



The Relationship between Stunting and Tooth Eruption of Primary School Children at Tuah Negeri Sub-district, Musi Rawas District, South Sumatera Province, Indonesia

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Abstract

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BACKGROUND: Stunting is a condition where the body height is shorter than normal, unproportioned to the child age, caused by lack of nutrition, and/or caused by repeated disease in a long time period since the development of fetus until the first 2 years of life. The University of Alabama at Birmingham Health System states that calcium, phosphorus, Vitamin C, and Vitamin D intake are extremely important so that lack of those nutrients can prohibit body growth and tooth development and eruption. Tuah Negeri Sub-district at Musi Rawas District, South Sumatera Province, Indonesia is one of sub-district in Indonesia with high prevalence of stunting event.

AIM: This research was performed to show that there is a relationship between stunting and tooth eruption of primary school children at Tuah Negeri Sub-district, Musi Rawas District, South Sumatera Province, Indonesia.

METHODS: The research employed a quantitative research design with a cross-sectional analytical survey method. Nutritional status was examined anthropometrically to identify stunting event. Tooth examination was performed among 94 students of five purposively selective primary schools based on their high prevalence of stunting cases. The results were then put into the odontogram.

RESULTS: The results of the study showed that there were 31 children with stunting (33.0%), which is higher than the national data, and 21 of those with the stunting (67.7%) were identified as having delayed tooth eruption. Statistical examination using Chi-squared test showed that the proportion of children with delayed tooth eruption was significantly higher among children with stunting compared to those without stunting, with $p = 0.034$ and odds ratio 2.63 (95% C.I. = 1.7–6.5).

CONCLUSION: There is an association between stunting and tooth eruption of primary school children at Tuah Negeri Sub-district, Musi Rawas District, South Sumatera Province, Indonesia. Children with stunting have 2.63 times higher possibility to experience delayed tooth eruption compared with those without stunting.

Background

Stunting is a condition where the body height is shorter than normal, unproportioned to the child age, caused by lack of nutrition, and/or caused by repeated disease in a long time period since the development of fetus until the first 2 years of life. Practically, stunting can be detected by measuring body height and weight and then compare it with the standard [1].

In Indonesia, the direct factors for stunting are low birth weight, consumption of low energy and protein food, diarrhea, and upper respiratory tract infection, while the indirect factors are no exclusive breast feeding, incomplete immunization package, and socio-economic conditions such as parent's education and job status and family economic status [2]. The report from Indonesian Ministry of Health showed that in average the prevalence of stunting in Indonesia in 2005–2017

was 36.4%. Stunting in primary school children aged 5–12 years old was 24.1% for male and 25.2 for female, respectively [3].

The inadequate growth and development in children with stunting not only affect the body height. Iriyani (2010) studied the relationship between body mass index and first permanent molar tooth eruption among children aged 6–7 years old and Rahmawati *et al.* (2014) studied the relationship between nutritional status and mandibular permanent central incisor at the same age group showed that children with poor nutritional status had delayed permanent teeth eruption compared to those with good nutritional status [4], [5]. Furthermore, children with stunting condition are more vulnerable for tooth decay because of the change of saliva characteristics in those stunted children [6].

The University of Alabama at Birmingham Health System states that calcium, phosphorus, Vitamin C, and Vitamin D intake are also extremely

important so that lack of those nutrients can prohibit body growth and tooth development and eruption [7].

This study was conducted in Tuah Negri Sub-district at Musi Rawas District, South Sumatra Province, Indonesia, because Musi Rawas is one of the districts in Indonesia with high prevalence of stunting event, where the stunting prevalence is 34.6%. The District Health Department stated that the high stunting prevalence was caused by low family economic status [8].

Methods

The research employed a quantitative research design with a cross-sectional analytical survey method. Tooth examination was performed among 94 randomly selected students of five purposively selected primary schools based on their high prevalence of stunting cases. The results were then put into the odontogram. Nutritional status was examined anthropometrically to identify stunting event. Measurements of height and weight were taken by trained health worker from local community health center. In this study, stunting was defined as height-for-age z-score of <-2 standard deviation of the National Centre for Health Statistics Reference [9]. The students grouped into stunting and not stunting. Data were analyzed with Chi-square and logistic regression test. Other respondent's characteristics were taken using questionnaire. Calculation of sample size using the survey formula with estimation of stunting among the primary students of 30% ($p = 0.3$) and precision of 0.1, gave the minimum sample size of 81 students to be recruited as respondents.

Ethical approval

This research has received ethical approval from the Ethics Commission of the Faculty of Public Health, Sriwijaya University, No.154/UN9.FKM/TU.KKE/2021, and the collection of data was conducted after an informed consent process had been done.

