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Relationship between stunting status and parental parenting patterns with the incidence of dental caries in toddlers in the working area of the bugel public health center

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ABSTRACT

Stunting and dental caries are two common child health problems that often occur simultaneously and influence each other. Parental care patterns, education level, knowledge, and socioeconomic status play important roles in dental caries occurrence in stunted children. To analyze the relationship between stunting status and parental care patterns with dental caries occurrence in children under five, as well as the factors underlying dental caries. Cross-sectional study on 162 children under five (81 stunted and 81 normal) at Bugel Public Health Center. Data collected through questionnaires and examinations. Analysis used Chi-Square test and multiple logistic regression (α=0.05). Prevalence of stunting and caries were each 90.1%. Significant relationships found between stunting and caries (p=0.001; OR=17.25), parental care and caries (p=0.002; OR=18.61), education and caries (p=0.035; OR=4.42), knowledge and caries (p=0.047; OR=4.30). Socioeconomic status was not significantly associated (p=0.433). Multivariate analysis showed stunting (OR=5.59; p=0.032) and parental care (OR=4.80; p=0.040) as significant factors. Stunting status and parental care are significant factors of dental caries in children under five. Integrated intervention programs are needed to address stunting and dental health, parenting education, and routine monitoring.

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INTRODUCTION

Every parents prioritizes their child's health in order to promote their development (Mohamad et al., 2025). Children's health is a crucial foundation for developing superior human resources in the future, thus requiring sustained, cross-sectoral attention. In Indonesia, there are two main health problems that are prioritized for treatment: dental caries and stunting in early childhood. Dental caries and stunting have long-term impacts on cognitive development, productive abilities, and the quality of the nation's future generation.

Dental caries is one of the most common chronic infectious diseases affecting children worldwide. This condition occurs due to the demineralization of hard tooth tissue triggered by the

activity of acid-producing bacteria, particularly Streptococcus mutans, when carbohydrates in food are fermented in the oral cavity. Dental caries not only causes damage to tooth structure but also leads to pain, difficulty eating, speech disorders, a reduced quality of life, and negatively impacts children's overall growth and development (Fejerskov et al., 2020).

Meanwhile, stunting, or failure to grow linearly in children due to chronic malnutrition, is also a serious global health problem. The WHO reported that in 2020, approximately 149 million children under five (22%) worldwide experienced stunting. The highest prevalence of stunting was found in Africa (33.3%) and Southeast Asia (31.4%), indicating that this issue remains a major concern in developing countries (WHO, 2020). According to the health development policy agency, stunting rates in Indonesia continue to decline. Data released in 2019 showed a total of 27.7% of stunting sufferers, 24.4% in 2021, 21.5% in 2023, and 19.8% in 2024.

In the Bugel Community Health Center (Puskesmas) working area in Karawaci District, Tangerang City, although the proportion is lower than in other community health centers in the district, the absolute number of cases of dental caries in preschool children was still statistically significant. This indicates that dental caries remains a significant health problem in the Bugel Community Health Center's working area, especially when combined with other risk factors such as nutritional status, parenting patterns, and socioeconomic conditions. This data is supported by internal data documented in the 2025 Tangerang City Community Health Center (Puskesmas) BPG recap sheet.

Several studies have identified a significant association between stunting status and the incidence of dental caries in children. A study in Sukabumi Indah Village, Bandar Lampung City, involving 150 children aged 3-5 years showed that the average dental caries index (dmfs) in stunted children reached 14.03±6.16 compared to 7.47±3.74 in normal children (p=0.0001), indicating a higher level of caries severity in stunted children (Andriyani et al., 2023).

In the Bugel Community Health Center's work area, stunting prevalence remains high, and limited access to dental health services poses a challenge. However, the relationship between stunting status and parental care patterns and the incidence of dental caries in toddlers in the area remains unclear. A comprehensive understanding of the relationship between these three variables is crucial for developing integrated and effective intervention strategies.

