Differences In Prevalence Of Early Childhood Caries (Ecc) In Stunted And Non-Stunted Children In Bandung

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Received 6 July 2023; 1st revision 13 February 2024; Accepted 31 December 2024; Published online 31 December 2024

Keywords:

Bandung; early childhood caries (ECC); prevalence; stunted-children

ABSTRACT

Background: *ECC (early childhood caries) has become a significant oral health problem in children. ECC in children can cause pain that could interferes nutritional intake. Meanwhile, malnutrition conditions can roughen the enamel surface, affect the salivary glands, reduced salivary flow rate, affect the salivary composition and pH to a lower level thereby increased the risk of ECC. This study aims to determine differences in prevalence of ECC on stunted and non-stunted children.*
Method: *This research was conducted using an observational analytic method with a cross-sectional study design. The ICC value (intraclass correlation coefficient) was obtained at 0.93. The collection of ECC prevalence data was carried out in April-May 2023 in Antapani Tengah and Antapani Kidul, Bandung. Data collection was carried out by examining the teeth and oral cavity in stunted and non-stunted children. The results of the research data were tested by using the Chi-Square test.*
Result: *The average value of the def-t index for stunted children was 6.43 and 5.23 for non-stunted children. Both sample groups are included in the high category according to WHO (World Health Organization). The prevalence of ECC in stunted children was found to be 93.3% while the prevalence of ECC in non-stunted children was 73.3%.*
Conclusion: *Chi-square test results show a p-value of 0.006 which indicates a p-value <0.05 so that there is a statistically significant difference between the prevalence of ECC in stunted and non-stunted children in Bandung.*

doi: http://dx.doi.org/10.30659/odj.11.2.251-258
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Odonto : Dental Journal accredited as Sinta 2 Journal (https://sinta.kemdikbud.go.id/journals/profile/3200)
How to Cite: *Mulsin et al*. Differences In Prevalence Of Early Childhood Caries (Ecc) In Stunted And Non-Stunted Children In Bandung. Odonto: Dental Journal, v.11, n.2, p. 251-258, December 2024.

INTRODUCTION

Early childhood caries (ECC) is a condition of decayed, missing, or filled of one or more tooth surfaces in primary tooth in children under the age of six years [(1)]. ECC is a major oral health problem in children in developing countries and is one of the preventable diseases with the highest prevalence rate in the world (2–4). Basic Health Research Data in 2007, 2013, and 2018 showed the highest prevalence of ECC was in children aged 3-4 years [(5)]. The prevalence rate of ECC in the city of Bandung in children aged 2-3 years is 69.2% [(6)].

ECC in children might cause pain that negatively affects children's nutritional intake which if not treated immediately will cause malnutrition conditions such as underweight and stunting [(7,8)]. Malnutrition includes nutrient deficiency conditions such as being underweight, wasting, stunting, micronutrient deficiencies, and low birth weight, and conditions of excess food consumption such as overweight and obesity [(4)]. Malnutrition conditions such as deficiency of vitamin D, iron, calcium, and albumin may lead to enamel defects that make the enamel surfaces rough, thereby increasing the susceptibility to plaque accumulation [(4)]. Malnutrition can also cause changes in the salivary glands, reduced salivary flow rate, changes in salivary composition such as amylase lysozyme, and immunoglobulins, and changes in salivary pH to a lower level thereby increasing the risk of ECC [(4,9)]. Stunting was also found to be associated with caries and delayed eruption of permanent teeth in children aged 6-7 years [(10)].

Stunting is the impaired growth and development of children due to unbalanced nutritional intake during the golden period. Stunting is not caused by abnormal growth hormones or certain diseases [(11)]. The golden period of children is a time when children experience rapid growth and development so balanced nutrition is needed [(12)]. This golden period includes 270 days of pregnancy and 730 days after birth [(13)]. Considering the child's growth and development, it is imperative to fix feeding delays as soon as possible, particularly within the first 1,000 days of life [(14)]. Children who get inadequate dietary treatment during this time may experience stunted development in addition to growth delay [(15)].

