



Relationship Between Stunting and Caries In Children Aged 2-5 Years Old Systematic Review

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Abstract

Introduction: Stunting is a chronic nutritional deficiency caused by a deficiency of macronutrients and micronutrients. Nutritional deficiency in stunting children affects the occurrence of salivary gland atrophy, changes in saliva composition, and changes in mineral content in teeth that are at risk for dental caries. **Purpose:** To determine the relationship between stunting and dental caries in children aged 2-5 years old. **Methods:** The type of research is a systematic review with qualitative analysis. **Result:** This study involved five journals that were selected from the PUBMED journals database and Google Scholar. Cross-sectional and experimental journals within the last 15 years discussing relationship between stunting and dental caries in children aged 2-5 years old. **Conclusion:** There is a relationship between stunting and dental caries (n=5).

Keyword: caries; malnutrition; stunting

Introduction

Stunting is a condition of chronic nutritional deficiency that causes impaired growth, characterized by less than-normal height based on age and gender.^{1,2} It is a health problem in children under the age of 5 years that occurs in several countries, with low and middle income.³ The effects of stunting include increased morbidity, mortality, delayed motor and cognitive development, and stunted brain growth.^{4,5} Children with stunting are more susceptible to diseases and high risk of developing degenerative diseases as adults.⁶ Stunting can be measured using the 2005 WHO reference standard deviation.⁷

Stunting may affect oral health and disrupt the growth of the teeth, which can cause imperfect tooth growth. It also may cause atrophy of the salivary glands, which has an impact

on decreasing salivary flow rate, reducing salivary buffer and self-cleaning function that can increase the risk factor of caries on the tooth surface.⁸⁻¹⁰

Dental caries is a health problem that generally occurs in children. Based on data from the World Health Organization (WHO), the prevalence of dental caries in preschool-age children is 60-90%.¹¹ According to WHO, children aged less than 5 years are an age group that is prone to caries due to behaviors or habits that do not support dental and oral health.¹¹ Based on the results of the RISKESDAS survey 2018, it was stated that the prevalence of preschool-age children in Indonesia who had dental caries problems was 90.2%.^{12,13} Dental caries is a chronic disease of the dental hard tissues, characterized by demineralization of tooth structures such as enamel, dentin, and cementum.^{14,15} Early caries lesions can be seen through clinical examination in the form of white spots on the enamel.^{16,17}

Children are susceptible to dental caries because of the difference in composition of the enamel on primary teeth from the permanent teeth.¹⁸ The structure of enamel on permanent teeth consists of 1% water, 2% organic matter, and 97% minerals.¹⁹ Tools that used in the assessment of caries according to WHO standards are mouth mirrors, and probes.²⁰

Previous studies indicated that stunting is strongly related to dental caries.^{21,22} It is caused by a decrease in the intake of nutrients needed, especially in the oral cavity.²³ Andriani et al. explained there is a relationship between stunting and caries severity in primary and permanent teeth.²⁴ Stunting is associated as a host factor that influences the development of caries lesions, abnormalities of the teeth structure, and salivary glands.²⁵ Abnormalities of tooth structure, such as hypoplasia, are the potential to cause the oral cavity to become cariogenic and decrease pH in the oral cavity.²⁶ In addition, stunting or failure of growth in toddlers can also interfere with the growth process of the teeth, so that the formation of the hard tissue structure of the erupted tooth becomes imperfect.²⁷ This study aimed to determine the relationship between stunting and dental caries in children aged 2-5 years.

METHODS

The type of research used in this systematic literature review was cross-sectional,⁶¹ with the AHRQ (Agency for Healthcare Research and Quality) as the Risk-of-bias assessment. The results obtained research with a high risk of bias. A sensitivity analysis was carried out to

exclude primary research with a high risk of bias from the study while still paying attention to the conclusions that will be obtained later.

Population

The population in this study were children from middle to low-income families in the age group 2-5 years old with stunting and dental caries. Children with systemic disease were excluded from this study.

Exposure

The exposure in this study was children with stunting and dental caries aged 2-5 years old. Children who are overweight/obese and have normal nutrition are excluded.

Outcome

The outcome of this study was children with stunting and experiencing dental caries that were assessed using the index of deft and dmft.

Data Search Strategy

The journal databases used are PubMed and Google Scholar. The keywords and controlled vocabulary used are listed in Table 1. The library used is in English with limiting 15 years of publication.

