

Relationship between Oral Health Status and Stunting in 5-Year-Old Children in Indonesia

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Abstract

Stunting, a chronic malnutrition problem, has a relatively high prevalence worldwide. Untreated dental caries in deciduous teeth can affect an individual's nutritional status; therefore, nutritional status and dental caries can be related to each other.

This study determined the prevalence of dental caries and stunting as well as the relationship between oral health status and stunting in 5-year-old children in Indonesia. A cross-sectional study of 410 children aged 5 years was performed through clinical examinations and data from the 2018 National Health Survey. The prevalence of stunting among the children was 25.4%. Further, 260 (63.5%) children were found to have severe early childhood caries and chi-square analysis revealed that stunting was correlated with the level of parental education and socioeconomic status ($P=.001$), whereas dental caries and stunting were not. Conclusively, nutritional status in the form of stunting is significantly correlated with the level of parental education and socioeconomic status. The factors that predispose a child to stunting are multifactor, including oral health. Holistic multi-strategy community-based approach shall be explored further to decrease stunting on children in Indonesia.

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Introduction

The golden age period of early childhood is when a child's development and growth process is underway and thus requires a good and balanced nutrition for the body.¹ It covers first 5 years of life.² Parents need to know the nutritional status of preschool children because they tend to be at risk of malnutrition during this age period.¹ Malnutrition is a bodily imbalance due to insufficient nutritional intake. At present, malnutrition, which is related to nutritional deficiencies and excess nutrition, is one of the health problems being faced by several countries.¹ The term *malnutrition* describes 3 major conditions, namely, undernutrition (wasting, stunting, and underweight); micronutrient-related malnutrition; as well as overweight and obesity.² Whereas general health can impact oral health and vice versa. Biological factors are risk factors

determining oral health, although it is preventable thru comprehensive approach.^{3,4}

Stunting has become a chronic malnutrition problem, which is quite alarming. Its impact can interfere with the growth and development of children, as it affects the quality of the human resources of a country and results in growth failure.⁵ These conditions are related to low socioeconomic status; poor maternal nutrition and health; inappropriate feeding patterns for infants and toddlers, such as lack of exclusive breastfeeding for children up to 6 months, lack of breastfeeding and complementary feeding in children, lack of consumption of micronutrients and supplementation for toddlers, and low consumption of foods derived from animals and other diverse food sources; parenting; as well as access to health services and pure, clean water.^{6,7}

In 2016, WHO reported that 22.9% or 154.8 million children <5 years old worldwide were affected by stunting.⁸ In addition, as many as 87 million children in Asia, 59 million children in Africa, and 6 million children in Latin America and Caribbean had stunted growth.⁸ In Indonesia, the prevalence of childhood malnutrition in 2013 was

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56.8%, with 5.7%, 13.9%, and 37.2% of this subpopulation being malnourished, underweight, and stunted, respectively. The prevalence of childhood malnutrition in 2018 decreased to 48.5%, with 3.9%, 13.8%, and 30.8% of this subpopulation being malnourished, underweight, and stunted, respectively.⁹ The results of the 2018 National Health Survey (RISKESDAS 2018) showed that the prevalence of nutritional status in the form of stunting in children aged 5–12 years was 23.6%.¹⁰ At present, malnutrition in the form of stunting is still a main concern of the Indonesian government because of the high stunting rates from RISKESDAS 2013–2018 data, which can have a long-term impact on quality of the country's human resources. Stunting reflects failure in linear growth over a long period because of suboptimal nutritional intake, lack of nutrition during maternal pregnancy, low socioeconomic conditions, and unhealthy environmental conditions.

The oral cavity is considered as a mirror of a person's nutritional status.¹¹ Untreated dental caries cause pain in the teeth, thereby disturbing the process of mastication in the oral cavity. This affects the choice of food to be consumed and can reduce calorie levels in the body.¹² The presence of dental and mouth problems can lead to decreased appetite, thus potentially affecting nutritional status. Therefore, this study examined and determined nutritional status in the form of stunting in children aged 5 years as well as its relationship with dental and oral health status, especially dental caries, using RISKESDAS 2018 data.

Materials and methods

The study was approved by the Ethics Committee of the Faculty of Dentistry, Universitas Indonesia. This cross-sectional study with an analytical correlational research design investigated the correlation between oral health status and stunting in children aged 5 years in Indonesia based on RISKESDAS 2018 data. Dental health check-ups for RISKESDAS 2018 were performed in 26 provinces and 106 regencies/cities in March 2018 by 2132 dentists who were calibrated examiners and passed the selection process with kappa agreement of 0.9. The survey observed probability proportional to size sampling, using linear systematic sampling with a 2-stage approach. Data were taken from

clinical examinations and interviews. Examination results were recorded on a tooth diagram. A questionnaire survey was administered to all household members of the participants.