Stunting increased the risk of morbidity and mortality, intellectual decline, disease susceptibility, reduced productivity, and the risk of increasing the number of babies with low birth weight if it fails to be treated immediately [(12,14)]. Assessment of stunting is based on the Body Length Index by Age (PB/U) or Height for Age (TB/U) and has a Z-score of less than -2SD (standard deviation) in children aged 0-59 months [(16)].

A survey conducted by the World Health Organization (WHO) in 2019 showed that 144 million children in the world are stunted, where Asia ranks second with the highest number of total cases in the world [(17)]. The stunting rate in Indonesia showed a figure of 24.4% in 2021 [(18)]. This figure decreased by 3.27% compared to SSGBI data for 2019 which showed a figure of 27.67% [(19)]. Even so, the prevalence of stunting in Indonesia is still above the standard set by WHO, which is 20%. The Indonesian government continues to make efforts to reduce the stunting rate by targeting the stunting rate in Indonesia to fall to 14% in 2024. The stunting condition in the city of Bandung can be illustrated by the results of the Toddler Weighing Month activity in 2020 by the Bandung City Health Office with a percentage of 8,93%, close to the highest stunting percentage in 2015, which was 8.96% [(20)]. Two primary factors have drawn attention to stunting internationally: first, it affects a large number of children globally, and second, it has detrimental effects on both short- and long-term health [(14)].

A 3.5-year longitudinal study was conducted by Delgado-Angulo by comparing the DMF-T index in stunted and non-stunted children [(21)]. The study showed that the average DMF-T index in stunted children was around 61-79% higher than in children who were not stunting [(21)]. This was also in line with research where the

def-t index for stunted children is 8.23 and for normal children is 3.3 which indicates a significant difference between the def-t index of stunted children and normal children [22].

Based on data on the prevalence rates of ECC and stunting in Indonesian children, especially in Bandung City, and the existence of a significant relationship between ECC in stunted children compared to children who are not stunting, this research encourages this study to look at differences in the prevalence of ECC in stunted and non-stunted children in Bandung City.

RESEARCH METHOD

This research was conducted using an observational analytic method with a cross-sectional study design. Data collection was carried out at Griya Antapani Health Center, Antapani Tengah, and Jajaway Health Center, Antapani Kidul, Bandung City. This research was approved by the Padjadjaran University Research Ethics Commission through letter No. 339/UN6.KEP/EC/2023. Thirty stunted and thirty non-stunted children aged three to five made up the research sample of sixty children in Bandung City, selected through the use of a purposive sampling approach. The researcher calibrated before to data collection in order to obtain an assessment that would be consistent with an intraclass correlation coefficient (ICC) of 0.93.

The prevalence rate of ECC in the sample was determined by examining the oral cavity and determining the caries index using the def-t index (decayed, extracted, filling-tooth) where the level of caries is known by the sum of components (d), (e), and (f) divided by the number of samples. Component (d) is caries on the primary tooth (e) is a tooth that is indicated for extraction or has been extracted due to caries, and (f) is a primary tooth that has had a permanent restoration due to caries [23]. Classification of caries level according to WHO is very low: 0.0 – 1.1; low: 1.2 – 2.6; medium: 2.7 - 4.4; tall: 4.5 – 6.5; and very high: >6,6 [24].

Furthermore, data of ECC is grouped according to its type. Type I of ECC is a condition of isolated carious lesions involving incisors and/or molars caused by a combination of solid or semi-solid foods accompanied by poor oral hygiene. Type II ECC is a condition where there is a 'labiolingual lesion' involving the maxillary incisors with or without molar involvement, and usually does not involve the mandibular incisors. The main cause is improper use of drinking bottles or breastfeeding with or without poor oral hygiene. Type III ECC is a carious lesion that involves almost all teeth and the mandibular incisors with the main cause being the combination of consumption of cariogenic foods and poor oral hygiene. Sampling was conducted in April-May 2023. The research data were tested by hypothesis testing using the Chi-Square test with the Statistical Program for Social Science (SPSS) application.

RESULTS

In this study, 60 research samples—30 stunted and 30 non-stunted children—between the ages of three and five were collected from the Griya Antapani Health Center in Antapani Tengah and the Jajaway Health Center in Antapani Kidul, Bandung City. An overview of the distribution of sample characteristics based on the sex and age of the children can be seen in Table 1.