Table 1. Data search strategy

Inclusion criteria	Population	Exposure	Outcome
Keyword	Childhood	Stunting	Caries
Natural language	<i>Child, Pre-school, Kid</i>	<i>Underweight, stunted, thinness</i>	<i>Dental caries, dental cavity</i>
Controlled vocabularies	<i>Child~ preschool child</i>	<i>Pediatric malnutrition, Child malnutrition, Childhood stunting, Infant malnutrition, Stunting in childhood.</i>	<i>Dental caries, cariogenic, Demineralization, Decay, white spots</i>

Biased Assessment and Data Synthesis Plan

The type of research used in this study is cross-sectional. Bias assessment uses the AHRQ (Agency for Healthcare Research and Quality) method. The primary research with a high risk of bias will be excluded from the study while still paying attention to the conclusions that will be obtained later. The data obtained will be synthesized qualitatively.

Results

This study was conducted to determine the relationship between stunting and dental caries in children aged 2-5 years old according to the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analyses) guidelines in two journal databases: PubMed and Google Scholar. The literature search strategy can be seen in the flow chart below (Figure 1).

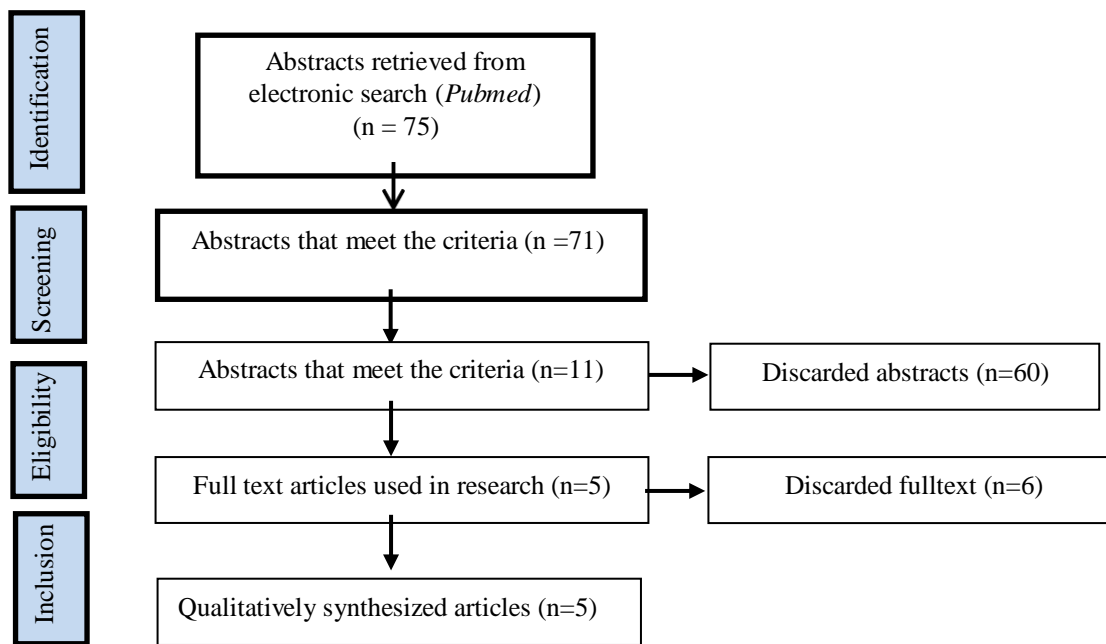


Figure 1. PRISMA flow diagram

Figure 1 shows 71 journals identified by searching the Pubmed and Google Scholar databases. The abstract of cross-sectional research was selected according to the criteria and resulted in 11 journals. Then all articles were evaluated, and 6 journals were discarded

because they did not meet the inclusion criteria: did not discuss children aged 2 - 5 years, did not use BMI classification or z-scores, and did not use a validated caries index. A total of 5 journals will be synthesized qualitatively in the research.

Characteristics of Research Journals

Based on the year of publication of the literature, there is one journal each published in 2016, 2019, and 2018, and two journals in 2020.^{3,8,16,33,35} The highest number of research subjects was in the study of Shen (2020), a total of 772 patients with stunting and dental caries, while the lowest number of research subjects was in the study of Rahmat (2016) with 30 patients stunting and dental caries, and 30 patients no stunting and no caries as a control group.^{3,16} The ratio of research subjects between the sexes of men and women in the three journals is the same.^{3,8} One journal does not mention the ratio of male and female subjects.^{16,33,35} The general characteristics of research journals can be seen more clearly in Table 2.