This research is expected to contribute to the development of more holistic public health policies and intervention programs, which focus not only on a single health aspect but also integrate stunting and dental caries prevention efforts simultaneously. Chronic malnutrition, which causes stunting, is often accompanied by deficiencies in vitamin D, calcium, phosphorus, and protein, resulting in enamel hypoplasia, decreased tooth structure, and increased susceptibility to caries. In addition to nutritional status, good parenting practices, including nutritious food provision, sugar management, early tooth brushing habits, and regular visits to dental health facilities, will support the prevention of caries and stunting. Therefore, this study aims to analyze the relationship between stunting status and parental care patterns and the incidence of dental caries in toddlers in the Bugel Community Health Center's work area and to identify the most significant factors influencing these conditions as a basis for developing integrated and effective intervention programs.

RESEARCH METHOD

Research Design

This study applies an analytical cross-sectional design with a quantitative approach and the use of a community-based design. This design was chosen based on the research objective, which was to assess the relationship between the independent variables, namely stunting status and parenting patterns, and the dependent variable, namely the incidence of dental caries.

Cross-sectional study is a type of observational research in which data collection for both exposure and outcome variables is conducted simultaneously over a specific time period. This

design is considered appropriate for describing the prevalence or distribution of a disease while assessing the relationship between risk factors and disease incidence in a population at the time of observation.

In this study, there are three categories of variables, namely control variables, independent variables, and dependent variables. The control variables consist of maternal education, maternal knowledge, and social status. The independent variables consist of stunting status (X1) and parenting patterns (X2). Stunting is measured by measuring toddler height and comparing it to WHO standards using a Z-score and a nominal scale. Parental care patterns are determined through structured interviews using a questionnaire and an ordinal scale. Meanwhile, the dependent variable is the incidence of dental caries in toddlers (Y). The incidence of dental caries in toddlers is determined through direct clinical examination of the toddler's oral cavity using the WHO method and a nominal scale.

Place and Time of Research

This research was conducted in the Bugel Community Health Center (Puskesmas), which includes several active integrated health posts (Posyandu) in the area. This research was conducted at the Bugel Community Health Center, which includes several active integrated health posts (Posyandu) in the area. The research location was selected purposively by considering several factors, including: (a) the prevalence of stunting in the Bugel Community Health Center's working area is still relatively high based on local health profile data, (b) the availability of dental health services in the area is still limited, so it needs attention in efforts to improve public health, (c) the socioeconomic conditions of the community are mostly included in the lower middle category, which can affect food consumption patterns and family health behaviors, (d) the socioeconomic conditions of the community are mostly included in the lower middle category, which can affect food consumption patterns and family health behaviors, (e) variations in parental education levels are quite diverse, so this area is considered representative for examining the relationship between parenting patterns and children's health status, (f) there has been no previous research on a similar topic in the area, making this location relevant as a new empirical study area.

The study was conducted over a period of five months, from September 2025 to February 2026. The research procedure begins with the preparation phase, which includes obtaining research permits, coordinating activities, and preparing research instruments. The next step is the implementation phase, which includes subject identification and recruitment, stunting status measurement, parenting data collection, dental caries screening, and secondary data collection.

Population and Sample

The target population in this study included all toddlers aged 6 to 59 months residing within the Bugel Community Health Center (Puskesmas) in Tangerang City. The accessible population in this study consisted of all toddlers aged 6 to 59 months registered and recorded within the Bugel Community Health Center's working area. Based on Bugel Community Health Center administrative data from 2024, the number of toddlers in this age group was 450, which served as the basis for determining the study sample. The sample determination in this study used an unpaired categorical analytical formula:

$$n= \frac{\left[Z\alpha\sqrt{2P(1-P)}+Z\beta\sqrt{P_1(1-P_1)+P_2(1-P_2)}\right]^2}{(P_1-P_2)^2} = \frac{\left[1{,}96\sqrt{2(0{,}374)(0{,}626)}+0{,}84\sqrt{0{,}53(0{,}47)+0{,}218(0{,}782)}\right]^2}{(0{,}53-0{,}218)^2} = \frac{[1{,}885]^2}{0{,}097} = 36{,}6 \approx 37$$

Based on the calculations above, the research sample size is 37 individuals per group, resulting in a total sample size of 37 x 2 = 74 toddlers. To anticipate the possibility of dropouts or incomplete data, 10% of the minimum sample size is added:

$n_{total} = n + (10\% \times n) = 74 + 7{,}4 = 81{,}4 \approx 81$

Thus, the minimum number of samples required in this study is 81 toddlers.

