ANALYSIS OF FACTORS AFFECTING DENTAL CARIES IN STUNTED TODDLERS

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ABSTRAK : ANALISIS FAKTOR YANG MEMPENGARUHI KARIES GIGI PADA ANAK BALITA STUNTING

Latar Belakang: Stunting dan karies gigi masih menjadi masalah kesehatan yang serius pada balita di Indonesia. Balita yang mengalami stunting berisiko lebih tinggi terkena karies gigi akibat gangguan pertumbuhan dan pola makan yang terganggu. Penelitian ini bertujuan untuk menganalisis faktor-faktor yang mempengaruhi karies gigi pada balita yang mengalami stunting di Pusat Kesehatan Masyarakat Sooko, Kabupaten Mojokerto.

Metode: Desain penelitian menggunakan pendekatan cross-sectional dengan teknik sampling simple stratified random sampling pada 85 responden. Data dikumpulkan melalui wawancara menggunakan kuesioner, dan dianalisis secara univariat, bivariat, dan multivariat.

Hasil: Hasil penelitian menunjukkan bahwa sebagian besar ibu dari balita yang mengalami stunting memiliki pengetahuan yang baik (43,5%), perilaku positif (30%), dan jumlah keluarga besar yang mengalami stunting (37,1%). Sebanyak 49,4% balita tidak memiliki riwayat Berat Badan Lahir Rendah (BBLR), dan 30% balita yang tidak mendapatkan ASI eksklusif tidak mengalami stunting. Sebagian besar ibu memiliki penghasilan di bawah upah minimum (52,4%), dan 52,4% balita dengan variasi pola makan tertentu mengalami karies. 25,9% balita yang tinggal di lingkungan miskin mengalami stunting. Uji regresi logistik menunjukkan bahwa pengetahuan ibu (p=0,007), riwayat BBLR (p=0,043), dan asupan makanan (p=0,000) memiliki pengaruh yang signifikan. Analisis multivariat menunjukkan bahwa asupan makanan (p=0,000), faktor ibu (p=0,002), dan insidensi stunting (p=0,000) memiliki pengaruh terhadap karies. Di sisi lain, perilaku ibu (p=0,641), jumlah anggota keluarga (p=0,052), ASI eksklusif (p=0,092), pola makan (p=0,998), pendapatan keluarga (p=0,465), dan sanitasi lingkungan (p=0,522) tidak memiliki pengaruh signifikan terhadap karies gigi.

Kesimpulan: Pencegahan karies gigi dapat dilakukan melalui pendidikan, meningkatkan pengetahuan ibu, memperbaiki pola makan anak-anak, dan meningkatkan kebersihan lingkungan dan sanitasi.

Kata Kunci: Karies Gigi, Stunting, Pengetahuan Ibu, Pola Makan, Sanitasi

ABSTRACT

Background: Stunting and dental caries are still high health problems in toddlers in Indonesia. Stunted toddlers are at greater risk of caries due to growth disorders and disturbed eating patterns. This study aims to analyze the factors that influence dental caries in stunted toddlers at Sooko Community Health Center Mojokerto Regency.

Method: The research design used a cross-sectional approach with simple stratified random sampling technique on 85 respondents. Data were collected through interviews using a questionnaire, and analyzed univariately, bivariately, and multivariately.

Results: The results showed that most mothers of stunted toddlers had good knowledge (43.5%), positive behavior (30%) and the number of large families experiencing stunting (37.1%). A total of 49.4% of toddlers did not have a history of LBW, and 30% of toddlers who did not get exclusive breastfeeding did not experience stunting. Most mothers had an income below the minimum wage (52.4%) and 52.4% of toddlers with certain dietary variations had caries. 25.9% of children under five who lived in poor neighborhoods were stunted. Logistic regression test showed that maternal knowledge (p=0.007), LBW history (p=0.043), and food intake (p=0.000) had a significant effect. Multivariate analysis showed that food intake (p=0.000), maternal factors (p=0.002), and the incidence of stunting (p=0.000) had an effect on caries. In contrast, maternal behavior (p=0.641), number of family members (p=0.052), exclusive breastfeeding (p=0.092), diet (p=0.998), family income (p=0.465), and environmental sanitation (p=0.522) had no significant effect on dental caries.