Table 1. Distribution of Sample Characteristics

Characteristic	Stunted (n = 30)		Non – stunted (n = 30)	
	n	%	n	%

Sex				
Female	11	36.7	15	50
Male	19	63.3	15	50
Age group (years)				
3	12	40	19	63.4
4	14	46.7	10	33.3
5	4	13.3	1	3.3

The def-t index and ECC type for stunted and non-stunted children can be seen in Table 2. The average def-t index for stunted children was 6.43 and 5.23 for non-stunted children. Both sample groups are in the high category (4.5 – 6.5) according to WHO. The ECC type for stunted children is 4 children including type I, 14 children including type II, and 4 children including type III. Whereas in non-stunted children, 4 children are included in type I, 20 children are included in type II, and 5 children are included in type III.

Table 3 showed the difference in the prevalence of ECC in stunted and non-stunted children. A total of 28 stunted children (93.3%) had ECC and 22 non-stunted children (73.3%) had ECC. The results of the Chi-square test obtained a p-value of 0.006 indicated a p-value <0.05 so that there was a significant difference between the prevalence of ECC in stunted and non-stunted children.

Table 2. def-t index and ECC type in stunted and non-stunted children

Characteristics	***d***	***e***	***f***	***def-t***	**ECC Type**		
					Type I	**Type II**	**Type III**
Stunted Children	191	0	2	6,43	4	14	4
Non-stunted Children	154	0	3	5,23	4	20	5
Total	**345**	**0**	**5**		**8**	**34**	**9**

Table 3. Differences in the prevalence of ECC in stunted and non-stunted children and the results of the Chi-Square test

Variable	**stunted**		**non-stunted**		***p***
	n	**%**	**n**	**%**	
Prevalence of ECC					
Yes	28	93,3	22	73,3	0,006
No	2	6,7	8	26,7	
Total	30	100	30	100	

DISCUSSION

The results of the examination of the teeth and oral cavity in stunted and non-stunted children are presented in table 2. The average def-t index for stunted children is 6.43, which means that at least 6 teeth are decayed, extracted, or filled because of caries per stunted child. Meanwhile, the def-t index for non-stunted children showed a smaller number 5.23, which meant that at least 5 teeth were decayed, extracted, or filled because of caries per children who were not stunting. Table 2 showed the average value of the def-t index which is not much difference between the sample groups of stunted and non-stunted children. This indicates a vulnerability to caries in both stunted and non-stunted children. The difference in the def-t index which is not much different indicated that there are other possible factors besides nutritional intake that affect the occurrence

of ECC in children, such as the child's habit of consuming sweet foods, the habit of maintaining oral hygiene and parental knowledge regarding children's dental and oral care.

Types of ECC can be divided into three, type I where there is an isolated carious lesion involving the incisors and/or molars; type II where there is a 'labiolingual lesion' involving the maxillary incisors with or without molar involvement and usually not involving the mandibular incisors; and type III where the carious lesion involves almost all the teeth and the mandibular incisors [3]. This study showed that 4 children belonged to type I, 14 children belonged to type II, and 4 children belonged to type III for stunted children. Meanwhile, 4 children who were not stunted were included in the ECC type I, 20 children were included in type II, and 5 children were included in type III. Type II is the most common type of ECC experienced by both stunted and non-stunted children. The main cause of type II ECC is the use of drinking bottles or improper breastfeeding with or without poor oral hygiene [3]. This showed the need for parent's education, especially mothers regarding proper breastfeeding and feeding of drinking bottles.

The incidence of stunting and ECC in children is influenced by maternal parenting in terms of providing enough nutrition and preserving dental health [25]. The oral health of children is significantly influenced by the parenting methods of mothers [26]. Extended breastfeeding, inadequate supplemental feeding, excessive sugar intake, and poor dental hygiene practices are all contributing factors to the high frequency of stunting and ECC [25].

