

Scoping Review

THE IMPACT OF STUNTING MALNUTRITION OF ORODENTAL HEALTH IN CHILDREN: A SCOPING REVIEW

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ABSTRACT

Introduction: Short children or commonly called stunting is a prevalent nutritional issue found among children globally. Indonesia has a notably high prevalence of stunting throughout the Southeast Asian region. Stunting malnutrition children will experience disturbances in the process of tooth growth, affecting the teeth during pre-eruption. Aim to provide an overview of the impact of stunting malnutrition on dental health in children.

Materials and Methods: This study uses the PRISMA method, with the steps: (1) Question framework (literature study); (2) Search for articles in databases (on Scopus, PubMed, and Google Scholar), and journal data bases with articles published from 2020 to 2022; (3) Selection of relevant research; (4) Data extraction; (5) Synthesis with narrative method.

Results and Discussions: The study obtained 7 articles to be reviewed, proving that stunting malnutrition children experienced delayed tooth eruption in 3 articles; 4 articles analyzing the impact of stunting malnutrition on dental caries; and experiencing unhealthy dental health status in 1 article.

Conclusion: The impact of stunting malnutrition children on orodental health is delayed tooth eruption, and severe dental caries, decreased oral health status, as well as decreased salivary flow velocity and salivary composition.

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INTRODUCTION

The stunting malnutrition experienced in children is a threat in today's world. Asia accounts for 55% of the global population of children that have stunting. Indonesia shows one of the highest rates of stunting among Southeast Asian nations.¹ The World Health organization (WHO) states that Indonesia has a high prevalence of stunting (30-39%).² The decline in the prevalence of stunting has been slow in the last ten years.²

The stunting malnutrition is a major nutritional problem facing Indonesia. The stunting malnutrition has the highest prevalence compared to other nutritional problems in Indonesia. Stunting malnutrition is a chronic nutritional problem caused by many factors, such as socio-economic conditions, maternal nutrition during pregnancy, pain in babies, and lack of nutritional intake in babies. The stunting malnutrition children in the future will experience difficulties in achieving optimal physical development.¹ The primary cause of malnutrition stunting is a long-term lack of nutrients or a reduced nutritional intake, which results in stunted development and growth delays.³ Malnutrition is the primary cause of disability and mortality among children under five in developing countries. Malnutrition stunting children will experience orodental health problems, including those related to diet and caries.⁴

The results of the study reported that there was a significant relationship between the presence of caries in stunted children.^{5,6,7} This occurs because the salivary glands in malnutrition stunting children experience atrophy, causing a decrease in salivary secretion.^{8,9} Malnutrition stunting and poor oral health are significantly correlated in infants under the age of five (toddlers).³ This occurs due to a significant lack of nutritional intake for dental and oral health.¹⁰ Therefore the purpose of this study was to review how stunting malnutrition affects children's orodental health?.

MATERIALS AND METHODS

This study uses the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) method,¹¹ with the following steps: (1) Frame questions from case studies and literature; (2) Run a search (on Scopus, PubMed and Google Scholar), with articles published from 2020 to 2022; (3) Selection of relevant articles; (4) Data extraction; (5) Synthesis of the results with the narrative method. Search articles using the keywords "Stunting Malnutrition", "Dental Health", and "Children". The way to use keywords is the "Boolean searching" method,¹² namely "Stunting malnutrition AND oral health AND dental health AND children".

The search was adjusted according to the inclusion category, the articles suitable for this study were: (1) objectives: children aged 1-13 years, (2) results: the impact of stunting malnutrition on children's oral and dental health, (3) research methods: systematic literature review, qualitative and quantitative, (4) research written in English and Indonesian, (5) free full text available. While the exclusion criteria were articles that were not suitable for this study were: (1) purpose: stunted children who are not malnourished, (2) outcome: not the impact of stunting malnutrition on children's oral and dental health, (3) research method: in outside the systematic literature review, qualitative and quantitative (4) research written outside English and Indonesian, (5) free full text is not available.

RESULTS AND DISCUSSIONS

The search results for articles in the database, namely Scopus, Pubmed, and Google scholar, have identified 3908 articles, consisting of 3 cross-sectional articles, 1 cohort article, and 3 systematic review articles, from 2 countries, namely Indonesia and Cambodia. The PRISMA flow diagram for selecting articles is shown in Figure 1. The selection results of the 7 articles reviewed proved that malnourished stunted children had delayed tooth eruption in 3 articles; 4 articles analyzing the impact of stunting malnutrition on dental caries; and experiencing unhealthy dental health status in 1 article. A summary of research article search results on the impact of stunting malnutrition on children's dental health is presented in Table 1.

