



(REVIEW ARTICLE)



The correlation between oral health and stunting in children: A literature review

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Abstract

Background: Growth stunting refers to a condition in which children have a lower stature compared to their classmates, as determined by the World Health Organization's child growth standard assessment. This disorder can impact the growth of the brain and other body components, including the oral cavity, leading to effects on oral hygiene and general oral health. The objective of this study is to establish the relationship between stunting and dental and oral health in children. There is a considerable body of scientific research that leans in this way, and it appears that there is an association between growth retardation and dental health. According to the findings of this research, oral health was determined by the presence of oral hygiene, oral illness (dental caries), salivary flow rate, and salivary content. One of the risk factors for ECC is the presence of stunting. According to this study, there is a connection between stunting and ECC as well as moderate dental hygiene.

Objectives: To review the correlation between oral health and stunting in children.

Conclusion: There exists an association between growth stunting and dental health in children. The oral hygiene can be classified as moderate to poor based on the OHI-S test, and selected studies have identified a high plaque index. Furthermore, it was shown that children with growth stunting had a reduction in both salivary flow rate and the content of their saliva. Dental caries is the primary cause of oral illness, leading to a decline in oral health and is associated with development stunting in children.

Keywords: Caries; Children; Growth and Development; Oral Health; Stunting

1. Introduction

Growth stunting refers to a condition where children experience impaired growth in both their body and brain due to prolonged starvation or frequent illnesses. As a result, these children tend to be shorter than their classmates and experience delays in cognitive development. One Stunting may be assessed using the TB/U indicator, which measures the departure of a child's body height measurement to age from the median standard deviation based on the World Health Organization (WHO) child development criteria. Specifically, if the z-score value is less than -2 SD, it indicates stunting [1]. Stunting is a permanent condition caused by inadequate nutrition and recurrent illnesses during the initial 1,000 days of life. Due to this occurrence, stunting has emerged as a notable public health issue with detrimental effects in several domains, such as heightened susceptibility to diseases, impaired physical and cognitive growth, and maybe even death if left unattended [2].

Two Approximately 21.9% or 149 million children under 5 years old worldwide suffer from stunted growth, with Southeast Asia accounting for 25% of these cases. Three The 2018 Indonesian Basic Health Research reports that the incidence of growth stunting in Indonesia is at 30.8%. The current incidence reflects a reduction of 6.4% in comparison to the prevalence observed in 2013 (37.2%). Two Approximately 21.9% or 149 million children under 5 years old

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worldwide suffer from stunted growth, with Southeast Asia accounting for 25% of these cases. Three The 2018 Indonesian Basic Health Research reports that the incidence of growth stunting in Indonesia is at 30.8%. The current incidence reflects a reduction of 6.4% in comparison to the prevalence observed in 2013 (37.2%) [1]. The development of nutritional problems in Indonesia is increasingly complex nowadays, apart from the problem of malnutrition, the problem of excess nutrition is also a problem that must be handled seriously. Short nutritional status (stunting) is a form of malnutrition which is measured based on the 2005 WHO reference standard deviation. In Indonesia, basic health research (Riskesdas) 2013, showed stunting reached 37%, consisting of 18% very short and 19.2% short [3].

Insufficient dietary consumption significantly affects the overall growth and development patterns of children, particularly those that will be observed during the emergence of permanent teeth in the oral cavity. Inadequate dietary consumption in children with stunted growth might result in delayed tooth eruption. Nevertheless, an overabundance of nutrients will also adversely affect the growth and maturation of teeth [2]. Chronic malnutrition in children, also known as stunting [4, 5], leads to a decrease in salivary production. This occurs because the salivary glands shrink, resulting in a lower flow rate of saliva. Malnourished children had a higher incidence of primary dental caries. Deciduous teeth that are shed later are more susceptible to prolonged exposure to food [6], which increases the likelihood of developing primary dental caries. Furthermore, it was shown that the postponement of the emergence of permanent replacement teeth was similarly linked to starvation. Epidemiological studies have established a direct cause-and-effect relationship between malnutrition and dental caries. Stunting can result in hindered tooth maturation, compromised tooth enamel development, and delayed eruption of primary teeth [7]. Dental caries is a persistent ailment that frequently manifests during infancy, accounting for 60-90% of cases. Treatment of dental caries is necessary to avoid the development of persistent oral infections and alleviate oral discomfort. Malnutrition and insufficient awareness of oral health might contribute to the elevated incidence of caries [8].