Results

The characteristics of respondents are shown in Tables 1 and 2.

There were 31 children with stunting (33.0% of respondents) and 21 of those with the stunting (67.7%) were identified as having delayed tooth eruption.

Table 1: Frequency distribution of elementary school students' characteristics based on stunted and not stunted

Frequency distribution	Stunted		Non-stunted		Total	
	n	f (%)	n	f (%)	n	f (%)
Age*						
9–10 years old	14	40.0	21	60.0	35	100
11–12 years old	17	28.8	42	71.2	59	100
Gender [#]						
Female	22	42.3	30	57.7	52	100
Male	9	21.4	33	78.6	42	100
Father's education*						
Low	25	32.9	51	67.1	76	100
High	6	33.3	12	66.7	18	100
Mother's education*						
Low	24	32.4	50	67.6	74	100
High	7	35.0	13	65.0	20	100
Father's occupation*						
Farmers	15	29.4	36	70.6	51	100
Others	16	37.2	27	62.8	43	100
Mother's occupation [#]						
Farmers	29	34.1	56	65.9	85	100
Others	2	22.2	7	77.8	9	100
Parent's income*						
≤1,000,000	19	32.2	40	67.8	59	100
>1,000,000	12	34.3	23	65.7	35	100

*Chi-squared test; [#]Fisher exact test.

There was no significant difference on the proportion of children with stunting event based on age, father's education, mother's education, father's occupation, mother's occupation, and parent's income, but there was a significant difference on the proportion of children with the stunting event based on the gender. The proportion of children with stunting was significantly higher among female compared to male ($p = 0.032$, odds ratio [OR] = 2.7 [95% C.I. = 1.1–6.7]). It suggests that female primary school children with stunting have 2.7 times higher possibility to be stunted compared with male primary school children.

Table 2: Frequency distribution of elementary school students' characteristics based on tooth eruption status

Frequency distribution	Delayed		Not delayed		Total	
	n	f (%)	n	f (%)	n	f (%)
Age						
9–10 years old	18	51.4	17	48.6	35	100
11–12 years old	31	52.5	28	47.5	59	100
Gender						
Female	28	53.8	24	46.2	52	100
Male	21	50.0	21	50.0	42	100
Father's education						
Low	44	57.9	32	42.1	76	100
High	5	27.8	13	72.2	18	100
Mother's education						
Low	41	55.4	33	44.6	74	100
High	8	40.0	12	60.0	20	100
Father's occupation						
Farmers	23	45.1	28	54.9	51	100
Others	26	65.0	17	39.5	43	100
Mother's occupation						
Farmers	45	52.9	40	47.1	85	100
Others	4	44.4	5	55.6	9	100
Parent's income						
≤1,000,000	34	57.6	25	42.4	59	100
>1,000,000	15	42.9	20	57.1	35	100

*Chi-squared test; [#]Fisher exact test.

The study showed that there were 49 children (52.1%) suffered experienced delayed tooth eruption and 45 students without it.

There was no significant difference on the proportion of children with delayed tooth eruption based on age, gender, mother's education, father's occupation, mother's occupation, and parent's income, but there was a significant difference on the proportion of children with delayed tooth eruption based on father's education. The proportion of children with delayed tooth

eruption was significantly higher among children with low educated fathers compared to children with high educated fathers ($p = 0.021$, $OR = 3.6$ [1.2–11.0]) (Table 3).

Table 3: Association between nutritional and tooth eruption in primary school children

Frequency distribution	Delayed		Not delayed		Total		p	OR
	n	f (%)	n	f (%)	n	f (%)		
Stunted	21	67.7	10	32.3	31	100	0.034	2.63 (1.7–6.5)
Not-stunted	28	44.4	35	55.6	63	100		

Statistical examination using Chi-squared test showed that the proportion of children with delayed tooth eruption was significantly higher among children with stunting compared to those without stunting, with $p = 0.034$ and $OR 2.63$ (95% C.I. = 1.7–6.5).

Multivariate analysis

The multivariate analysis was performed to assess which variables that can be used to predict the probability of a child to experience delayed tooth eruption based on those predictor variables. The result is listed in Table 4.