Table 1. Summary of Search Results Research Articles

No	Author	Method	Results/Conclusions
1.	Zulkarnain <i>et al.</i> , (2022) ¹³	Cross-sectional	Children that have stunted growth tend to exhibit a 2.63 times higher probability of having a delayed eruption of permanent teeth in comparison to their non-stunted counterparts.
2.	Setiawan <i>et al.</i> , (2022) ¹⁴	Systematic review	Stunting malnutrition children experience a decrease in the speed, number and sequence of eruption of primary teeth
3.	Sadida <i>et al.</i> , (2022) ¹⁵	Systematic review	Stunting malnutrition children experience decreased salivary flow velocity and salivary composition; resulting in a decrease in dental and oral health, generally dental caries with a high plaque index
4.	Renggli <i>et al.</i> , (2021) ¹⁶	Cohort	Stunting malnutrition babies in Cambodia, especially those under 24 months of age, suffer from severe dental caries
5.	Lufti <i>et al.</i> , (2021) ¹⁷	Cross-sectional	Children aged 10-12 years who experience stunting malnutrition have a significant relationship with the severity of dental caries
6.	Abdat <i>et al.</i> , (2020) ¹⁸	Cross-sectional	There is a substantial correlation between stunting malnutrition in infants aged under five years (toddlers) in Aceh and their dental and oral health status.
7.	Achmad <i>et al.</i> , (2020) ¹⁹	Systematic review	Stunting malnutrition children experience delayed eruption of permanent teeth, caries, and decreased salivary flow rate

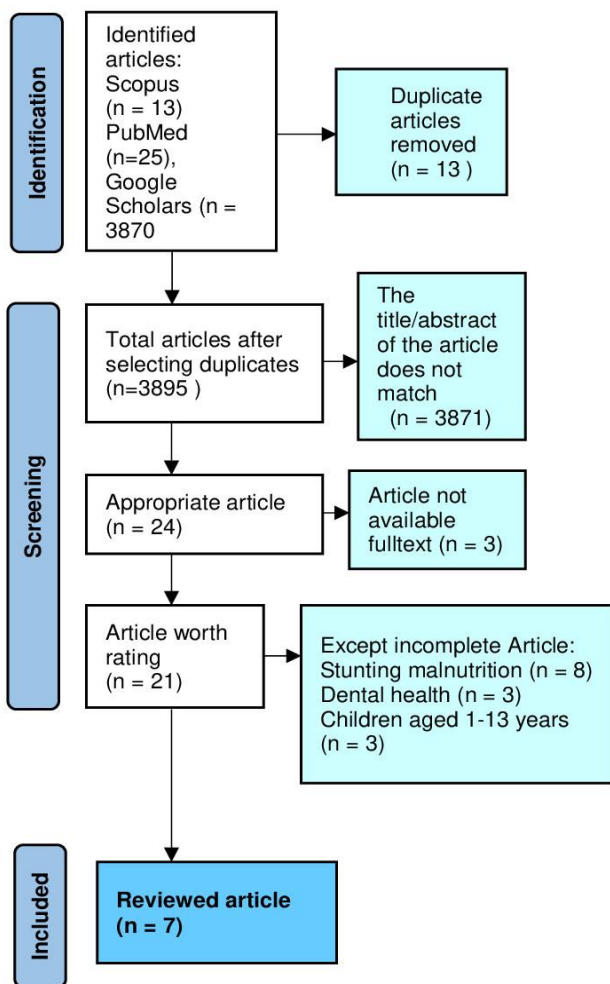


Figure 1. PRISMA Flow Diagram for Article Selection.¹¹

Children affected with stunting malnutrition have historically had prolonged periods of inadequate nutrition,³ resulting in malnutrition and subsequent implications for dental growth. Moreover, it will result in

