(3):349–58.
[19] Setiawan AS, Indriyanti R, Suryanti N, Rahayuwati L, Juniarti N. Neonatal stunting and early childhood Caries: A Mini Review. Frontiers in Pediatric. 2022 Jul;10:1–8.
[20] Sitthisettapong T, Tasanarong P, Phantumvanit P. Strategic Management of Early Childhood Caries in Thailand: A Critical Overview. Front Public Health. 2021 Jun 11;9.
[21] Lui DT, Wahab RMA, Kuppusamy E, Hamzaid NH, Hassan MR, Yazid F. Association of early childhood caries and nutritional status: a scoping review. Vol. 47, Journal of Clinical Pediatric Dentistry. 2023.
[22] Folayan MO, El Tantawi M, Schroth RJ, Vukovic A, Kemoli A, Gaffar B, et al. Associations between early childhood caries, malnutrition and anaemia: A global perspective. Vol. 6, BMC Nutrition. BioMed Central Ltd; 2020.
[23] Renggli EP, Turton B, Sokal-Gutierrez K, Hondru G, Chher T, Hak S, et al. Stunting malnutrition associated with severe tooth decay in Cambodian toddlers. Nutrients. 2021;13(2).
[24] Rapôso NML, Andrade-Maia G, Ferreira MC, Paschoal MAB. Early Childhood Caries in a Northeastern Brazilian Capital: Observations of Social Distinct Daycare Centers. Pesqui Bras Odontopediatria Clin Integr. 2024;24.
[25] Mattaliti SFO, Aldilawati S, Anastasya A. The Relationship Between Stunting and Caries Status in Children Aged 3-5 Years in Parangloe District, Gowa Regency in 2021. Makassar Dental Journal. 2023;12(2).
[26] Devan I, Ramanarayanan V, Janakiram C. Prevalence of early childhood caries in India: A systematic review and meta-analysis. Vol. 66, Indian Journal of Public Health. Wolters Kluwer Medknow Publications; 2022. p. 3–11.

[27] Amalia R, Chairunisa F, Alfian MF, Supartinah A. Indonesia: Epidemiological profiles of early childhood caries. Front Public Health. 2019;7(AUG).
[28] Fernández CN, Borjas MI, Cambría-Ronda SD, Zavala W. Prevalence and severity of early childhood caries in malnourished children in Mendoza, Argentina. Acta odontologica latinoamericana. 2020;33(3).