

## Research Article

### Early childhood caries and dietary habit of 4-6 years old children: research is descriptive

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#### ABSTRACT

**Introduction:** Early childhood caries (ECC) is tooth decay commonly happened in early childhood. ECC is becoming a significant public health problem. The American Academy of Pediatric Dentistry (AAPD) encourages health care providers and caregivers to adopt preventative measures that can reduce a child's risk of developing this disease. ECC is caused by several factors, one of which is the child's diet. The prevalence of ECC in children aged 4-6 years is increasing, even though it is the age when permanent teeth start to grow. The purpose of this study was to determine the relation between ECC and dietary habit in children aged 4-6 years. **Methods:** The type of research is descriptive survey. The population of this study was 109 children and the sample of this study was 45 children using the purposive sampling technique and sample counting using stratified sampling. The research instruments were: odontogram medical record and Food Frequency Questionnaire form. **Results:** 44.45% of the children experienced ECC. The highest percentage of cariogenic food diets were snacks (48.9%), bread (42.2%), and cakes (33.3%). The highest percentage of non-cariogenic food diets were rice (93.3%), fruits (71.1%), and vegetables (40%). **Conclusion:** Children who experienced ECC were 44.45%. The distribution of cariogenic food diets for kindergarten students are snacks, bread, and cakes, while the highest distribution of non-cariogenic food diets are rice, fruits, and vegetables.

**KEY WORDS:** early childhood caries, diet, cariogenic, children

### Early Childhood *caries* dan pola makan anak usia 4-6 tahun: Penelitian deskriptif

#### ABSTRAK

**Pendahuluan:** Early childhood *caries* (ECC) adalah kerusakan gigi pada anak-anak usia dini. ECC menjadi masalah kesehatan masyarakat yang signifikan. ECC disebabkan oleh beberapa faktor, salah satunya adalah pola makan anak. Prevalensi ECC pada anak usia 4-6 tahun meningkat, padahal merupakan usia dimana gigi permanen mulai tumbuh dan berubahnya pola makan pada anak berusia 4-6 tahun. Tujuan penelitian mengetahui ECC dan pola makan kariogenik dan non kariogenik pada anak berusia 4-6 tahun. **Metode:** Jenis penelitian deskriptif dengan metode survei. Populasi penelitian ini berjumlah 109 anak. Sampel dari penelitian ini berjumlah 45 anak dengan menggunakan teknik purposive sampling dan penghitungan sampel menggunakan stratified sampling. Instrumen penelitian menggunakan rekam medis odontogram dan formulir Food Frequency Questionnaire. **Hasil:** Anak yang mengalami ECC sebanyak 44,45%. Persentase tertinggi pola makan makanan kariogenik adalah makanan ringan dalam kemasan (48,9%), roti (42,2%) dan kue (33,3%). Persentase tertinggi pola makan makanan non kariogenik adalah nasi (93,3%), buah-buahan (71,1%), dan sayuran (40%). **Simpulan:** Prevalensi ECC pada anak yang mengalami ECC sebanyak 44,45%. Distribusi pola makan makanan kariogenik siswa TK adalah makanan ringan dalam kemasan, roti dan kue sedangkan distribusi pola makan makanan non kariogenik tertinggi adalah nasi, buah-buahan, dan sayuran.

**KATA KUNCI:** early childhood *caries*, diet, kariogenik, anak

## INTRODUCTION

Dental and oral health is closely linked with the general health and quality of life of the community.<sup>1</sup> Poor dental and oral health conditions are often ignored by the general public as they considered it as non life-threatening problems. Poor dental and oral health is a major public health problem because of its high prevalence and contributes to deteriorating social, economic, and psychological conditions.<sup>2,3</sup> Based on the Global Burden of Disease Study 2017, 3.5 billion people of world's population suffered dental and oral problems, including Indonesians.<sup>4</sup>

According to *Riset Kesehatan Dasar* (Riskesdas) in 2018, the prevalence of dental and oral problems in the population of Indonesia is at 57.6% and only 10.2% of the population has received treatments from medical personnel.<sup>5</sup> The most common dental and oral disease is caries, which is experienced both by children and adults. There is no significant difference between the two from the etiological aspects and histopathological characteristics. But the process of growth and development, dental anatomy, and physiology of children's teeth have its own different characteristics.<sup>6</sup>