The inclusion criteria for this study were: (a) toddlers aged 6-59 months residing within the Bugel Community Health Center's working area, (b) toddlers whose nutritional status (height/age)

had been measured at a community health post (Posyandu) or community health center, (c) toddlers whose growth and development records were recorded on their Health Card (KMS) or KIA book, (d) parents/primary caregivers of toddlers are willing to participate in the research and have signed an agreement to answer honestly and the data provided is guaranteed not to be misused, (e) parents/caregivers were able to communicate well in Indonesian, (f) toddlers were healthy and cooperative during dental examinations.

Measuring Instruments and Reference Standards

The measurement instrument for toddlers aged <24 months uses an infantometer with the following procedure: the toddler is laid on his back on the infantometer, the toddler's head is attached to the headboard in a Frankfort horizontal plane position, the research assistant holds the toddler's head so that it does not move, the toddler's legs are straightened and the footboard is shifted until it is attached to the soles of the toddler's feet, the measurement results are read with an accuracy of 0.1 cm. Meanwhile, the measurement instrument for toddlers aged ≥24 months uses a microtoise with the following procedure: the toddler stands upright facing forward without shoes, then the back, buttocks, and heels are against the wall/stature meter, then the gaze is straight ahead, the headpiece is lowered until it touches the top of the head, the measurement results are read with an accuracy of 0.1 cm.

The data used in this study were sourced from primary and secondary sources. Primary data were obtained directly from interviews, observations, and physical examinations of toddlers in the Bugel Community Health Center (Puskesmas) work area. During the interviews, a questionnaire was administered with a Likert scale using a 5-point interval (Strongly Agree, Agree, Undecided, Disagree, Strongly Disagree) with a total of 30 statements. The dimension of parenting patterns of eating has 10 statements, the dimension of parenting patterns of dental health has 8 statements, the dimension of supervision and attention has 6 statements, the dimension of daily habits has 6 statements. Secondary data were obtained from Bugel Community Health Center documents such as health profiles, integrated health post (Posyandu) reports, and data on the prevalence of stunting and dental caries.

RESULTS AND DISCUSSIONS

The results of the univariate analysis in this study were based on six categories, including: parental education, parental knowledge, socioeconomic status, stunting status, parental parenting patterns, and dental caries incidence.

Table 1. Frequency distribution by parental education

Parental Education	Sum (f)	Percentage (%)
Low (Elementary School – High School)	56	69,1%
High (College)	25	30,9%
Sum	81	100%

Table 2. Frequency distribution by parental knowledge

Parental Knowledge	Sum (f)	Percentage (%)
Poor	45	55,6%
Good	36	44,4%
Sum	81	100%

Table 3. Frequency distribution by socioeconomic status

Socioeconomic Status	Sum (f)	Percentage (%)
Poor	21	25,9%
Good	60	74,1%
Sum	81	100%

Table 4. Frequency distribution by stunting status

Stunting Status	Sum (f)	Percentage (%)
Stunting	73	90,1%
Normal	8	9,9%
Sum	81	100%

Table 5. Frequency distribution by parental parenting patterns

Parental Parenting Patterns	Sum (f)	Percentage (%)
Poor	70	86,4%
Good	11	13,6%
Sum	81	100%

Table 6. Frequency distribution by dental caries incidence

Dental Caries Status	Jumlah (f)	Persentase (%)
No Caries	8	9,9%
Caries	73	90,1%
Total	81	100%

The results of the bivariate analysis in this study using the Chi-Square statistical test with a 95% confidence level (α = 0.05), are divided into five categories, including: (a) the relationship between parental education and dental caries incidence, (b) the relationship between parental knowledge and dental caries incidence, (c) the relationship between socioeconomic status and dental caries incidence, (d) the relationship between stunting status and dental caries incidence, (e) the relationship between parental parenting patterns and dental caries incidence.

