

ORIGINAL ARTICLE

The association between maternal knowledge, stunting severity, and dental caries among stunted children: a cross-sectional study

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Received: 17 May 2026

Revised: 25 June 2026

Accepted: 20 July 2025

Published: 31 July 2026

DOI: [10.24198/pjd.vol38no2.70164](https://doi.org/10.24198/pjd.vol38no2.70164)

p-ISSN [1979-0201](#)

e-ISSN [2549-6212](#)

Citation:

Supli, IKD, Juliawati, M,
Laksmiastuti, RS, Gusbela, BI. The
association between maternal
knowledge, stunting severity, and
dental caries among stunted
children: a cross-sectional study.
Padjadjaran J Dent. July
2026;38(2):268-276.

KEYWORDS

Stunting, dental caries, def-t index, maternal knowledge

ABSTRACT

Introduction: Stunting remains a significant public health problem in Indonesia, including in Banyuasin Regency, South Sumatra, where the prevalence is 24.8%, exceeding the national average. Maternal knowledge may influence children's dietary practices, oral hygiene, and preventive care, thereby affecting the risk of dental caries. Stunting may also impair oral development and increase the risk of dental caries in children. This study aimed to analyze the association between maternal knowledge, stunting severity, and dental caries among stunted children. **Methods:** This observational analytical study used a cross-sectional design. A total of 65 stunted toddlers were included using total sampling at Mariana Community Health Center, South Sumatra, between August and December 2025. Data were obtained from community health center records, and maternal knowledge regarding stunting was assessed using a questionnaire. Dental caries was measured using the def-t index. The associations between maternal knowledge regarding stunting, stunting severity and dental caries was analyzed using the Chi-square test. **Results:** Among the stunted children, 60.0% (n=39) were moderately stunted and 40.0% (n=26) were severely stunted. Most mothers had poor knowledge regarding stunting, with 58 respondents (89.23%) categorized as having poor knowledge (score <55). No significant association was found between maternal knowledge and stunting severity (p=0.073), while stunting severity was significantly associated with dental caries (p = 0.037). **Conclusion:** Maternal knowledge was not associated with stunting severity, whereas stunting severity was significantly associated with dental caries. Oral health assessment may be considered as a component of the comprehensive management of children with stunting.

INTRODUCTION

Stunting represents a major nutritional challenge among children and has emerged as a global public health concern, particularly in developing and low- and middle-income countries such as Indonesia.¹ According to the World Health Organization (WHO), the global prevalence of stunting is approximately 22% among children under five years of age, with the highest concentrations in Southeast Asia and Sub-Saharan Africa.² Stunting is defined as a height-for-age measurement below -2 Standard Deviations (SD) from the WHO growth curve, resulting in short or very short stature for age.³ In Banyuasin District, the prevalence of stunting was reported at 24.8% and 20.4%, ranking Banyuasin second among districts in South Sumatra province after Musi Rawas district.^{4,5} In

2023, 2,065 stunting cases were documented in this region (BKKBN South Sumatra).⁶ The prevalence in Banyuasin District remains above the national average, making the area as a priority for stunting prevention efforts.⁵

Maternal knowledge and behavior as primary caregivers significantly influence nutrition, oral hygiene, and the early detection of dental problems in young children.⁷ Hamalaw et al., reported that better maternal oral health knowledge and behaviors were associated with improved oral health and lower caries experience among children, emphasizing the critical role of mothers in promoting children's oral health.⁷ Maternal knowledge has also been identified as a confounding factor that affects the associations between nutritional status and children's dental health.⁸

Effective nutritional counseling for mothers has been shown to improve maternal knowledge, promote appropriate infant and young child feeding practices, and reduce the risk of stunting.⁹ Although dental and oral health are significant components of overall health, they are often overlooked in discussions of stunting.¹⁰ Stunting, resulting from chronic undernutrition during critical periods of growth, can adversely affect craniofacial and tooth development.¹¹ Stunted children frequently experience delayed tooth eruption, enamel developmental defects, salivary gland atrophy, and reduced salivary flow and buffering capacity.¹¹ These biological changes weaken the natural protective mechanisms of the oral cavity, facilitating bacterial colonization and increasing the risk of dental caries.¹² Consequently, the prevalence of dental caries is consistently reported to be higher among stunted children than among children with normal nutritional status.¹³

Maternal knowledge is therefore considered an important upstream determinant in this pathway.¹⁴ Mothers with limited knowledge regarding nutrition, child feeding, and oral health are more likely to provide inadequate dietary practices, delay preventive dental care, and maintain suboptimal oral hygiene for their children. These behaviors may contribute to the development of stunting and, subsequently, increase the children susceptibility to dental caries.¹⁵ Thus, maternal knowledge may influence dental caries both indirectly through its effect on nutritional status and stunting and directly through oral health-related behaviors.