Caries at a very young age are called Early Childhood Caries (ECC), namely caries that occur in one or more surfaces of cavities, lost, or restored on the primary teeth of children aged 71 months or less.<sup>7</sup> According to the World Health Organization (WHO), the prevalence of ECC has increased rapidly in developing countries, including Indonesia.<sup>8</sup>

The data of Riskesdas in 2018 shows that as many as 41.1% of children aged 3-4 years experience oral health problems, and as many as 57.9% in children aged 5 years. The measurement of the prevalence of dental caries using the DMF-T index shows a score of 6.2 for children aged 3-4 years and a score of 8.1 for children aged 5 years. The DMF-T index results in children aged 5 years can be interpreted that as many as 67.3% of children aged 5 years have a dental caries experience above 6, so that it fall under the category of Severe Early Childhood Caries (S-ECC).<sup>5</sup>

There are several factors causing ECC, but the factor that has been identified is the poor level of dental and oral hygiene which is characterized by the presence of dental plaque due to poor tooth brushing, bad eating habit, and the presence of pathogens.<sup>9,10,11,12</sup> Bad eating habit in children is a common occurrence. Bad eating habit, one of which is excessively eating food that is cariogenic.

Cariogenic foods are foods that contain lots of sugar, such as sweet and sticky foods, that can cause dental caries. This is because cariogenic food has a tendency to attach itself to the surface of the tooth.<sup>13</sup> ECC has a special causative factor, namely giving bottled milk or breast milk before the child is going to sleep, the presence of Defect Developmental Enamel (DDE), the entry of *Streptococcus mutans* bacteria originating from caregivers, and wrong childcare method.<sup>9,10,11,12</sup>

Astuti's Research<sup>14</sup> shows that the wrong pattern of feeding (ASI or milk) in children, poor oral hygiene, frequent consumption cariogenic food, low level of education and socioeconomic status of the parents are the reasons for high prevalence of ECC in children aged 3-5 years. Sutela's research<sup>15</sup> shows that there is no significant relationship between the ECC and the nutritional status of the child, but overall there is a tendency that as the child's age increase, the severity of the ECC will also increase.

Thornley's research<sup>16</sup> shows that the consumption of foods and drinks that has high concentrate of sugar and fine starch and the habit of brushing tooth is closely related to ECC in children aged 3-7 years. Armilda's research<sup>17</sup> shows that the distribution of cariogenic food in dietary habit are snacks, bread and candy while the highest non-cariogenic food diet are rice, vegetables and instant noodles with caries experiences included in the medium category based on the average DMF-T index.

TK BPK PENABUR 246 Bandung City is a kindergarten that has UKS and UKGS that has been running for years and dentists who regulate and run UKGS to regularly examine students in school and collect data of their dental and oral conditions and stored the students' medical and dental medical records. This encourages the researcher to conduct research that aims to find out ECC and dietary habit in children aged 4-6 years.

## METHODS

The type of research conducted is a type of descriptive research using the survey method. The population in the study were Kindergarten students of BPK Penabur 246 Bandung in the 2019/2020 school year, a total of 247 students. The sample determination is carried out by the purposive sampling method. The sample of this study were students who attended the BPK Penabur 246 Bandung City in the 2019/2020 school year that met the inclusion criteria; Judging from the student odontogram medical records and survey results from the students' parents. Inclusion criteria in this study, namely: (1) children aged 4 years to under 6 years who attend the BPK Penabur 246 Kindergarten Bandung City and (2) Parents who approve and are willing to fill in the survey.

Exclusion criteria in this study, namely: (1) Children with incomplete medical record data and (2) Questionnaires that were submitted past the limit of data collection time. The variables in this study are Early Childhood Caries (ECC), cariogenic food dietary habit, and non-cariogenic food dietary habit. ECC is examined from the medical records by entering tooth decay data on the odontogram medical record into the ECC form which is marked by the presence of caries lesions on the surface of maxillary central incisors, maxillary lateral incisors, maxillary first molar, maxillary canines and maxillary second molars, and mandibular

molars.<sup>7</sup>

## RESULTS

The results showed the characteristics of research subjects based on gender and age, ECC experience, cariogenic food dietary habit, non-cariogenic food dietary habit.