This study aims to determine the correlation between stunting and dental and oral health in children. This research was conducted so that the relationship between the two can be explained clearly based on previous studies. So it can be used to conduct further research.

2. Material and methods

This study applied a systematic approach by utilizing the literature review method. The research was done audaciously in December 2023.

2.1. Research Strategy

Literatures searched were conducted in December 2023 across preset databases to get articles on the PubMed and Google Scholar databases. The selected search terms for this literature review are “oral health” and “stunting”. Articles that do not match the specified keywords are not included in the search.

2.2. Inclusion Criteria

The inclusion criteria used in this research include: literature is available in full text in PDF format, literature is in English, can be accessed for free or open access, literature is published articles or accepted manuscripts, research subjects are humans, research subjects consist of a wide range of subjects. age, and the study design used is the original article.

2.3. Exclusion Criteria

The exclusion criteria used in this research include: literature that uses languages other than English, research subjects in the form of experimental animals, literature reviews or systematic reviews, and not available full-text or open access.

2.4. Synthetic Data

Literature was identified based on keyword searches and screened based on title and abstract. The full-text of each piece of literature was screened to determine whether the study was relevant to the inclusion and exclusion criteria specified in this study.

3. Results and discussion

Untreated dental caries and the resulting infection can induce pain and discomfort, leading to a decrease in food consumption as eating becomes an unpleasant experience for youngsters. Furthermore, dental caries can lead to disruptions in hunger and sleep, which can have a negative influence on the growth and development of children. In general, Disrupted sleep can impact the synthesis and development of glucocorticoids. Pulpitis and tooth abscess cause chronic inflammation that impacts metabolic pathways associated with cytokines. Recent data indicates that children with ECC exhibit elevated levels of proinflammatory cytokines. Cytokines serve as intermediaries in the processes of inflammation, infection, and immunology, and their levels rise in tandem with the severity of ECC (Early Childhood Caries). The proinflammatory cytokines produce free radicals that create peroxide, as well as prostaglandin E2, interleukin 6, necrotizing tumor factor, and alpha and cysteine leukotrienes. These substances are powerful agents in the inflammatory response and are strongly linked to an elevated risk of malnutrition. The presence of inflammation in ECC is a contributing factor to the development of disease-related malnutrition and can hinder growth. Severe ECC is linked to iron deficiency anemia, which leads to decreased salivary flow and deficiencies in vitamin D, vitamin A, calcium, and albumin. It results in the underdevelopment or reduced mineralization of tooth enamel, as well as the diminished protective effects of iron, vitamins, and zinc on teeth [9]. Stunting or malnutrition in children can cause the flow rate of saliva to decrease. Research shows that there is a relationship between short nutritional status and the level of dental caries children, and causes the function of saliva as a buffer, cleaner and antibacterial to also decrease [3].

Table 1 Summary of study results

No.	Author Name, Year	Objective	Research Result
1	Badruddin et al., 2021	This study aimed to establish the occurrence of dental caries and stunting, and examine the correlation between oral health status and stunting among 5-year-old children in Indonesia.	The level of parental education and socioeconomic position are strongly associated with nutritional status, namely in the form of stunting. The elements that contribute to a child's susceptibility to stunting are many, encompassing dental health being one of them.
2	Folayan et al., 2021	The objective of this study is to establish a correlation between malnutrition and early childhood caries (ECC) in children living in sub-urban areas of Nigeria.	Stunted growth, being underweight or overweight, and poor oral hygiene were identified as risk factors for tooth decay.
3	Simorangkir et al., 2020	The aim of the study was to evaluate the correlation between dental caries and dietary consumption with growth retardation in 6-8 year-old students attending primary school in the Pantai Labu District in 2018.	The study found that there was a strong correlation between a high incidence of tooth decay and a poor consumption of protein, which was identified as a risk factor for stunted growth. Stunting in children is three times more likely to occur due to inadequate protein consumption, with an 89% risk of inducing stunting compared to adequate protein intake.
4	Mattalitti et al., 2023	The study examined the correlation between stunting and caries status in children between the ages of 3 and 5 in the Parangloe District of Gowa Regency.	A correlation has been established between stunting and the occurrence of dental caries in children between the ages of 3 and 5 in the Parangloe District of Gowa Regency in 2021.
5	Zulkifli et al., 2022	This study seeks to examine the correlation between Early Childhood Caries (ECC) and the nutritional condition of five-year-old children in Indonesia, using data from the 2018 Riskesdas survey.	A multinomial logistic regression analysis demonstrated a statistically significant association between ECC and wasting, with an odds ratio (OR) of 1.352 and a 95% confidence interval (CI) ranging from 0.989 to 2.589.