Previous studies have reported that stunting is associated with an increased risk of dental caries, while maternal knowledge influences child nutrition and oral health practices.⁷⁻⁹ However, these associations have mostly been examined separately, and evidence regarding the association between maternal knowledge and dental caries among stunted children remains limited.

The novelty of this research lies in simultaneously examining the association between maternal knowledge and the stunting severity, as well as the association between stunting severity and dental caries among stunted children aged 1–5 years in Banyuasin Regency, South Sumatra. Unlike previous studies that have primarily investigated these associations separately or compared stunted and non-stunted children, this study focuses on variations in stunting severity within a population of stunted children in a high-burden setting. This approach provides new evidence to support the integration of maternal education and oral health into comprehensive community-based stunting prevention and management strategies. This study aims to analyze the association between maternal knowledge, stunting severity, and dental caries among stunted children.

METHODS

A cross-sectional study design was utilized. The target population included stunted children aged 1 to 5 years residing in the service area of Mariana Public Health Center, Banyuasin Regency, South Sumatra. Data collection was conducted from August to December 2025. The sample consisted of mother-child pairs of stunted children aged 1 to 5 years who met the inclusion and exclusion criteria.

Information regarding stunted children was initially obtained from secondary data provided by the Nutrition Division of the Health Centre. Inclusion criteria required mother-child pairs with stunted children who provided informed consent, while exclusion applied to stunted children with systemic diseases.

A total sampling approach was employed; therefore, all eligible mother-child pairs who met the inclusion criteria were recruited. Initially, 70 stunted children were identified, of whom five were excluded because of systemic diseases. Consequently, 65 mother-child pairs were included in the final analysis. Participants were initially recruited from the registry of children diagnosed with stunting at the Mariana Community Health Center.

To confirm their nutritional status, all eligible children underwent anthropometric reassessment during the study. Height was measured using a standardized stadiometer, and age was verified from official records. Height-for-age Z-scores (HAZ) were calculated based on the WHO Child Growth Standards by trained nutritionists at Mariana Community Health Centre. Children with HAZ < -2 SD were classified as stunted, whereas those with HAZ < -3 SD were classified as severely stunted. Only children whose nutritional status met these criteria at the time of data collection were included in the final analysis.

Maternal knowledge of stunting and oral health was assessed using a structured questionnaire adapted from the previously published questionnaires developed by Sulastri and Nurul. The items were modified to align with the objectives of the present study while maintaining their original conceptual domains. As the original questionnaires and the study participants used the Indonesian language, cross-cultural adaptation was not required.^{16,17}

The reliability coefficient, determined by the Kuder-Richardson 20 (KR-20) formula¹⁸, was 0.775, exceeding the acceptable threshold of 0.70 and indicating good reliability. A reliability coefficient of ≥ 0.70 is widely considered acceptable for questionnaires used in health research.¹⁹ All mothers of stunted children who provided informed consent completed the validated instrument. The questionnaire consisted of 15 true-false items using a Guttman scale, with correct answers scored 1 and incorrect answers scored 0. The total score ranged from 0 to 15, and higher scores indicated better maternal knowledge regarding stunting. Knowledge levels were categorized as Good (score 76–100%), Fair (score 56–75%), or Poor (score $< 56\%$).

Dental caries history was assessed by examining teeth that were damaged or decayed, indicated for extraction, or filled due to caries, using the def-t index. Results were documented on a dental examination form and classified as very low, low, moderate, high, or very high caries index. Clinical oral examinations were conducted by two calibrated dentists, assisted by two dental nurses, to ensure standardized and reliable data collection. Before the study commenced, the two dentists underwent calibration training under the supervision of a pediatric dentistry specialist for def-t index assessment to ensure consistency and reproducibility of the clinical measurements. The dental nurses assisted in patient preparation, data recording, and sample handling throughout the examination process.