**Table 1.** Characteristics of research subjects

Characteristic		Caries Experience			Amount (n)	Percentage (%)
		ECC	Non ECC	Caries*		
Gender	Male	14	7	2	23	51,1
	Female	6	13	3	22	48,9
Total		20	20	5	45	100
Age	4 y.o.	6	6	1	13	28,9
	5 y.o.	13	11	4	28	62,2
	6 y.o.	1	3	0	4	11,1
Total		20	20	5	45	100

\*Caries on permanent teeth

Table 1 shows that the characteristics of research subjects in Kindergarten students of BPK Penabur 246 Bandung City, Class 2019 Age 4 to 6 years. The number of research subjects was 45 children consisted of 23 boys, with children who experienced ECC as many as 14 students, children with healthy teeth as many as 7 students, and children with 2 caries experiences and 22 children with female gender, with children who experience ECC As many as 6 students, children with healthy teeth as many as 13 students, and 3 students with caries experience. The results showed that there were more male subjects (51.1%) than female subjects (48.9%).

Based on the age of students, the number of subjects of 45 children consists of 13 students aged 4 years with children who experience 6 ECC students, children with healthy teeth as many as 6 students, and children with 1 student caries experience; 28 students aged 5 years with children who experienced ECC as many as 13 students, 11 children with healthy teeth, and children with caries experience as many as 4 students; And 4 students aged 6 years with children who experience ECC as many as 1 student, children with healthy teeth as many as 3 students, and no children with caries experience. The results showed that students aged 5 years had more amounts (62.2%) than 4 years old (28.9%) and 6 years (11.1%).

**Table 2.** Frequency distribution of early childhood caries (ECC)

Experience	Amount (n)	Percentage (%)
ECC	20	44.45
Non ECC	20	44.45
Caries*	5	11.1
<b>Total</b>	<b>45</b>	<b>100</b>

\*Caries on permanent teeth

Table 2 shows that the ECC experience in Kindergarten students of BPK Penabur 246 Bandung City Class of 2019 aged 4-6 years. Obtained from the analysis of Odontogram medical records with the number of subjects of 45 students, ECC was experienced by 20 students (44.45%), dental caries experienced by 5 Students (11.1%), and students with healthy teeth without caries or ECC are 20 students (44.45%).

**Table 3.** Frequency distribution of cariogenic foods per day in children

Cariogenic Food Type	Dietary frequency / day										Total	
	1 time		2-3 times		>3 times		Others		Never			
	N	%	N	%	N	%	N	%	N	%	N	%
Bread	19	42,2	2	4,4	1	2,2	23	51,2	0	0	45	100
Cake	15	33,3	3	6,7	0	0	26	57,8	1	2,2	45	100
Candy	10	22,2	0	0	1	2,2	24	53,4	10	22,2	45	100
Chocolate	2	4,4	1	2,2	0	0	37	82,3	5	11,1	45	100
Snack	22	48,9	7	15,6	1	2,2	14	31,1	1	2,2	45	100

Table 3 shows the three highest percentages of the cariogenic dietary habit obtained from filling out the questionnaire, namely the dietary habit of eating snack once a day owned by 22 children (47,8%), the dietary habit of consuming bread once a day in 19 children (42,2%) as well as dietary habit of eating cake once a day by 15 children (33,3%). The smallest percentage of dietary habit found in the frequency of eating bread more than 3 times a day, consuming candy more than three times a day, and chocolate dietary habit 2-3 times a day with one child (2,2%).

**Table 4.** Frequency Distribution of Non-Cariogenic Foods Per Day in Children

Non-cariogenic Food Type	Dietary frequency / day										Total	
	1 time		2-3 times		>3 times		Others		Never			
	N	%	N	%	N	%	N	%	N	%	N	%
Rice	0	0	42	93,3	3	6,7	0	0	0	0	45	100
Corn	0	0	0	0	1	2,2	34	75,6	10	22,2	45	100
Instant Noodles	0	0	0	0	0	0	30	66,7	15	33,3	45	100
Sweet Potato	0	0	0	0	0	0	11	24,4	34	75,6	45	100
Cassava	0	0	0	0	0	0	12	26,7	33	73,3	45	100
Vegetables	16	35,6	18	40	0	0	8	17,7	3	6,7	45	100
Nuts	7	15,6	0	0	0	0	30	66,6	8	17,8	45	100
Fruits	32	71,1	5	11,1	0	0	8	16,9	0	0	45	100

Table 4 shows the three highest percentages of the non-cariogenic dietary habit obtained from filling out the questionnaire, namely the 2-3 times a day rice dietary habit owned by 42 children (93,3%), consuming fruits once a day in 32 children (71,1%) and vegetable dietary habit of 2-3 times a day in 18 children (40%). The smallest percentage of dietary habit found in the frequency of eating corn more than three times a day with the number of one child (2,2%).