Table 4: Regression model for predicting tooth eruption in primary school children

Variables	B	S.E.	Wald	Df	Sig.	Exp (B)	95% C.I. for Exp(B)	
							Lower	Upper
Fathers education	1.354	0.595	5.172	1	0.023	3.872	1.206	12.435
Stunted	1.037	0.480	4.664	1	0.031	2.820	1.101	7.227
Constant	-1.351	0.578	5.464	1	0.019	0.259		

Logistic regression analysis showed that there were two variables that can be used to predict the probability for a child in Tuah Negeri sub-district at Musi Rawas district, South Sumatra Province, Indonesia, to experience delayed tooth eruption, which were father's education and stunting condition. Children with low educated fathers have the probability of 3.87 times higher to experience delayed tooth eruption than children with low educated fathers. Children with stunting condition have the probability of 2.82 times higher to experience delayed tooth eruption than children without stunting condition.

Furthermore, Table 5 showed that the logistic regression model can correctly predict 60.6% of the delayed tooth eruption cases among respondents in this study.

Table 5: Classification table for predicting the tooth eruption in primary school children

Observed	Predicted not delayed		Percentage
Not delayed	13	32	28.9
Delayed	5	44	89.9
Overall Percentage	18	76	60.6

Discussion

We found that the percentage of primary school children with stunting was 33.0%, which is higher than the 2017 national data which were 24.1% for male primary school children and 25.2 for female primary school children, respectively [3]. Moreover, it was also higher than the provincial level prevalence data which were 22.8% in 2017 [10]. This is may be partly related to the low economic condition of most of the household in this working area of Air Beliti Community Health centre, because in 2015, this district was declared by the government of Indonesia as one of under-developed districts in Indonesia. A study on stunting among under-five children in coastal area of Kendal district found that there was significant relationship between stunting and parent's characteristics [11], especially for the children who lived in a big size family with low purchasing power [12].

The study showed that there were 49 children (52.1%) suffered experienced delayed tooth eruption and 45 students without it. In general, delayed tooth eruption can be caused by endocrine such as hypothyroidism, hypoparathyroidism, hypopituitarism, nutritional disorder, and several systemic diseases [13]. The systemic diseases that can cause the delay tooth eruption such as hemifacial hypertrophy and odontomaxillary dysplasia, cleidocranial dysplasia, down syndrome, achondroplastic dwarfism, trichodonto-osseous-syndrome, pycnodysostosis, and pituitary gigantism [13], [14]. For this study, permanent teeth trauma, teeth illness, endocrine disorder, and systemic diseases were part of exclusion criteria during the sample recruitment process so that the discovered delayed tooth eruption was considered as the result of children's nutritional factor.

The study found that 67.7% of than stunted children were suffered delayed tooth eruption.

The proportion of children with delayed tooth eruption was significantly higher among children with low educated fathers compared to children with high educated fathers ($p = 0.021$, $OR = 3.6$ [1.2–11.0]). This finding was in accordance with the result of Putri *et al.* who supposed that parents with low education level had inadequate information on child care, child health maintenance, and food consumption habit [15]. Low educated parents will have less ability to provide enough nutritious food to their children and become more possible to be stunted children with delayed tooth eruption [11], [16].

We also found that the proportion of children with delayed tooth eruption was significantly higher among children with stunting compared to those without stunting, with $p = 0.034$ and $OR 2.63$ (95% C.I. = 1.7–6.5), the result suggested that there was an association

between stunting and delayed tooth eruption among primary school children. The OR of 2.63 indicated that children with stunting condition have 2.63 times higher possibility to experience delayed tooth eruption compared with those without stunting. Children with good nutritional status experience their tooth eruption earlier than those with poor nutritional status. This is in accordance with the result from Windrati who found that there was a significant association between nutritional status and the eruption of permanent teeth among primary school children in Manado, Indonesia. The eruption of permanent teeth of children with normal nutritional status, obese, and severely obese was in line with their eruption age, while stunted children had delayed permanent teeth eruption [17]. Lack of nutrition delay bone growth including the maturation of periodontal bone which supports the children's tooth eruption process [18]. As the results, the eruption of permanent teeth of under-five children with stunting condition was significantly lower compared with the eruption of normal under-five children [19].

Logistic regression analysis showed that there were two variables that can be used to predict the probability for a child in Tuah Negeri sub-district at Musi Rawas district, South Sumatra Province, Indonesia, to experience delayed tooth eruption, which were father's education and stunting condition, but the model can only correctly predict 60.6% of the delayed tooth eruption cases among the respondents. These suggests are other variables that need to be added into the model to increase the accuracy of the model so that practically it is appropriate to be employed.

Conclusion

There was a significant association between stunting and delayed tooth eruption among primary school children. Children with stunting condition have 2.63 times higher possibility to experience delayed tooth eruption compared with those without stunting. Stunting condition and father's educational status together can be used to predict the probability for a child to experience delayed tooth eruption, but other variables need to be added into the model to increase the accuracy of the model.

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