The association between dental caries variables and maternal knowledge regarding stunting was analyzed using the chi-square test after confirming that the expected cell frequencies met the assumptions required for the test. Statistical significance was defined as $p < 0.05$. Maternal educational level was collected as a demographic characteristic; however, it was not included as an adjustment variable in the statistical analysis because the primary objective of this study was not to evaluate its independent effect on dental caries. Variables known to influence dental caries, including oral hygiene practices, dietary sugar intake, fluoride exposure, and socioeconomic status, were not assessed because they were beyond the scope of the study and were not included in the data collection protocol. Consequently, these variables were not included in the statistical analysis.

RESULTS

Seventy pairs of mothers and stunted children were recruited from Mariana Primary Health Center in Banyuasin Regency. All participating mothers provided written informed consent prior to data collection. Five mother-child pairs were excluded due to systemic disease. The final analysis included 65 mother-child pairs.

Table 1. Demographic characteristics of participants at mariana community health center, banyuasin 2025

Mother's Characteristics	Frequency	Percentage (%)
Mother's age		
Age 20 – 25	14	21.54
Age 26 – 30	17	26.15
Age 31 – 35	22	33.85
Age 36 – 40	8	12.31
Age > 40	4	6.15
Level of Education		
Bachelor	2	3.1
Diploma	2	3.1
Elementary school	11	16.9
Junior High School	18	27.7
Senior High School	29	46.6
Vocational High School	3	4.6

Table 1 indicates that 46.6% of the participants' mothers had attained a high school level of education.

Table 2. Frequency distribution of maternal knowledge

Level of Maternal Knowledge	Frequency	Percentage
Good (score 76 – 100)	2	3.08%
Fair (score 56 – 75)	5	7.69%
Poor (score < 56)	58	89.23%

Table 2 indicates that the majority of surveyed mothers demonstrated a poor level of knowledge (score < 55), accounting for 89.23%.

Table 3. Frequency Distribution of Stunting severity (TB/U) and Mean Dental Caries Score

Stunting severity (TB/U)	Frequency n (%)	Mean def-t ± SD	95 % Confidence intervals	Category
Moderately stunted (Short)	39 (60 %)	5.67 ± 2,98	4.75-6.68	High
Severely stunted (Very Short)	26 (40 %)	9.69 ± 4.86	7.73-11.65	Very High

Table 3 indicates that the majority (60%) of children were classified as moderately stunted (short) and had a mean dental caries score of 5.67 ± 2.98 (95% CI: 4.75-6.68) at the Mariana Community Health Center, Banyuasin. In contrast, children classified as severely stunted (very short) exhibited a higher mean dental caries score of 9.69 ± 4.86 (95% CI: 7.73-11.65).

Table 4 presents a p-value of 0.073 ($p > 0.05$), indicating no statistically significant association between stunting severity and maternal knowledge level among children in the service area of Mariana Community Health Center, Banyuasin.

Table 5 presents a p-value of 0.037 ($p < 0.05$) and an odds ratio (OR) of 0.209 (95% CI: 0.074-0.591) indicating a statistically significant association between stunting severity and dental caries among children in the service area of the Mariana Community Health Center, Banyuasin.

Table 4. Association between stunting severity and level of maternal knowledge

		stunting severity (TB/U)		Total	p-value
		Moderately stunted	Severely stunted		
Level of Maternal Knowledge	Poor (score < 56)	32	26	58	0.073
	Fair (score 56 - 75)	5	0	5	
	Good (score 76 - 100)	2	0	2	
Total		39	26	65	

Table 5. Association between stunting severity and dental caries

		Dental Caries					Total	p-value	Odd Ratio (95 % CI)
		Very Low	Low	Moderate	High	Very High			
Stunting severity (TB/U)	moderate	2	6	8	10	13	39	0.037	0.209 (0.074-0.591)
	severe	1	1	2	3	19	26		
Total		3	7	10	13	32	65		

DISCUSSION

This distribution suggests that most mothers are in the mature reproductive age range of 20–35 years, which is generally considered biologically optimal for pregnancy. Maternal age may influence parenting patterns, experience, and health-related decision-making. Although older mothers typically have more parenting experience than younger mothers, age alone does not ensure high-quality health practices without adequate knowledge support.¹⁹ These findings indicate that most mothers had a secondary level of education, whereas the proportion with higher education remains relatively low.