Conclusion: Prevention of dental caries can be done through education, increasing maternal knowledge, improving children's diet, and improving environmental hygiene and sanitation.

Keywords: Dental Caries, Stunting, Maternal Knowledge, Diet, Sanitation

INTRODUCTION

Stunting is a serious health problem in developing countries, including Indonesia, which ranks second highest in Southeast Asia with a prevalence of 30.8%. This condition affects children's physical and cognitive growth. One of the impacts of stunting is an increased risk of dental health problems, including dental caries. Dental caries in stunted toddlers can be influenced by various factors, including eating behavior, maternal nutritional status during pregnancy, and oral hygiene habits (La Ode Alifariki, 2020) . Meanwhile, dental caries, which is common in children, can interfere with chewing, absorption, and digestion of food, contributing to chronic malnutrition, which ultimately exacerbates the risk of stunting (Aviva et al., 2020).

National data from the 2023 SSGI survey shows a decrease in stunting prevalence to 21.5%, but this figure remains above the WHO standard. In East Java, the prevalence is 17.7%, while Mojokerto Regency records 11.6%. Specifically, the Sooko Health Center reports an increase in cases in Kedungmaling Village, despite the overall trend showing a decrease. Additionally, the dental service report from the Sooko Health Center noted 90 cases of tooth decay among infants during 2024 (Mukodi & Rahmawati, 2023).

Stunting has been found to have a significant correlation with various dental health problems. In 2016, an estimated 3.58 billion people worldwide had oral health problems, with 486 million children suffering from primary dental caries. The prevalence of primary dental caries is high in underweight and stunted children. Dental caries in children can cause eating and sleeping disorders, which can disrupt nutrient intake and growth hormone secretion. Stunting can lead to developmental delays, including oral developmental disorders. Stunted children are more susceptible to dental caries due to changes in salivary characteristics, such as decreased flow rate and pH (Alfah et al., 2023). The acid produced by bacteria lowers the pH of saliva, which in turn will demineralize the tooth surface and cause caries formation Abdat et al. (2020) , ; Chen et al. (2020) . This situation shows the double burden of stunting and tooth decay. Factors that play a role include mothers' knowledge and behavior, nutritional status, eating patterns, breastfeeding history, family income, and environmental conditions (Kusumawati et al., 2024).

Previous research in China, 2024 explained that underweight children had higher caries severity compared to normal weight children, and the difference was statistically significant (OR = 2.69, P <0.05); stunted children had higher caries severity compared to normal weight children (Wang et al., 2025). Stunting and dental caries can be prevented through balanced nutrition and good dental hygiene. Good nutrition allows children to grow optimally and eat well, while healthy teeth support chewing and saliva production, enabling maximum nutrient absorption (Larisa, 2020).

Therefore, this study was conducted to analyze the factors affecting dental caries in toddlers with stunting as a moderating variable at the Sooko Community Health Center in Mojokerto Regency.

RESEARCH METHODS

This study is a quantitative analytical study with a cross-sectional design conducted in the working area of the Sooko Community Health Center in Mojokerto Regency from March to May 2025. The study population consisted of mothers with stunted toddlers, with a sample size of 85 respondents obtained through simple stratified random sampling. Independent variables include knowledge, income, parental behavior, number of family members, low birth weight (LBW), history of exclusive breastfeeding, dietary patterns, and environment, while the dependent variable is the occurrence of dental caries in stunted infants, with stunting serving as a moderator variable. Data were collected through primary and secondary data sources. The instrument used was a structured questionnaire that had been validated and reliability-tested, then processed through editing, coding, entry, scoring, and tabulation. Analysis was conducted using univariate, bivariate, and multivariate methods, including logistic regression tests.

RESEARCH RESULTS

Univariate test results

Table 1. shows that most stunted toddlers are female (63.5%), while most non- stunted toddlers are male (36.5%).