## DISCUSSION

The results of research on ECC experience in Kindergarten Students of BPK Penabur 246 Bandung City showed that 20 children experienced ECC, 5 children experienced dental caries, and 20 other children have healthy teeth without ECC and dental caries. All children who are at high risk of caries experienced ECC. Some children who are at moderate and low risk of ECC and had experienced it are the children that have a cariogenic dietary habit. Other children who are in medium risk and low risk who do not experience ECC have a dominant non-cariogenic dietary habit. Based on gender, there are more male students who experience ECC than female students.

Based on age, more students aged 5 years experienced ECC than students aged 4 and 6 years. Based on the results of the study, students aged 4 years who experienced ECC mostly experienced a mild ECC that have not spread, and present only on maxillary central incisors. In students aged 5 and 6 years, the ECC had spread to the lateral incisors, and maxillary molars. ECC is a disease that can be contagious. Streptococcus mutans can transmit in two ways: vertical transmission and horizontal transmission.<sup>19</sup> Vertical transmission occurs from parents or caregivers to children. The mother's bad oral hygiene during pregnancy and poor breastfeeding and high sugar consumption per day can increase the risk of transmission from mother to child.<sup>19</sup> Horizontal transmission, neonatal factors increase the risk of Streptococcus mutans transmission when the baby is born.<sup>19</sup> Children with high sugar consumption are also at high risk of developing ECC. Sugar will be processed by Streptococcus mutans and produce acids that can cause demineralization of tooth structure.<sup>19</sup>

Cariogenic foods with high sugar content after being fermented by bacteria will reduce the pH of saliva to less than 5.5 so that it can cause ECC.<sup>20</sup> The loss of the tooth surface integrity due to interference with the development of enamel is one of the risk factors for ECC. Developmental Defect enamel (DDE) known as enamel hypoplasia is a condition where enamel is thinner and becomes vulnerable to damage. DDE can be a rough surface that is ready to be colonized by Streptococcus mutans. DDE

appears in the growth of primary teeth as much as 22% to 49% percent in healthy children and more than 60% in prematurely born children.<sup>8</sup>

Based on the information obtained by researcher, BPK PENABUR 246 Kindergarten in Bandung City has implemented the UKGS program. The school cooperates with dentists who carry out regular dental examinations for each child every semester. The results of filling out the questionnaire showed that most of the students' parents had an adequate level of health literacy and had sufficient economic conditions so that most students routinely brush their teeth with fluoride toothpaste every day and some students have attended routine dental check-ups outside of the school.

The results of research on the cariogenic food dietary habit in children aged 4-6 years in BPK Penabur 246 Kindergarten Bandung City which is reviewed from the frequency of eating per day, the highest percentage is in the snack dietary habit with a frequency of 1 time a day amounting to 22 children (48.9%).

This daily consumption of snack is in line with research conducted by Worotitjan in 2013, which is as many as 20 children (33.33%) with a frequency of snack dietary habit 2-3 times a day.<sup>21</sup> Snack is a light food with small portions that are designed as easily consumed foods.<sup>22</sup> Some parents view snack time as a means to pamper their children. Parents think that their children has received sufficient nutrition through the main food and giving them snacks is only for the children's enjoyment. Parents tend to choose packaged snacks because they are practical, easy to obtain, especially when outside the home, and it tastes good, such as cookies, wafers, biscuits, and chips.<sup>22</sup>

Percentage of the second highest cariogenic food dietary habit after snack is a bread dietary habit, with a frequency of 1 time a day amounting to 19 children (42.2%). This is in line with Armilda's research in 2017, which is 18 children (43.90) with the frequency of bread dietary habit 1 time a day.<sup>17</sup> Bread is a type of soft-textured wet food as a source of carbohydrates that are easily sticky. Bread is consumed a lot because it is practical, and at this time bread has a variation that is very diverse and easy to obtain. Usually bread is consumed at breakfast time, but over time, bread is not only enjoyed in the morning, but has extended as an alternative food menu during the daytime or at night.<sup>17</sup> The third highest percentage of cariogenic food dietary habit after bread is a cake dietary habit, with a frequency of 1 time a day amounting to 15 children (33.3%). Cakes have many types, including tarts and pastries. Cakes that have a sweet taste and an attractive shape are highly liked by children in general.