Table 2 demonstrates that the majority of respondents exhibited a poor level of knowledge, with 58 individuals (89.23%) falling into this category. In contrast, only 5 individuals (7.69%) possessed fair knowledge, and 2 individuals (3.08%) demonstrated good knowledge. These findings indicate that most mothers had limited knowledge regarding stunting, as reflected by their overall questionnaire scores, which may suggest a need for improved health education on stunting prevention and child nutrition.^{20,21} The present study found that most mothers (89.23 %) had poor knowledge regarding stunting based on the questionnaire scores, despite differences in their formal educational backgrounds. This highly skewed distribution should be considered when interpreting the findings, as the limited variation in maternal knowledge may have reduced the ability to detect statistically significant associations.

These results are consistent with the findings of Yani RWE et al.,²² Stunting, as an indicator of chronic malnutrition, can disrupt the amelogenesis process, increasing the risk of enamel hypoplasia and susceptibility to demineralization, which in turn may increase caries incidence.²³ Furthermore, prolonged growth disorders may reduce local immune responses and alter the composition and buffering capacity of saliva, thereby accelerating the progression of caries lesions.²⁴

Table 4 indicates that no statistically significant association ($p = 0.073$) was found between maternal knowledge level and stunting severity in this study, which may be attributed to the highly uneven distribution of respondents. The absence of a statistically significant association may be attributed to the unequal distribution of respondents across maternal knowledge categories, with the majority of mothers demonstrating poor knowledge and only a small proportion classified as having fair or food knowledge. The study was conducted using a relatively limited sample drawn exclusively from the Mariana Community Health

Center. While this does not necessarily explain the non-significant findings, recruiting participants from a single health center may limit the variability of participant characteristics and maternal knowledge levels, and may reduce the generalizability of the findings to other populations.

This imbalance may have reduced the statistical power of the analysis, thereby limiting the ability to detect a significant association between maternal knowledge and stunting severity. Stunting is a multifactorial condition influenced by both direct and indirect determinants, such as inadequate nutritional intake, recurrent infections, socioeconomic status, household food security, and environmental sanitation and hygiene. Consequently, high maternal knowledge does not necessarily result in optimal parenting and feeding practices.^{25,26,27}

Table 5 demonstrates a significant association between stunting severity and dental caries in children ($p = 0.037$). Previous studies have reported a higher prevalence and severity of dental caries among children with stunting compared to those with normal nutritional status. However, these findings are not directly comparable to the present study, as this study specifically examined differences among stunted children by comparing levels of stunting severity (moderate and severe). The present findings suggest that, among children who are already stunted, greater stunting severity may still be associated with a higher experience of dental caries. A cross-sectional study conducted in Tuah Negeri District, Musi Rawas, also identified a significant association between stunting and the severity of dental caries in children ($p < 0.001$), reinforcing the concept that chronic malnutrition can negatively impact oral health and increase susceptibility to dental caries.²⁸

These results are consistent with findings by Wang et al., who observed that stunting in children aged 3-5 years was positively associated with caries activity, with the association reaching statistical significance ($OR=2.1$, $P<0.05$).²⁹ Similarly, Abdat et al. reported a significant association between stunting and an increased incidence of dental caries in toddlers, noting that stunted children exhibited a higher deft index than those with normal nutritional status ($p < 0.05$), with a strong correlation.³⁰ The association between stunting and dental caries can be explained through interconnected biological and behavioral mechanisms. Stunting, as an indicator of chronic malnutrition during critical periods of growth, may disrupt tooth development, particularly enamel formation, leading to enamel hypoplasia that increases susceptibility to acid demineralization and bacterial colonization. Additionally, malnutrition can impair salivary function by reducing salivary flow rate and altering its composition, thereby weakening its protective roles, including buffering capacity, antimicrobial activity, and remineralization processes.¹²

Compromised immune function in stunted children further heightens vulnerability to oral infections, including caries associated with cariogenic bacteria such as *Streptococcus mutans*. Moreover, behavioral factors, such as limited access to nutritious diets, inadequate oral health care, and a higher likelihood of consuming cariogenic foods accompanied by poor oral hygiene practices, may exacerbate this condition. Collectively, these factors create a synergistic biological and environmental pathway that facilitates the initiation and progression of dental caries in stunted children.^{11,23}