For the first six months of early childhood, exclusive breastfeeding is necessary to ensure their healthy development and growth [27]. Then the complementary feeding was started at six months old as a supportive measure to meet the nutritional needs of young children [25]. Breastfeeding was no longer the only source of nourishment; in order to meet the greater nutritional demands of children, feeding practices and effective breastfeeding were required [25]. The majority of mothers have breastfed for extended periods of time without appropriately implementing supplementary feeding techniques [25]. Extended breastfeeding may result in nutritional deficiencies that lead to stunting and increased risk of caries due to condition that teeth have started erupt at this age [28,29]. Due to financial difficulties, mothers continued to breastfeed for extended periods of time without adopting appropriate supplemental feeding techniques to lower consumption costs [30,31]. This nutritional deficiency is largely caused by the eating and breastfeeding practices of mothers. The anomalies might show up as hypoplasia of the enamel, hyposalivation, and delayed tooth eruption; these conditions have been linked to malnourished children [9].

The difference in the prevalence of ECC in stunted and non-stunted children and the results of the Chi-Square test is shown in Table 3. The ECC prevalence in stunted children was 93.3%, which means that out of 100 stunted children in Bandung City, 93 stunted children had ECC. Meanwhile, the prevalence of ECC in non-stunted children was 73.3%, which means that out of 100 non-stunted children in Bandung City, 73 non-stunted children had ECC. The results of the Chi-Square test showed a p-value of 0.006 indicated a p-value <0.05 so there was a significant difference between the prevalence of ECC in stunted and non-stunted children in the city of Bandung. This finding correlates with suboptimal salivary function in stunted children. Stunting cause a decrease in the resistance of the oral cavity to microbial biofilms and a decrease in the salivary flow rate which can increase the risk of children experiencing early childhood caries (ECC) [32]. Stunting conditions cause atrophy of the salivary glands which can reduce the rate of saliva, reduce salivary secretion and reduce the

function of saliva as a buffer, cleaner, and anti-bacterial [32,33]. Consumption of food, especially cariogenic food is not balanced with the amount and function of saliva so it causes a decrease in the pH of dental plaque which can trigger tooth demineralization which is at risk of causing ECC in stunted children. The amount and quality of breastfeeding and supplemental feeding techniques might be decreased by early sugar intake. Children frequently choose sweet meals over nutritious ones, which may lead their nutritional intake to become imbalanced [34].

Pregnant women's dietary state will determine the baby's dental health. Week 12 marks the start of the tooth mineralization process, which is crucial since during this time the enamel matrix will start to create a network complex in the primary teeth's structure [14]. Both macronutrients and micronutrients are involved in this process, and any deficiencies will result in alterations to the structure of the teeth [14].

Deficiencies of micronutrients are associated with the emergence of ECC in stunted children [35]. The integrity and development of epithelial cells are critically dependent on vitamin A. Ameloblast activity during the formation of enamel will be affected by a vitamin A insufficient at this time [14]. Vitamin D plays an important role in regulating calcium levels and calcification of hard tissue so vitamin D deficiency during pregnancy and childhood can interfere with the formation of dentin and tooth enamel [35]. Another micronutrient that is important for the growth and development of teeth is zinc which functions in the senses of smell and taste and plays a role in the body's immune function [35]. Children who experience zinc deficiency show a high rate of caries and poor gingival health [35]. The risk of ECC is also increased in children who experience stunting due to the inability of children to brush their teeth properly due to inadequate psychomotor development which causes the accumulation of plaque deposits on the teeth [32].

This study has several limitations in the small sample size because it was only conducted in two sub-districts in the city of Bandung. This study also did not carry out a caries risk assessment on the study sample to further analyze other risk factors that might cause ECC in the sample. Therefore, further research can be carried out with a larger sample size and caries risk assessment can be carried out before data collection so other risk factors that cause ECC in stunted children can be identified.

CONCLUSION

Based on the research that has been done, it can be concluded that there is a statistically significant difference in the prevalence of early childhood caries (ECC) in stunted and non-stunted children in the city of Bandung.

ACKNOWLEDGEMENT

Thank you to the Jajaway Health Center and the Griya Antapani Health Center in Bandung City for being willing to allow and accept researchers to conduct research with stunted and non-stunted children.

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