Table 7. The relationship between parental education and dental caries incidence

Education	Dental Caries				Sum		P-value	OR (95% CI)
	Caries		No Caries					
	n	%	n	%	n	%		
Low	53	94,6	3	5,4	56	100,0	0,035	4.417
Hinggi	20	80	5	20	25	100,0		(1.001-
Sum	73	90,1	8	9,9	81	100,0		19.492)

Table 8. The relationship between parental knowledge and dental caries incidence

Knowledge	Dental Caries				Sum		P-value	OR (95% CI)
	Caries		No Caries					
	n	%	n	%	n	%		
Poor	43	95,6	2	4,4	45	100,0	0,047	4.300
Good	30	83,3	6	16,7	36	100,0		(0.819-
Sum	73	90,1	8	9,9	81	100,0		22.588)

Table 9. The relationship between socioeconomic status and dental caries incidence

Socioeconomic Status	Dental Caries				Sum		P-value	OR (95% CI)
	Caries		No Caries					
	n	%	n	%	n	%		
Poor	20	95,2	1	4,8	21	100,0	0,433	2.642
Good	53	88,3	7	11,7	60	100,0		(0.314-
Sum	73	90,1	8	9,9	81	100,0		22.232)

Table 10. The relationship between stunting status and dental caries incidence

Stunting Status	Dental Caries				Sum		P-value	OR (95% CI)
	Caries		No Caries					
	n	%	n	%	n	%		
Stunting	69	94,5	4	5,5	73	100,0	0,001	17.250
Normal	4	50,0	4	50,0	8	100,0		(3.288-
Sum	73	90,1	8	9,9	81	100,0		90.461)

Table 11. The relationship between parental parenting patterns and dental caries incidence

Parental Parenting Patterns	Dental Caries				Sum		P-value	OR (95% CI)
	Caries		No Caries					
	n	%	n	%	n	%		
Poor	67	95,7	3	4,3	70	100,0	0,002	18.611
Good	6	54,5	5	45,5	11	100,0		(3.552-
Sum	73	90,1	8	9,9	81	100,0		97.512)

Table 12. Comparison table of attributable fractions

Variables	OR	AFe (AR%)
Parental Education	4,4	77,3%
Parental Knowledge	4,3	76,7%
Sosioeconomic Status	2,6	61,5%
Stunting Status	17,3	94,2%
Parental Parenting Patterns	18,6	94,6%

Note: AFe = Attributable Fraction exposed = (OR-1)/OR x 100%. Shows the proportion of caries events that could be prevented if risk factors were eliminated in the exposed group.

Multivariate analysis was conducted to determine the simultaneous relationship between stunting status and parenting patterns with dental caries incidence, while controlling for covariate variables. The first stage was to select candidate variables by checking for p-values <0.25. Previously, bivariate analysis results with p-values <0.25 were included as candidates in the multivariate model. Once candidate variables were identified, backward elimination was performed to remove insignificant variables. Next, a confounding test was conducted by comparing the OR before and after the covariate variables were removed. If the OR change was >10%, the variable was considered confounding and should be retained in the model even if the p-value was >0.05. Next, the Goodness of Fit test was performed using the Hosmer-Lemeshow Test and the Omnibus Test. Interpretation of the multivariate analysis results yielded an Adjusted Odds Ratio (AOR) with a 95% confidence interval indicating estimation precision and a p-value indicating statistical significance. AOR >1 indicates a risk factor, an AOR <1 indicates a protective factor, and an AOR = 1 indicates no association.

Table 13. Multivariate final modeling

Variables	B	S.E.	p-value	OR	95% CI
Stunting Status	1.721	0.804	0.032	5.592	1.157 - 27.025
Parenting Pattern	1.568	0.762	0.040	4.797	1.076 - 21.376
Constant	-1.892	0.698	0.007	0.151	

Nagelkerke R Square 0,384

The results showed a significant relationship between parental education and the incidence of dental caries in toddlers in the Bugel Community Health Center (p-value = 0.008 < 0.05). Of the 56 respondents with low education (elementary school-high school), 53 toddlers (94.6%) experienced dental caries, while of the 25 respondents with higher education (university), 20 toddlers (80.0%) experienced dental caries. The odds ratio (OR) of 4.4 indicates that toddlers with low-educated parents have a 4.4 times greater risk of developing dental caries compared to toddlers with highly educated parents. This finding aligns with Notoatmodjo's (2012) theory, which states that education is a predisposing factor influencing a person's health behavior. Parents with higher levels of education tend to have better access to health information, are better able to understand health information, and are more likely to adopt positive health behaviors. In the context of children's oral health, parents with higher education better understand the importance of maintaining dental hygiene from an early age, limiting the consumption of sweet foods, and conducting regular dental checkups. Research by Abdat (2019) in Alang-Alang Lebar District, Palembang City, on 87 toddlers aged 6-59 months showed that maternal knowledge about oral

health was significantly associated with stunting. This study identified that mothers with low knowledge tended to neglect early dental hygiene practices and did not take their children for regular dental checkups at health facilities. This underscores the important role of parental education in determining a child's dental health status.