delays in the maturation process of the periodontal bones that support the teeth, so they will experience delays in tooth eruption.^{10,20,21} This is confirmed that stunting malnutrition children are 4.6 times more at risk of having a delayed eruption of the second upper right premolar, and 4.4 times more at risk of having a delayed eruption of the second left premolar.²² This finding corresponds to the outcomes of a study conducted by Zulkarnain *et al.* (2022), Setiawan *et al.* (2022), and Achmad *et al.* (2020) that the eruption of permanent teeth is delayed in stunted children as compared to non-stunting children., which can be seen from the small number of erupted primary teeth.^{13,14,19} The results of research on 10-year-old children in the Tuah Negeri sub-district found a significant relationship between stunting and tooth eruption in children. Stunting children are 4.6 times more at risk of having a delayed eruption of the right upper premolar, and 4.4 times more at risk of having a delayed eruption of the second left premolar. The nutritional status of malnutrition stunting children is significantly associated with mandibular central incisor eruption. The nutritional status of malnutrition stunting children will affect the growth of the teeth, because nutritional deficiencies of protein, calcium, phosphorus, vitamin C and vitamin D can inhibit the growth of the bones of the teeth, including delaying the eruption time of the teeth.^{21,22} The research results confirmed that malnutrition stunting, lack of intake of nutrients, such as carbohydrates, protein, fat, iodine,

calcium, magnesium, phosphorus, vitamin C and vitamin D during growth and development, can cause delayed eruption of permanent teeth.¹⁰

Almost all stunting children aged 5 years in Indonesia have severe caries in their primary teeth.²³ It is confirmed that significantly stunted children under five have unhygienic dental status and high dental caries.²⁴ It is also emphasized that there is an increase in permanent tooth caries in malnutrition stunting children. is a significant risk factor.²⁵ This confirms the results of a study by Renggili *et al.* (2021), Lufti *et al.* (2021) and Achmad *et al.* (2020), that malnutrition stunting children have a significant relationship with the severity of dental caries.^{16,17,19} This occurs because the salivary glands in stunted children experience atrophy, causing a decrease in salivary secretion, so that it has a low salivary condition causing low self-cleaning power. This is the main factor that triggers caries.^{8,9}

The research results also state that stunting malnutrition children are more susceptible to dental caries, because their saliva underwent characteristic changes such as decreased salivary flow rate and pH. Decreased salivary secretion can cause a decrease in the buffering ability of saliva so that the pH of the oral cavity is disrupted so that teeth are more susceptible to caries.¹⁸ Saliva also has an antimicrobial component and the ability to maintain the pH balance of the oral cavity (buffer) when the pH drops to acidic and when the pH rises to very high (alkaline), so that the process of caries formation can be prevented.²⁶ Plaque on the enamel surface will absorb acid, so the pH of the oral cavity becomes lower. The process of caries begins as soon as the plaque pH drops and is at a critical pH of around 5.5. If the pH of the oral cavity remains below normal for a long time, it will demineralize the teeth and result in caries.²⁷

Saliva is very important in maintaining oral health. A good salivary flow rate allows for optimal cleaning of the oral cavity.²⁷ Malnutrition stunting children experience a decreased salivary flow rate.¹⁸ This is supported from research results by Sadida *et al.* (2022), Abdat *et al.* (2020), and Achmad *et al.* (2020), that stunting children experience a low oral hygiene index, due to low

salivary flow rate and salivary composition. This happens because in stunting children there is atrophy of the salivary glands so that the salivary flow rate, buffer capacity, and salivary pH are lower than normal children.^{15,18,19}

Malnutrition stunting children experiencing protein energy deficiency and vitamin A are also associated with salivary gland atrophy, which causes reduced oral defense against infection and its ability to protect against acid plaque. *Streptococcus mutans* bacteria utilize the acid produced during metabolism to produce energy, causing damage to tooth structure.²⁸ The results of this study were only Sadida *et al.* (2021) who reviewed the content of nutritional elements in saliva, that is, malnutrition stunting children experience deficiencies of protein, vitamins A, C, and E, increasing the plaque index. It is also stated that stunting children experience significant deficiencies of phosphorus, calcium and copper, which increase the incidence of dental caries.¹⁵ It was also emphasized that stunting children encountered hypoplastic enamel conditions with enamel defects. Deficiencies of vitamin A, vitamin D, and protein energy deficiency have been shown to be associated with hypoplastic enamel.^{15,29,30} This occurs because malnutrition stunting children decrease salivary flow rate and composition.¹⁸

CONCLUSIONS

The impact of stunting malnutrition children on orodental health is delayed tooth eruption, severe dental caries, decreased oral health status, as well as decreased salivary flow velocity and salivary composition.

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