Children who have stunting are susceptible to experiencing salivary gland atrophy, alterations in saliva composition, and changes in the mineral content of their teeth [10]. Children who have stunted growth typically suffer from the

shrinking of their salivary glands due to a lack of vitamin A [11]. Vitamin A has a crucial function in the process of eyesight and the development of specialized cells in the salivary glands. Vitamin A-induced disruption of epithelial cell differentiation can result in reduced salivary flow rate and impaired buffering capacity of saliva. Stunting circumstances can alter the composition of saliva by reducing the levels of secretory immunoglobulin A antibodies (sIgA), which play a role in fighting microorganisms. This alteration is induced by deficits in zinc, iron, protein, and vitamin B. Children with stunting circumstances experience alterations in the mineral composition of their teeth, namely in calcium, fluorine, phosphorus, and iron. These changes have consequences such as enamel hypoplasia and the hindrance of tooth eruption [6]. The association between growth stunting and dental health appears to be clearly apparent, and there exists much scientific data that supports this relationship. The research characterized oral health based on the presence of oral hygiene, oral illness (specifically dental caries), salivary flow rate, and salivary content. Oral hygiene was assessed using the OHI-S method by three authors. The prevalence of inadequate oral hygiene was greater among stunted children (96%) compared to healthy children (84%) [5, 12].

Additional research has shown that out of a group of 25 children experiencing development stunting, some of them exhibit inadequate oral hygiene, while the others have a moderate degree of oral cleanliness. There is correlation between stunting and early childhood caries (ECC), as well as modest oral hygiene. Analysis of plaque and calculus revealed a significantly higher plaque index in children with growth stunting compared to the well-nourished group. However, the calculus index in this investigation remained limited and only demonstrated statistical significance for the squandered category [13]. Children with growth stunting had a significantly higher mean plaque index compared to well-nourished children. The hypofunction of the salivary glands, which is linked to malnutrition, can contribute to moderate to poor oral health in stunted children. Saliva is crucial for maintaining dental health and proper functioning. Salivary gland hypofunction can lead to a decline in the rate of salivary flow, a decrease in the buffer capacity of saliva, and a reduction in its composition. Under favorable circumstances, these salivary defensive actions can assist in maintaining the cleanliness of the tooth surface, particularly by combating the germs that gather in dental plaque and food particles. Children with growth stunting have reduced salivary flow rate, both when stimulated and unstimulated, in comparison to well-nourished children. In cases of chronic malnutrition, characterized by growth stunting, there is a tendency for the saliva flow rate to decrease. This decrease in saliva flow disrupts the protective role of saliva in the mouth. This might potentially diminish the oral cavity's resistance to infection and the plaque's ability to neutralize acid, which is closely linked to tooth decay. The unstimulated salivary flow rate was determined to have no impact, maybe as a result of alterations in the parotid glands' weight and reduced density of β -adrenoceptors. The parotid glands contribute to 50% of saliva production when stimulated, but they only account for 20% during unstimulated conditions [1, 14].

The association between dental caries and anthropometric dimensions remains poorly understood due to a dearth of comprehensive investigations conducted worldwide. Nevertheless, consuming sufficient nutrients is crucial for maintaining optimal dental health. The lack of micronutrients can serve as a significant connection between nutritional conditions including stunting, underweight, and wasting, and the development of dental caries. Vitamin D insufficiency significantly contributes to the occurrence of dental cavities in children, particularly among micronutrients. Additionally, there are reports indicating that inadequate levels of Vitamin D in expectant mothers throughout tooth development stages might potentially impact the form of the teeth. This can lead to the development of faulty enamel. The presence of enamel flaws enhances the likelihood of cariogenic bacteria establishing their colonies, leading to the development of early and severe caries. The link between diet and oral illness can be described as a mutually beneficial and interdependent interaction. The nutritional intake significantly impacts the overall health of the oral cavity, encompassing the teeth, periodontium (supporting structure of the teeth), oral mucosa, and alveolar bone. Changes in nutrient intake due to modifications in meal consumption, absorption, metabolism, or excretion might impact the condition of the teeth, surrounding tissues, and bone as well. Malnutrition is associated with a higher occurrence of dental caries, enamel hypoplasia, salivary gland hypofunction, and delayed eruption [15].