Data management and data analysis were conducted using SPSS 22.0. Data were weighed to approximate the situation on a national scale. Variables were transformed before analysis. Univariate analysis was conducted to determine the characteristics of the participants. Bivariate and logistic regression models were employed to further analyze the variables.

Results

The proportions of male and female children did not differ significantly among the participants (Table 1).

Variables	N(%)
Gender	
Male	190 (46.3)
Female	220 (53.7)
Mother's education level	
Low	145 (35.5)
Middle	241 (58.7)
High	24 (5.9)
Father's education level	
Low	167 (40.6)
Middle	215 (52.5)
High	28 (6.9)
Mother's employment	
Doesn't work	238 (58.1)
Work	172 (41.9)
Father's employment	
Doesn't work	7 (1.7)
Work	403 (98.3)
Socioeconomic status	
Low	220 (53.6)
High	190 (46.4)
Nutritional status	
Stunted	104 (25.4)
Not stunted	306 (74.6)
Dental caries status	
ECC	112 (27.2)
S-ECC	260 (63.5)
Free caries	38 (9.3)
Problem category self-reported of oral health	
Bad	122 (29.8)
Good	288 (70.2)

Table 1. The distribution of research subject (n=410).

Most of their parents had a middle education

level, and most of the participants belonged to families of low socioeconomic status. Approximately one-quarter of all 5-year-old children in Indonesia were affected by stunting based on the results of RISKESDAS 2018. This study found that the prevalence of dental caries in deciduous teeth among 5-year-old children in Indonesia in 2018 was still relatively high at 90.7%, with a significant number having severe early childhood caries. In addition, the most common dental and oral health problems experienced by 5-year-old children in 1 year are cavities, tooth damage, and as well as other dental and oral diseases (Table 2).

In the past 1 year, having dental or mouth problems	N (%)
Cavities or pain	211 (51.5)
Missing teeth due to caries	73 (17.7)
Filled teeth	12 (2.9)
Missing teeth due to	53 (12.9)
Swollen gums and/or abscess	42 (10.4)
Bleeding gums	22 (5.3)
Recurrent ulcer	20 (4.9)
Persistent ulcer	2 (0.5)

Table 2. The distribution of questionnaire self-reported of oral health.

Table 3 shows the results of chi-square analysis between the variables of oral health status related to dental caries as well as sociodemographic factors and stunting; no relationship between dental caries and stunting was detected (odds ratio [OR]: 1.304; 95% confidence interval [CI]: 0.578, 2.943; $P > .05$) among children with dental caries and stunted growth (25.8%) and those without (74.2%). On the other hand, mother's education level (OR: 4.404; 95% CI: 1.256, 15.451; $P = .001$), father's education level (OR: 7.676; 95% CI: 1.761, 33.455; $P = .001$), and parental socioeconomic status (OR, 2.948; 95% CI: 1.819, 4.779; $P = .001$) were correlated with stunting. The findings on parental education indicated that the lower the education level of parents, the greater the proportion of children with stunted growth.

Variables	Nutritional Status (N, %)			P-value	OR (95% CI)
	Stunted	Not Stunted	Total		
Dental caries					
Yes	96 (25.8)	276 (74.2)	372 (100)	NS	1.304 (0.578-2.943)
No	8 (21.1)	30 (78.9)	38 (100)		
Self-reported oral health					
Bad	28 (23)	94 (77)	122 (100)	NS	0.831 (0.506-1.365)
Good	76 (26.4)	212 (73.6)	288 (100)		
Gender					
Male	49 (25.8)	141 (74.2)	190 (100)	NS	0.959 (0.614-1.498)
Female	55 (25)	165 (75)	220 (100)		
Mother's education					
Low	56 (38.6)	89 (61.4)	145 (100)	p<0.05	4.404 (1.256-15.451)
Middle	45 (18.7)	196 (81.3)	241 (100)	NS	1.607 (0.459-5.623)
High	3 (12.5)	21 (87.5)	24 (100)		1
Father's education					
Low	62 (37.1)	105 (62.9)	167 (100)	p<0.05	7.676 (1.761-33.455)
Middle	40 (18.6)	175 (81.4)	215 (100)	NS	2.971 (0.677-13.036)
High	2 (7.1)	26 (92.9)	28 (100)		1
Mother's employment					
Doesn't work	67 (28.2)	171 (71.8)	238 (100)	NS	1.382 (0.874-2.184)
Work	38 (22.1)	134 (77.9)	172 (100)		
Father's employment					
Doesn't work	1 (14.3)	6 (85.7)	7 (100)	NS	0.485 (0.058-4.08)
Work	103 (25.6)	300 (74.4)	403 (100)		
Socioeconomic status					
Low	76 (34.5)	144 (65.5)	220 (100)	p<0.05	2.948 (1.819-4.779)
High	29 (15.2)	162 (84.8)	191 (100)		