Table 1
Frequency Distribution of Gender and Incidence of Stunting in Toddlers in the Working Area of the Sooko Community Health Center, Mojokerto Regency

Gender of Toddlers	Stunting Group		Not Stunted		Total	
	f	%	f	%	f	%
Male	31	36.5	31	36.5	62	36,5
Female	54	63.5	54	63,5	108	63,4

Table 2
Frequency Distribution of Mothers' Occupations and Incidence of Stunting in Toddlers in the Working Area of the Sooko Community Health Center, Mojokerto Regency

Mother's Work	Stunting Group		Not Stunted		Total	
	f	%	f	%	f	%
Not Working	67	78,8	17	20	84	49,5
Working	18	21.2	68	80	86	50,5

Table 2 shows that almost all mothers in the stunting group are unemployed, namely 67 people (78.8%). Similarly, in the non- stunting group, almost all mothers are also unemployed, namely 17 people (20%).

Table 3 explains that among the stunted group, most mothers had a secondary education (D3, S1), totaling 35 people (41.2%). Similarly, among the non-stunted group, most mothers had a secondary education (SMP – SMA), totaling 52 people (60.7%).

Table 3
Frequency Distribution of Mothers' Education Levels and Incidence of Stunting in Toddlers in the Working Area of the Sooko Community Health Center, Mojokerto Regency

Mother's Education	Stunting Group		Not Stunted		Total	
	f	%	f	%	f	%
Basic (SD)	23	27,1	5	6,0	28	16,4
Intermediate (SMP, SMA)	27	31,8	52	60,7	79	46,4
Advanced (D3, S1)	35	41,2	28	33,3	63	37,2

Table 4
Frequency Distribution of Mothers' Income with Incidence of Stunting in Toddlers in the Working Area of the Sooko Community Health Center, Mojokerto Regency

Mother's Income	Stuntin Group		Not Stunted		Total	
	f	%	f	%	f	%
< RMW Mojokerto	75	88,2	53	61,9	119	70,8
> RMW Mojokerto	10	11,8	32	38,1	49	29,2

Table 4 explains that almost all mothers in the stunting group have an income below the Mojokerto Regency minimum wage, namely 75 people (88.2%). Similarly, in the non-stunting group, most mothers have an income below the Mojokerto Regency minimum wage, namely 53 people (61.9%).

Bivariate test results

Based on Table 5, the results of the logistic regression test indicate that the knowledge variable has a significant effect on the incidence of dental caries in toddlers in the working area of the Sooko Community Health Center in Mojokerto Regency (p = 0.007). Conversely, the variables of maternal behavior (p = 0.641) and number of family members (p= 0.052) were not found to have a

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significant effect on the incidence of dental caries among stunted infants in that area.

Table 5
The Influence of Mothers on Dental Caries in Toddlers in the Working Area of the Sooko Community Health Center, Mojokerto Regency

Maternal factors		Stunting Group		Not Stunted		Total		P Value
		f	%	f	%	f	%	
Knowledge	Good	57	43.5	74	56,5	131	77.1	0.007
	Fair	24	28,2	9	27,3	33	19.4	
	Poor	4	4,7	2	2.4	6	3.5	
Behavior	Good	51	30	48	28.2	99	58,2	0,641
	Not so good	34	20	37	21,8	71	41,8	
Number of families	Small	22	12,9	34	20,0	56	32.9	0,052
	Large	63	37,1	51	30,0	114	67,1	

Table 6
The Effect of Infant Factors (Low Birth Weight, Exclusive Breastfeeding) on Dental Caries in Infants in the Working Area of the Sooko Community Health Center, Mojokerto Regency

Infant Factors		Stunting Group		Not Stunted		Total		P Value
		f	%	f	%	f	%	
LBW	LBW	8	4.7	1	0.6	9	5.3	0,043
	Not LBW	77	45.3	84	49.4	161	94.7	
History of Exclusive Breastfeeding	Exclusive Breastfeeding	45	26,5	34	20	79	46,5	0,092
	No	40	23,5	51	30	91	53,5	
Diet	Diverse	58	34,1	85	50	143	84,1	0,998
	Not diverse	27	15,9	0	0	27	15,9	

Based on Table 6, the results of logistic regression analysis indicate that the occurrence of low birth weight has a significant effect on stunting in toddlers in the working area of the Sooko Community Health Center in Mojokerto Regency (p = 0.043). Meanwhile, the variables of exclusive breastfeeding (p = 0.092) and dietary patterns (p = 0.998) were not found to have a significant effect on stunting among infants in that area.