Table 2. General Characteristics of Research Journals

Journal Code	Number of Subject	Subjects Age	Research Place
Rahman 2016	60	4-5 years old	Taman Kanak-kanak Kertak hanyar, Banjar, Kalimantan Selatan.
Abdat 2020	70	3-5 years old	Kabupaten Pidie, Aceh Province.
Shen 2020	772 (50% male, 50% female)	5 years old	Kindergarten in China.
Folayan 2019	370 (66,6% male, 33,3% female)	6-70 month.	Central Ife Province, Nigeria.
Xavier 2013	229	3-5 years old	Brazil, USA.

The results of the bias analysis based on the AHRQ assessment showed that the five journals in this study were considered to have a "low" risk of bias, and none of the journals were "unclear". The journal is described as having good quality if the bias analysis shows a low value. All literature writes clearly about informed consent to obtain participant consent as a research sample.

Data Extraction Result

Table 3. Data Extraction Result

Journal Code	Number of Subjects			Risk Factor	Result		Bias Analysis	Advantages	Dis-advantages
	Ag es	Gender	Nutritio nal Status		Relationshi p between stunting and dental caries	Index			
Rahman 2016 ³	5 y.o	Not Explained T: 60	Normal and <i>stunting</i>	Brush teeth, sosio economic.	Related	deft (8,23)	Low bias	-Chi Square test -Exclusion criteria	Limited subjects.
Abdat 2020 ³⁵	3-5 y.o	Not Explained T: 70	Normal and <i>stunting</i>	Brush teeth, sosio economic.	Related	deft (6,13)	Low bias	Explained risk factor of caries	Subjects was dominated by female.
Shen 2020 ¹⁶	5 y.o	M: 397 subjects F: 375 subjects T: 772	Normal and <i>stunting</i>	Brush teeth, sosio economic.	Related	dmft	Low bias	Explained disadvantages of studies.	30% of subjects did not attend.
Folayan 2019 ⁸	2-5 y.o	F: 203 subjects M: 167 subjects T: 370	Normal, <i>stunting</i> , <i>overwei ght</i>	Brush teeth, sosio economic.	Related	dmft (0,14)	Low bias	Some of variables can be controlled.	Data used only from one region.
Xavier 2013 ³³	3-5 y.o	Not Explained T: 229	Normal, <i>stunting</i> , <i>overwei ght</i>	Brush teeth, sosio economic.	Related	dmft (4,00)	Low bias	Explained disadvantages of studies.	Data used only from one region.

Table 3 shows that there are risk factors that can affect the occurrence of dental caries. Based on the journals, the risk factors include information on social demographics, socioeconomics, frequency of brushing teeth, family knowledge, especially mothers regarding oral hygiene, and frequency of visits to the dentist.^{3,8,16,33,35} These factors play a role in increasing the validated caries index score (deft, dmft, and OHI).

This systematic literature review uses cross sectional journals involving 2-5 years old children. Rahman (2016) studied 5 years old children at Kertak Hanyar Kindergarten, Banjar Regency, South Kalimantan Province.³ The subjects were divided into two groups according to their nutritional status (each group n=30 people).³ The results indicated a difference in the deft index between groups. The deft index in the group of stunted children was very high.^{23,3} It is caused by prolonged nutritional deficiencies in children, resulting in atrophy of the salivary glands, leading to a decrease in the self-cleansing function. The advantages of this

studies, the research explains exclusion criteria: children with no systemic disease, do not use orthopedic devices, and do not use peatland water as drinking water or gargling.³ Meanwhile, the disadvantage of this study is the number of subjects is limited.

Abdat (2020) investigated subjects of children aged 3-5 years in five sub-districts in Pidie district, Aceh.³⁵ The results show a relationship between stunting conditions and dental caries. In this study, the deft index children group with stunting conditions falls in the high category. This study assesses risk factors that can cause caries in detail, such as tooth brushing habits, living environment conditions, and economic factors. However, the number of girls are more dominant than boys.³⁵

Shen (2020) studied 5-year-old children attending kindergarten in Liaoning Province, China.¹⁶ There were 772 subjects in this study, with a male-female sex ratio of 397:375.16 Results showed a relationship between stunting and dental caries. Dental caries that occurred in the subjects were influenced by factors such as duration of breastfeeding, frequency of brushing teeth, and frequency of visits to the dentist. The index used to assess caries in this study: DMFT and PUFA. This study explains the drawback of losing 30% of participants due to a lack of coordination.¹⁶