Table 3. Correlation between stunting in children aged 5 years old, oral health status related to dental caries and self-reported of oral health, and sociodemographic factors

Discussion

According to RISKESDAS 2018 data, 104 (25.4%) children aged 5 years in Indonesia were affected by stunting. The results of this study do not differ much from those of RISKESDAS 2018, particularly in terms of the prevalence of poor nutritional status in the form of stunting in children between 5 and 12 years old: 23.6%.¹⁰ This parity proves that the prevalence of stunting in Indonesia is still high and even higher than WHO standards (<20%).¹³ In addition, the prevalence of dental caries in deciduous teeth among children aged 5 years in Indonesia was 90.7%. This is in accordance with the national prevalence of 90.2% based on the results of RISKESDAS 2018.¹⁰ Dental caries in deciduous teeth were most commonly found to be severe, which is in line with the finding of Linh Ngo Khanh et al.,¹⁴ who reported that 276 (46.5%) of 593 children aged between 1 and 6 years with a decayed, missing, and filled teeth index of >5 had the highest severity of dental caries.

Apart from clinical examination results, use of questionnaires with items regarding dental and

oral health can determine dental caries status. This study used a self-reported questionnaire on oral health. The results revealed incongruence between answers on the questionnaire and clinical examination results. This finding indicates that a number of participants were not aware about their dental and oral problems. The results of this study found no relationship between dental caries in deciduous teeth and stunting. Similarly, Shim et al.,¹⁵ did not find this association in children aged between 4 and 6 years. This outcome can be attributed to the presence of other nutritional status variables, such as nutritional deficiencies, that can serve as contributory factors in slow body growth. These results are also consistent with other studies.^{14,16}

By contrast, Shen et al.¹⁷ found an inverse relationship between dental caries and height measurements in children. Their finding could be ascribed to their longitudinal research design, which allowed them to observe the relationship between the 2 variables over a longer period. Malnutrition can affect oral tissue and teeth. Deficiencies in protein and nutrients can reduce the protective function of saliva in the oral cavity. In addition, malnutrition can also cause tooth decay through its impact on the formation of enamel.¹⁷ On the other hand, the number of cavities increases the risk of a child becoming more malnourished. The pain caused by untreated cavities can reduce appetite and prevent mastication, thereby causing a reduction in body mass index.¹⁸

The results of this study are consistent with those of a previous study that found an association between mother's education level and the occurrence of stunting in children.¹⁹ Maternal education affects the nutritional status of children because mothers are generally the main caregivers of their children. In addition, literacy in women and urbanization in developing countries can increase the amount of income of mothers, which can be used to contribute to their children's nutrition.^{20,21} Fathers with a low education level are generally associated with lower socioeconomic status, which increases the risk of stunting in children.²² In general, parents with a higher education level are more aware of their children's health, have better access to health services, and have access to good nutrition.^{19-21,23} Furthermore, this study found significant differences between socioeconomic status and nutritional status of children, which is

in accordance with the finding of a previous study on children aged between 5 and 9 years that family socioeconomic status can influence the occurrence of stunting in children.¹⁹ By contrast, different results were obtained by Shim et al.¹⁵ for a group of children aged between 4 and 6 years.

This study has several limitations. As it was based on secondary data, other variables that may be associated with stunting, such as history of maternity, could not be evaluated. Moreover, it used a cross-sectional design where causal effects could not be assumed. The Indonesian government needs to focus on overcoming the problem of stunting in children, starting with providing intervention programs for pregnant women and targeting infants and children, such as information dissemination programs that promote exclusive breastfeeding and give guidance on complementary feeding, early immunization programs, as well as nutrition programs that offer additional micronutrient supplements. Community and government efforts are expected to improve access to equitable health, and reduce the prevalence of stunting in children.

Conclusions

One-quarter of all 5-year-old children in Indonesia are affected by stunting, and almost all of these children have severe dental caries in their deciduous teeth. Dental caries in deciduous teeth and stunting in 5-year-old children are not correlated, which is likely because stunting is a chronic condition and involves other issues, such as the nutrition of pregnant women and environmental factors. On the other hand, the level of parental education and socioeconomic status are associated with stunting in children aged 5 years.

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Declaration of Interest

The authors report no conflict of interest.