Table 7
The Effect of Family Income on Dental Caries in Toddlers in the Working Area of the Sooko Community Health Center, Mojokerto Regency

Family Income	Stunting Group		Not Stunted		Total	
	f	%	F	%	f	%
> RMW Kab. Mojokerto	40	47,6	0	0	40	23,8
< RMW Kab. Mojokerto	45	52,4	85	100	128	76,2
P - *Value*	0,465					

Based on Table 7, the results of logistic regression analysis show that family income has no significant effect on the incidence of dental caries in toddlers in the working area of the Sooko Community Health Center in Mojokerto Regency (p = 0.465).

Table 8
The Effect of Dietary Intake (Dietary Variation) on Dental Caries in Toddlers in the Working Area of the Sooko Community Health Center, Mojokerto Regency

Dietary Intake (Dietary Variation)	Stunting Group		Not Stunted		Total	
	f	%	f	%	f	%
Diverse	58	34.1	85	50	143	84.1
Not diverse	27	15.9	0	0	27	15.9
P - *Value*	0,000					

Based on Table 8, the results of logistic regression analysis show that variations in dietary patterns have a significant effect on the incidence of dental caries in toddlers in the working area of the Sooko Community Health Center in Mojokerto Regency (p = 0.000).

Table 9
The Effect of the Environment on Dental Caries in Toddlers in the Working Area of the Sooko Community Health Center, Mojokerto Regency

Influence Environment	Stunting Group		Not Stunted		Total	
	f	%	f	%	f	%
Good	41	24.1	44	25.9	85	50
Not so good	44	25.9	41	24.1	85	50
P - *Value*	0,522					

Based on Table 9. the results of logistic regression analysis show that sanitation does not have a significant effect on the incidence of dental caries in toddlers in the working area of the Sooko Community Health Center in Mojokerto Regency (p = 0.522).

Table 10
Results of the analysis of the effect of stunting on dental caries in toddlers at the Sooko Community Health Center in Mojokerto Regency in 2024 in the final model

Variable	Path Coefficient	Average	SD	T Count	*P Value*s
Food intake → Stunting	-0,417	-0,415	0,052	8,043	0,000
Infant factor → Stunting	0,049	0,049	0,058	0,850	0,395
Maternal factors → Stunting	-0,221	-0,224	0,072	3,056	0,002
Socioeconomics → Stunting	0,050	0,052	0,068	0,731	0,465
Stunting → Tooth decay	-0,651	-0,529	0,161	4,048	0,000

Based on Table 10. the results of multivariate analysis show that food intake has a significant effect on the incidence of stunting (p = 0.000). Maternal factors were also found to have a significant effect on the incidence of stunting (p = 0.002). Furthermore, stunting significantly affects the incidence of dental caries in toddlers (p = 0.000).

Multivariate test results

Based on Table 11. the analysis results show that food intake has a significant effect on stunting (p = 0.000), as do maternal factors, which have been proven to have a significant effect on stunting (p = 0.005). In addition, stunting also affects the incidence of dental caries in toddlers. Furthermore, stunting was found to act as a moderating variable in the relationship between dietary intake and the occurrence of dental caries, as well as between maternal factors and the occurrence of dental caries.

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Table 11
Results of the analysis of the influence of maternal factors, infant factors, dietary intake factors, and socioeconomic factors at the Sooko Community Health Center in Mojokerto Regency in 2024

Variable	Path Coefficient	Average	SD	T Count	*P Value*s
Maternal factors → Stunting → Tooth decay	0,112	0,114	0,040	2,818	**0,005**
Infant factor → Stunting → Tooth decay	-0.025	-0.025	0,029	0,085	0,394
Food intake → Stunting → Tooth decay	0,211	0,211	0,038	-5,492	**0,000**
Socioeconomics → Stunting → Tooth decay	-0,025	-0,027	0,035	0,721	0,471