4. Conclusion

This study can be inferred that there exists an association between growth stunting and dental health in children. The oral hygiene can be classified as moderate to poor based on the OHI-S test, and selected studies have identified a high plaque index. Furthermore, it was shown that children with growth stunting had a reduction in both salivary flow rate and the content of their saliva. Dental caries is the primary cause of oral illness, leading to a decline in oral health and is associated with development stunting in children.

Compliance with ethical standards

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Disclosure of Conflict of interest

There was no conflict of interest in this study.

References

- [1] Sadida ZJ, Indriyanti R, Setiawan AS. Does Growth Stunting Correlate with Oral Health in Children?: A Systematic Review. *Eur J Dent* 2022; 16: 32–40.
- [2] Fadilla ND, Wardani R, Putri FM. Correlation between stunting children aged 6-7 years in term of nutritional status and the eruption of permanent first molar. *Padjadjaran J Dent* 2022; 34: 140–146.
- [3] Aldilawati S, Mattalitti SFO, Anastasya A. The relationship between stunting and caries status in children aged 3-5 years in Parangloe District, Gowa Regency in 2021. *Makassar Dent J* 2023; 12: 186–188.
- [4] Putri TN, Indriyanti R, Setiawan AS. A descriptive study on oral hygiene practice and caries increment in children with growth stunting. *Front Oral Heal* 2023; 4: 1236228.
- [5] Indriyanti R, Nainggolan TR, Sundari AS, et al. Modelling the maternal oral health knowledge, age group, social-economic status, and oral health-related quality of life in stunting children. *Int J* 2021; 10: 201.
- [6] Oktashafa DR, Awalia H, Negara MC, et al. Relationship Between Stunting and Caries In Children Aged 2-5 Years Old Systematic Review. *Sriwij J Dent* 2023; 4: 42–53.
- [7] Abdat M, Usman S, Suhaila H. Relationship between stunting with dental and oral status in toddlers. *J Dentomaxillofacial Sci* 2020; 5: 114–119.
- [8] Abdat M, Chairunas C. Analysis of Status of Oral Stunting in Toddlers and Its Relationship with Mother's Parenting. In: 2nd Aceh International Dental Meeting 2021 (AIDEM 2021). Atlantis Press, 2022, pp. 122–127.
- [9] Zulkifli N, Rahardjo A, Darwita RR, et al. Association Of Early Childhood Caries And Nutritional Status Among 5-Year-Old Children In Indonesia. *J Heal Dent Sci* 2022; 2: 235–256.
- [10] Simorangkir EA, Pintauli S, Sudaryati E. Relationship between Caries Experience and Food Intake with Stunting Among 6-8-Years Old of Elementary School at Pantai Labu District in 2018. *Britain Int Exact Sci J* 2020; 2: 313–319.
- [11] Pytko-Polończyk J, Stawarz-Janeczek M, Kryczyk-Poprawa A, et al. Antioxidant-rich natural raw materials in the prevention and treatment of selected oral cavity and periodontal diseases. *Antioxidants* 2021; 10: 1–16.
- [12] Anzar W, Qureshi A, Afaq A, et al. Association of Dental Caries and Anthropometric Measures among Primary School Children. *Children*; 8. Epub ahead of print 2021. DOI: 10.3390/children8030223.
- [13] Saldunaite K, Bendoraitiene EA, Slabšinskiene E, et al. The role of parental education and socioeconomic status in dental caries prevention among Lithuanian children. *Med* 2014; 50: 156–161.
- [14] Li Z, Kim R, Vollmer S, et al. Factors Associated with Child Stunting, Wasting, and Underweight in 35 Low- And Middle-Income Countries. *JAMA Netw Open* 2020; 3: 1–18.
- [15] Phogat R, Rani G, Manjunath BC, et al. Relationship of Anthropometric Measurements and Nutritional Status with Early Childhood Caries among Rural Preschool Children – A Cross-sectional Analytical Study. *J Indian Assoc Public Heal Dent*; 21, https://journals.lww.com/aphd/fulltext/2023/21040/relationship_of_anthropometric_measurements_and.7.a.spx (2023).