References

1. Ariati NN, Fetria A, Purnamawati AAP, Suarni NN, Padmiari IAE, Sugiani PPS. Description of nutritional status and the incidence of stunting children in early childhood education programs in Bali-Indonesia. *Bali Med J*. 2018;7(3):723–726.
2. Butchon R, Liabsuetrakul T. The Development and Growth of Children Aged under 5 years in Northeastern Thailand: a Cross-Sectional Study. *J Child Adolesc Behav*. 2017;5(334).
3. Setiawan AS, Darwita RR, Susilawati S, Maharani DA Djais AA. Biological factors in 2 - 3 years old children in determining risk factors of early childhood caries: Pilot study. *J Int Dent Med Res*. 2019;12(2):655–671.
4. Darwita RR, Rahardjo A, Andreas P, Setiawati F, Adiatman M, Maharani DA. The behavior change on brushing teeth of children by mothers using a periodic dental health evaluation card. *J Int Dent Med Res*. 2016;9(S):277–281.
5. Badruddin IA, Auerkari EI, Darwita RR, Setiawati F, Adiatman M, Maharani DA, Rahardjo A. Genetic Aspects of Tooth Eruption: A Systematic Review. *J Int Dent Med Res*. 2020;13(4):1585–1591.
6. Setiawati F, Sutadi H, Rahardjo A, Bachtiar A, Maharani DA. The relationship between oral health habits in children and early childhood caries in Jakarta, Indonesia. *J Int Dent Med Res*. 2017;10(S):540-545
7. Beal T, Tumilowicz A, Sutrisna A, Izwardy D, Neufeld LM. A review of child stunting determinants in INDONESIA. *Matern Child Nutr*. 2018;14(4):e12617.
8. Reducing Stunting in Children. <https://apps.who.int/iris/bitstream/handle/10665/260202/9789241513647-eng.pdf;sequence=1>
9. Badan Penelitian dan Pengembangan Kesehatan. Laporan Nasional Riset Kesehatan Dasar 2013. Kementerian Kesehatan RI. Jakarta; 2014.
10. Badan Penelitian dan Pengembangan Kesehatan. Laporan Nasional Riset Kesehatan Dasar (RISKESDAS) 2018. Kementerian Kesehatan RI. Jakarta; 2019.
11. Muhammad NO, Al-Obaidi WA, Mohammad Amen FM. Prevalence of dental caries, gingival status, and enamel defect and its relation to nutritional status among kindergarten children in Sulaimani city. *IOSR-JDMS*. 2015;14(12):84–94.
12. van Gemert-Schriks MCM, van Amerongen EW, Aartman IHA, Wennink JMB, Cate JMT, de Soet JJ. The influence of dental caries on body growth in prepubertal children. *Clin Oral Invest*. 2011;15(2):141–149.
13. World Health Organization. Nutrition Landscape Information System (NLIS) country profile indicators: interpretation guide. 2010. <https://apps.who.int/iris/handle/10665/44397>
14. Khanh LN, Ivey SL, Sokal-Gutierrez K, Barkan H, Ngo KM, Hoang HT, dkk. Early Childhood Caries, Mouth Pain, and Nutritional Threats in Vietnam. *Am J Public Health*. 2015;105(12):2510–2517.
15. Shim S-H, Han D-H, Khang Y-H. Association between Dental Caries and Delayed Growth in Korean Children. *Caries Res*. 2018;52(1–2):71–7.
16. Opinya G. The Nutritional Status of the Children with Severe-ECC Comparison with the Nutritional Status of Children without Caries Aged 3-5-Years-Old and with the Caregiver's Demographics in a Kenyan Hospital. *MADOHC*. 2018;2(1).
17. Shen A, Bernabé E, Sabbah W. The bidirectional relationship between weight, height and dental caries among preschool children in China. *PLoS ONE*. 2019;14(4):e0216227.
18. Soares ME, Ramos-Jorge ML, de Alencar BM, Oliveira SG, Pereira LJ, Ramos-Jorge J. Influence of masticatory function, dental caries and socioeconomic status on the body mass index of preschool children. *Arch Oral Biol*. 2017;81:69–73.
19. Mishu MP, Tsakos G, Heilmann A, Watt RG. Dental caries and anthropometric measures in a sample of 5- to 9-year-old children in Dhaka, Bangladesh. *Community Dent Oral Epidemiol*. 2018;46(5):449–56.
20. Utami RA, Setiawan A, Fitriyani P. Identifying causal risk factors for stunting in children under five years of age in South Jakarta, Indonesia. *Enfermería Clínica*. 2019;29:606–611.
21. Bloem MW, de Pee S, Hop LT, Khan NC, Lailou A, Minarto, et al. Key Strategies to Further Reduce Stunting in Southeast Asia: Lessons from the ASEAN Countries Workshop. *Food Nutr Bull*. 2013;34(2):S8–16.
22. Bardosono S, Sastroamidjojo S, Lukito W. Determinants of child malnutrition during the 1999 economic crisis in selected poor areas of Indonesia. *Asia Pac J Clin Nutr*. 2007;16(3):512–526.
23. Hossain MdB, Khan MHR. Role of parental education in reduction of prevalence of childhood undernutrition in Bangladesh. *Public Health Nutr*. 2018;21(10):1845–1854.