The results of the study showed not significant relationship between parental knowledge and the incidence of dental caries in toddlers in the Bugel Community Health Center (p-value = 0.004 < 0.05). Of the 45 respondents with poor knowledge, 43 toddlers (95.6%) experienced dental caries, while of the 36 respondents with good knowledge, 30 toddlers (83.3%) experienced dental caries. The odds ratio (OR) of 4.3 indicates that toddlers with parents with poor knowledge have a 4.3-fold greater risk of developing dental caries. Knowledge is a crucial domain in shaping overt behavior. According to Notoatmodjo (2012), behavior based on knowledge is more sustainable than behavior not based on knowledge. Parents with good knowledge about dental health and nutrition are better able to provide appropriate care to their children, including food selection, dental hygiene practices, and early detection of dental health problems. Research by Alicia et al. (2024) found that parental oral health knowledge and practices are closely related to the incidence of Early Childhood Caries. Parents with insufficient knowledge about dental health tend to give their children excessive amounts of sweet foods or drinks, fail to clean their children's teeth early, and delay the first visit to the dentist until their child experiences serious dental problems.

The results of the study showed no significant relationship between socioeconomic status and the incidence of dental caries in toddlers in the Bugel Community Health Center (p-value = 0.315 > 0.05). Although the proportion of dental caries in the low socioeconomic status group (95.2%) was higher than in the high socioeconomic status group (88.3%), this difference was not statistically significant. This finding contradicts the theory that socioeconomic status is a risk factor for dental caries. According to Petersen (2003), families with low socioeconomic status tend to have limited access to dental health services, information about oral health, and dental hygiene products such as toothbrushes and fluoride toothpaste. The lack of a significant relationship in this study is likely due to several factors. First, the unequal distribution of respondents, with the majority (74.1%) having a high socioeconomic status, made it difficult to detect significant differences. Second, high socioeconomic status does not necessarily guarantee good dental health practices if it is not accompanied by appropriate knowledge and parenting styles. This aligns with research findings that, despite the majority of respondents having a good socioeconomic status, the prevalence of dental caries remains high (90.1%). Third, knowledge and parenting factors may have a stronger influence on the incidence of dental caries than socioeconomic status. This is evident from the multivariate analysis, where, after controlling for other variables, socioeconomic status did not enter the final model.

The results of the study showed a significant association between stunting status and the incidence of dental caries in toddlers in the Bugel Community Health Center (p-value = 0.001 < 0.05). Of the 73 toddlers with stunting status, 69 (94.5%) experienced dental caries, while of the 8 toddlers with normal nutritional status, only 4 (50.0%) experienced dental caries. The odds ratio (OR) of 5.2 indicates that toddlers with stunting status have a 5.2 times greater risk of developing dental caries compared to toddlers with normal nutritional status. These results align with research conducted by Andriyani et al. (2023) in Sukabumi Indah Village, Bandar Lampung City, on 150 children aged 3-5 years, showed that the average dental caries index (DMF) in stunted children reached 14.03±6.16 compared to 7.47±3.74 in normal children (p=0.0001), indicating a higher caries severity in stunted children. This study confirmed a strong relationship between nutritional status and children's dental and oral health.

The results of the study showed a significant relationship between parental parenting patterns and the incidence of dental caries in toddlers in the Bugel Community Health Center (p-value = 0.002 < 0.05). Of the 70 respondents with poor parenting patterns, 67 toddlers (95.7%) experienced dental caries, while of the 11 respondents with good parenting patterns, only 6

toddlers (54.5%) experienced dental caries. The odds ratio (OR) of 4.8 indicates that toddlers with poor parenting patterns have a 4.8-fold greater risk of developing dental caries compared to toddlers with good parenting patterns. These results align with a literature review conducted by Sopianti et al. (2023), which found that maternal parenting patterns have a strong correlation with stunting and children's oral health. This study concluded that suboptimal parenting patterns may be a common determinant linking stunting and dental caries. Parents with poor parenting practices tend to provide an unbalanced diet, neglect early dental hygiene practices, and fail to have their children regularly checked by a health facility.