DISCUSSION

Analysis of The Influence of Maternal Factors (Knowledge, Behavior, Number of Family Members) on Dental Caries

The Influence of Maternal Knowledge on Dental Caries

Most mothers of toddlers with stunting have good knowledge, and this study shows that knowledge influences the incidence of dental caries. This is in line with Lawrence Green's theory that knowledge is an important predisposing factor in behavior formation, so caries prevention behavior is more effective when based on knowledge. These findings are consistent with the studies by Ngurah Ade Sorolawe et al. (2021), Parmasari et al. (2022), and Amrullah & Yuwanto (2019) , which demonstrated a significant association between knowledge and dental caries, where good knowledge reduces the risk of caries. However, the study by Anneke Tahulending & Adam (2018) yielded different results, finding no significant association due to the multifactorial nature of caries. The conditions in the Sooko Health Center area, characterized by secondary education levels, low socioeconomic status, and a high-sugar and carbohydrate consumption culture, also contribute to the high risk of caries.

The Influence of Maternal Behavior on Dental Caries

The results showed that most mothers behaved positively even though their toddlers were stunted, and the bivariate test proved that there was no effect of maternal behavior on dental caries. According to the Health Belief Model (HBM) theory, health behavior is influenced by perceptions of risk, severity, benefits, and preventive measures. This research is in line with previous research by (Rahmawati & Hermawati, 2024) which also found that parental behavior in caring for children's teeth is not always directly proportional to the incidence of caries, because there are other multifactorial factors such as nutrition, environmental cleanliness, and access to dental health services. These findings differ from those of (Pramudho & Hermawan, 2019), who found that mothers' behavior in providing cariogenic snacks was significantly associated with children's dental caries (p=0.000), as well as (Wibowo et al., 2024) , who also showed that poor maternal behavior was significantly associated with preschool children's dental caries experience (p=0.000). Thus, although not proven in this study, theoretically and based on other research, maternal behavior remains a crucial factor in the occurrence of dental caries in children.

The effect of family size on dental caries

The results showed that most respondents came from large families and experienced stunting, but the bivariate test did not find an effect of family size on dental caries. Talcott Parsons' Structural Functionalism theory explains that large families divide their attention, putting children at risk of poor health supervision. These findings align with Herawati et al. (2020) at RSU Kumala Siwi Kudus, who also did not find a relationship between the number of children and dental caries (p=0.346). The researchers suggest that while attention may be divided in large families, dental caries is more influenced by other factors such as behavior, knowledge, and consumption patterns of cariogenic foods.

Analysis of the influence of infant factors (low birth weight, history of exclusive breastfeeding) on dental caries

The Effect of LBW on Dental Caries

This study shows that most toddlers are not LBW and are not stunted, but the regression results prove that LBW affects stunting. LBW is also indirectly related to dental caries through nutritional status disorders, enamel mineralization, and susceptibility to Streptococcus mutans infection. Children with LBW have been found to have higher prevalence and severity of dental caries compared to children with normal birth weight (Robbihi & Shaliha, 2021) . These findings are supported by (Dewi, 2019) , who found a significant association

between LBW and early childhood caries (p=0.001; OR=16.9), meaning that LBW children are at a much higher risk of developing caries compared to children with normal birth weight.

The Effect of Exclusive Breastfeeding History on Dental Caries

The results of the study show that most infants receive exclusive breastfeeding and are not stunted, and bivariate tests show that neither exclusive breastfeeding nor dietary patterns have an effect on stunting. Theoretically, breast milk protects teeth because it contains proteins, lactoferrin, and IgA, which are non-cariogenic. However, in this study, there was no effect of exclusive breastfeeding on dental caries due to oral hygiene factors and nighttime feeding habits (Hafizhah et al., 2022). These results are consistent with Ambarsari (2018), who found no significant association (p=0.353), but differ from studies in Gresik and Partakusuma et al. (2023) , which reported that exclusive breastfeeding was significantly associated with lower rates of dental caries in children.