Folayan (2019) used the subject of 370 children, with a male-to-female sex ratio of 203:167.⁸ This study found that children with stunting conditions were more prone to dental caries because of changes in the salivary glands which cause a decrease in salivary flow rate. In this study, some factors can be at risk of causing dental caries, such as high sugar consumption, lack of knowledge of the mother on oral hygiene, and poor oral hygiene status. The index used to measure caries status in the form of OHIS. The advantages of this study are that the researcher explains that several confounding variables can be controlled using multivariable analysis. The weakness of this study is that the research location is only one region, while Nigeria has a total of 477.8 regions.⁸

Xavier (2013) involved 229 children aged 3-5 years and found a relationship between children with stunting conditions and the occurrence of dental caries.³³ However, in this study, the highest DMFT score was found in the overweight group. In this study, researchers explain the existing shortcomings in the form of a population that is used only from one region.³³

DISCUSSION

Based on journal analysis, there was a relationship between stunting and dental caries.^{3,12} Other factors can affect the nutritional status of children, according to Akombi (2017), low economic status is a risk factor for children experiencing stunting due to nutritional deficiency. Rahman et al.(2016) and Aviva et al. (2020) stated that children with low economic status are vulnerable to malnutrition which causes stunting because of the lack of daily nutritional intake requirements.^{3,12} According to Shafiqur (2016) and Dimaisip-bulb (2018), children with low economic status consume foods with less nutrition, causing a risk of malnutrition which can cause dental caries.^{2,13}

Children with stunting are at risk for atrophy of the salivary glands, changes in saliva composition, and changes in the mineral content of the teeth.^{3,4,8,12} Avivah (2020) states that children with stunted conditions generally experience atrophy of the salivary glands caused by vitamin A deficiency.¹² Vitamin A has an essential role in vision and cellular differentiation of epithelial cells in the salivary glands.¹² Disruption of epithelial cell differentiation due to Vitamin A may lead to a decrease in salivary flow rate and a decrease in the function of saliva as a buffer(buffer solution).^{3,4} Anqi (2020) states that stunting conditions can affect the composition of saliva in the form of the derivative containing secretory immunoglobulin A antibodies (sIgA) that function as anti-bacterial caused by nutritional deficiencies of zinc, iron, protein, and vitamin B.^{3,16} According to Lantu (2015), Hendarto (2015), and Folayan (2019), there is a change in the mineral content of teeth in the form of calcium, fluorine, phosphorus, iron in children with stunting conditions which has an impact on the occurrence of enamel hypoplasia, and inhibition of tooth eruption.^{8,9,36}

In addition to economic and nutritional intake factors, according to Rahman (2016), environmental factors also influence the formation of dental caries.³ The habit of consuming peatland water with a pH below 5.5 can affect a high DEFT score of 8.13 in stunted children.³ This statement is in line with the research by Xavier (2013), Wassuna (2018), and Abdat (2020), which states that educational factors and parental knowledge affect the improvement of living welfare, behavior toward parenting, and the need for health services.^{7,33,35} Knowledge of parents, especially mothers, regarding balanced nutrition, environmental hygiene, and oral hygiene is needed to prevent stunting and dental caries in children.^{2,3,7,13,19,22, 33,35}

Based on the description above, nutritional intake is a significant factor in influencing the occurrence of dental caries. Nutritional deficiencies such as macronutrients and micronutrients at the age of the golden period in children can increase the risk of stunting, affecting the occurrence of dental caries. In addition, socioeconomic status, parental knowledge of nutrition, and environmental factors are factors that can influence the relationship between stunting and the occurrence of dental caries in children.

It is necessary to educate the public about the relationship between stunting and dental caries, adequacy of nutritional intake, implementation of immunizations, and knowledge in maintaining oral hygiene. Further research is needed by increasing the number of research samples and adding research locations to cover a larger area to obtain the prevalence of dental caries in stunted children.

Conclusion

Based on the literature analysis in this systematic review, it can be concluded that:

1. There is a relationship between stunting and dental caries caused by atrophy of the salivary glands, changes in saliva composition, and changes in the minerals in the teeth.
2. There are factors from the environment that can indirectly affect the incidence of dental caries in children with stunting, such as socioeconomic level, level of knowledge of parents on nutritional needs, access to health care facilities, and environmental factors in the form of low water pH.

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