Although the present study demonstrated a significant association between the stunting severity and dental caries, these findings should be interpreted with caution. Dental caries is a multifactorial disease influenced by a complex interaction of biological, behavioural, environmental, and socioeconomic factors. Because this study employed a cross-sectional design, the observed association does not establish a causal association between stunting severity and dental caries. Furthermore, several important potential confounding factors, including dietary sugar intake, oral hygiene practices, fluoride exposure, socioeconomic status, and access to dental care, were not measured or controlled. These unmeasured variables may have contributed to the observed association and

should be considered when interpreting the findings. Future studies incorporating these variables and using longitudinal study designs are warranted to better clarify the association between stunting severity and dental caries.

These findings align with international evidence that demonstrates a significant association between stunting and increased dental caries activity in preschool children.³¹ Children with growth impairment are at greater risk of developing dental caries than their non-stunted peers.³² The observed association suggests that nutritional assessment and oral health promotion may be considered together when planning preventive strategies for children at risk of stunting. However, further interventional studies are needed to determine the effectiveness of integrated nutritional and oral health approaches.

Dental caries is a multifactorial disease influenced by biological, behavioral, and environmental factors.¹² Factors such as dietary habits, oral hygiene, fluoride exposure, socioeconomic status, and access to dental care may have acted as potential confounders but were not assessed in this study. Therefore, the association between stunting severity and dental caries should be interpreted with caution. Further longitudinal studies controlling for these confounding factors are needed to better clarify this association.

The limitations of this study include the recruitment of participants from a single primary health care center, which may introduce selection bias and limit the generalizability of the findings. The characteristics of children with stunting in this setting may not represent those in other regions, where differences in socioeconomic conditions, cultural practices, and access to health services may influence nutritional status and oral health outcomes. In addition, maternal knowledge was assessed using a questionnaire, which may be subject to information or response bias.

Several potential confounding factors, including dietary habits, oral hygiene practices, fluoride exposure, socioeconomic status, and access to dental care, were not assessed or controlled and may have influenced the observed association between stunting severity and dental caries. Furthermore, the cross-sectional design precludes causal inference. Future multicenter longitudinal studies that account for these potential confounding factors are recommended to improve the validity and generalizability of the findings.

CONCLUSION

Maternal knowledge was not associated with stunting severity, whereas stunting severity was significantly associated with dental caries. These findings suggest that oral health assessment may be considered as a component of the overall care of children with stunting.

The implication of this study are that the observed association between stunting severity and dental caries highlights the importance of considering oral health as part of the comprehensive health evaluation of children with stunting. Although this cross-sectional study does not establish a causal association, the findings suggest that oral health assessment may be considered as a component of the overall care of children with stunting.

Acknowledgement: This study was conducted through collaboration between the authors and several institutions, including the Master's Program in Dentistry, Faculty of Dentistry and Oral Health, Universitas Trisakti; the National Unity and Political Agency of Banyuasin Regency; the Banyuasin Regency Health Office; and the Mariana Primary Health Care Center, Banyuasin Regency

Author Contributions: Conceptualization, I.K.D.S, S.R.L. and M.J.; methodology, S.R.L M.J. and B.I.G; software, I.K.D.S.; validation, I.K.D.S.; S.R.L. and M.J.; formal analysis, I.K.D.S.; investigation, I.K.D.S.; resources, I.K.D.S.; data curation, I.K.D.S.; writing original draft preparation, I.K.; writing review and editing, I.K., S.R.L, M.J. and B.I.; visualization, I.K.D.S.; supervision, S.R.L and M.J.; project administration, I.K.D.S.; funding acquisition, I.K.D.S.; All authors have read and agreed to the published version of the manuscript."

Funding: This research was fully funded by the authors through self-funding, without any external funding or sponsorship from other parties

Institutional Review Board Statement: This study was conducted in accordance with the Declaration of Helsinki, and was approved by the Institutional Review Board (or Ethics Committee) of the Faculty of Dentistry, Universitas Trisakti (No.1019/S2/KEPK/FGK/10/2025, approve on 24 October 2025).

Informed Consent Statement: Informed consent was obtained from all participants involved in this study

Data Availability Statement: Data are unavailable due to privacy or ethical restrictions.

Conflicts of Interest: The authors declare no conflict of interest.

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