Parenting practices in the context of oral health encompass several important dimensions. First, there's the dimension of feeding practices, which includes food selection, feeding frequency, and sweet consumption habits. Parents with poor parenting practices tend to overindulge in foods and drinks high in sugar without considering the impact on their children's dental health. In their research, Takahashi & Nyvad (2011) stated that the frequency of sweet food consumption is more influential on caries incidence than the amount consumed, because each sweet food consumption lowers the oral pH and takes time to return to normal. Second, there's the dimension of dental hygiene, which includes early tooth brushing practices, the use of fluoride toothpaste, and dental cleanings. Data shows that although 91.1% of Indonesians brush their teeth, only 7.3% practice proper brushing (Petersen, 2003). Parents with good parenting practices will teach and encourage their children to brush twice daily using the correct technique from the moment the first tooth erupts.

Third, the health care dimension includes regular visits to the Integrated Health Post (Posyandu) and Community Health Center (Puskesmas) for growth monitoring and dental checkups. Parents with good parenting practices are more proactive in taking their children for routine health checkups, so that health problems, including dental caries, can be detected and treated early. Research by Alicia et al. (2024) analyzed the role of maternal knowledge, parenting practices, and complementary feeding (MPASI) in toddlers with stunting and dental caries. The results showed that mothers' low knowledge about nutrition and dental health resulted in inappropriate parenting practices, which in turn simultaneously increased the risk of stunting and dental caries. This underscores the importance of educating parents about responsive parenting and good health practices. Responsive parenting, which includes attention to children's nutritional and oral health needs, is a protective factor against both conditions. Sopianti et al. (2023) in their study stated that responsive parenting has a positive impact on children's health outcomes, including nutritional status and oral health. Responsive parents are more sensitive to their children's needs and provide appropriate stimulation and care. Madsen et al. (2021) in their research in Norway found that psychosocial factors such as knowledge, attitudes, and social support play a crucial role in shaping responsive parenting patterns. This suggests that interventions to improve parenting quality should not only focus on knowledge but also consider psychosocial aspects and environmental support.

CONCLUSION

Based on the results and discussion of the conclusions obtained from this research: Stunting status is the significant factor in the incidence of dental caries. After controlling for parenting patterns, toddlers with stunting status have a 5.592-fold greater risk of developing dental caries compared to toddlers with normal nutritional status (AOR=5.592; p=0.032; 95% CI: 1.157–27.025). The highest AOR value for stunting in the model makes it the most dominant factor.

Parenting patterns are the second significant factor. After controlling for stunting, toddlers with poor parenting patterns have a 4.797-fold greater risk of developing dental caries compared to toddlers with good parenting patterns (AOR=4.797; p=0.040; 95% CI: 1.076–21.376).

The influence of parental education and knowledge is indirect (mediated by parenting styles). In the bivariate analysis, education (p=0.008; OR=4.4) and knowledge (p=0.004; OR=4.3)

showed a significant association with dental caries. However, after being included in the multivariate model along with stunting and parenting styles, these two variables lost significance ($p>0.05$). This suggests that the influence of education and knowledge on caries is likely mediated by parenting style: parents with higher education and knowledge tend to adopt better parenting styles, and these parenting styles directly protect children from caries.

Socioeconomic status did not tend to influence risk factors. The socioeconomic status variable did not qualify as a candidate for multivariate analysis from the outset ($p=0.315 > 0.25$), indicating that in the Bugel Public Health Center area, parental socioeconomic status did not tend to be a significant factor in the incidence of dental caries in toddlers after accounting for other factors.

The final model explained 38.4% of the variation in dental caries incidence. In an epidemiological context, 0.384 is considered weak. The remaining 61.6% was influenced by factors outside the model, such as cariogenic food consumption habits, tooth brushing frequency, and access to fluoridated drinking water.

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