The effect of diet on dental caries

The results of the study showed that most respondents with a varied diet did not experience caries, and bivariate tests also found no effect of diet on dental caries. Oral hygiene factors, particularly good toothbrushing habits, were found to be more influential than diet, so children with high cariogenic consumption could still avoid caries if they diligently maintained good oral hygiene. This aligns with the findings of (Hamid et al., 2017) and Fauzi (2017) , who both found no significant association between dietary patterns and dental caries, as oral care behavior is more determinative.

The influence of socioeconomic factors (family income) on dental caries

The results of the study indicate that there is no effect of family income on dental caries in toddlers at the Sooko Community Health Center. Theoretically, low socioeconomic status is typically correlated with high rates of caries due to limited access to nutritious food, dental care services, and a diet high in sugary foods that promote caries. However, these findings align with those of Aviva et al. (2020) , who also found no significant effect of income, occupation, or family size on dental caries ($p > 0.05$). This finding aligns with research by (Partakusuma et al., 2023) , which states that behavioral factors, such as high-sugar diets and poor dental hygiene, have a greater influence on the incidence of caries than economic factors. This means that even if a family has a high income, if the child's nutritional and dental hygiene patterns are poor, the risk of dental caries remains high. The researchers suggest that while economic factors play a role, the incidence of dental caries is more influenced by oral hygiene practices and children's dietary habits.

The influence of the environment (sanitation, hygiene) on dental caries

The results of the study indicate that most toddlers living in poor environments experience stunting, but logistic regression tests did not find any effect of the sanitation environment on dental caries. According to Social Cognitive Theory (SCT), the environment plays a role through modeling, reinforcement, and self-efficacy in shaping dental health behaviors. Theoretically, poor sanitation and oral hygiene increase the risk of caries due to plaque and bacteria. The study by Supriatna & J. Angki (2017) also showed that oral hygiene levels influence dental caries in children aged 6–12 years (p=0.001). Thus, although not proven in this study, the environment still has the potential to influence the occurrence of dental caries through children's hygiene behaviors.

The influence of maternal, toddler, socioeconomic, dietary intake, and environmental factors on dental caries through stunting as a moderating variable

The results of the study indicate that there is an effect of dietary intake on stunting (p=0.000), maternal factors on stunting (p=0.005), and stunting on dental caries, with stunting proven to be a moderating variable in this relationship. Theoretically, stunting as a condition of malnutrition increases the risk of dental caries due to reduced saliva function, making it easier for caries-causing bacteria to proliferate (Normansyah et al., 2022) . Maternal behavior and knowledge also play a significant role, particularly in stunted children who are more vulnerable. These findings are supported by Lutfi et al. (2021a) , who found a significant association between stunting and caries severity, consistent with Abdat et al. in Darmayanti & Puspitasari (2021) and Abadi & Abral (2020) , who reported caries patterns in stunted children. The study by Folayan et al. (2020) also reinforces that malnutrition, including stunting, is a risk indicator for the occurrence of early childhood caries. Adequate nutrition is very necessary for the eruption of teeth in toddlers, so that the impact on stunted toddlers can experience delayed tooth eruption and cause various disorders including caries and malnutrition

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in children (Lutfi et al., 2021b) Simaremare & Wulandari (2021).

CONCLUSION

The results of the study in the working area of the Sooko Community Health Center in Mojokerto Regency show that there is an influence of knowledge on dental caries (p=0.007), BBLR on stunting (p=0.043), and stunting on dental caries (p=0.000). Additionally, dietary intake and maternal factors also influence the occurrence of dental caries, with stunting proven to be a moderating variable. Meanwhile, no significant influence was found for maternal behavior (p=0.641), number of family members (p=0.052), exclusive breastfeeding (p=0.092), dietary patterns (p=0.000, non-significant results), family income (p=0.465), or sanitation environment (p=0.522) on dental caries in infants. Thus, knowledge, nutritional intake, BBLR status, and stunting are important variables associated with the occurrence of dental caries in infants.

SUGGESTION

Stunted toddlers need more attention through regular dental checkups, as poor nutrition can exacerbate their susceptibility to caries. Posyandu and Posbindu can provide a means for regularly monitoring toddlers' oral and dental health.

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