The first highest percentage of non-cariogenic food dietary habit is found in the rice diet with a frequency of 2-3 times a day, which is 93.3% with a total of 43 children. This is because rice is the main source of carbohydrates in the Indonesian diet.<sup>17</sup> Rice contains carbohydrates which is a high source of energy. Not only it is a source of energy, rice is also source of vitamins and minerals such as fiber, calcium, iron, vitamin B6, and magnesium so that consuming rice can support the formation of teeth to remain strong.<sup>23</sup> On the other hand, the macronutrient content in rice can be a food for bacteria that cause cavities so that dental brushing routine should be done 2 times a day after breakfast and before going to sleep.

The second highest percentage of non-cariogenic food dietary habit after rice is fruits dietary habit, with a frequency of 1 time a day of 32 children (71.1%). The third highest percentage of non-cariogenic foods after fruits is vegetable dietary habit, with a frequency of 2-3 times a day amounting to 18 children (40%). Fruits contain lots of vitamins that are beneficial for dental and oral health, especially vitamin A and vitamin C. Consumption of fruits that has a hard texture can stimulate salivary production.

The antioxidant content in fruit can also help protect gingival and other oral tissue from cell damage or bacterial infections. On the other hand, consumption of acids can continuously weaken the structure of the tooth enamel and cause the opening of dentin, so that the fruit with a  $\text{pH} \leq 5.5$  should be avoided. Vegetables are rich in vitamins, minerals and water, it also contain fibers that can stimulate the function of mastication and salivary secretion, as a result, it helps promote self-cleaning of the teeth, reduce the surface area of plaque, and can prevent dental caries.<sup>17</sup>

Based on the results of the study, most of the Kindergarten students of BPK Penabur 246 Bandung City have a non-cariogenic food dietary habit. From the results of caries risk assessment, most parents have a high level of health information and economic status. This allows parents to know how a good dietary habit affects the dental and oral health of their children. UKGS has also carried out several counseling around dental and oral health for the parents of students, so that parents of students can receive adequate dental and oral health information through the UKGS program. Based on the results of filling out the questionnaire, most students rarely consume cariogenic foods. The average consumption is once a week, but there is also those who only had it once a month. This is in line with research conducted by Atmadi, *et al*<sup>24</sup> where 85% of students who consume cariogenic food only had it sometimes, not every day.

The results showed that some students were found to have a high cariogenic dietary habit but did not experience ECC. This shows that even though the cariogenic diet is high, if the maintenance of dental health is good and has a low risk of caries then they will not experience ECC. In addition, if students have high cariogenic food dietary habit but their non-cariogenic dietary habit is also high, it will reduce the occurrence of ECC. This is in line with Armilda's research results.<sup>17</sup> The results also showed that some students who did not consume cariogenic foods but had ECC experience were found, this is due to high caries risk (his mother had active caries, had not brushed teeth with Fluoride toothpaste, etc.).

Based on research on cariogenic and non-cariogenic dietary habit and ECC experiences in children aged 4-6 years at BPK PENABUR 246 Kindergarten, Bandung City, there are things that need to be recommended as follows: (1) Students are advised

to always maintain the health of dental and mouth by reducing eating cariogenic foods that can damage teeth; (2) Periodic counseling needs to be carried out on good and bad food for dental and oral health in all Kindergarten students of BPK Penabur 246 Bandung City; (3) Periodic counseling is needed on how to maintain oral health; (4) The school is expected to continue to implement the UKGS program for the maintenance of dental and oral health of BPK Penabur 246 Kindergarten Bandung City students; and (5) further research needs to be carried out on the relationship between dietary habit of cariogenic and non-cariogenic foods with ECC experience.

Based on the direct experience of researchers in the research process, there are several limitations experienced. Some limitations in the study are as follows: 1) The number of research samples is only 45 people and with the small number of samples taken due to researcher's limited direct access to respondents; 2) The questionnaire is given online so that there is no personal interview between researchers and respondents. 3) The specific times of snack dietary habits were not considered. The limitations of this study are expected to be improved and refined in further research. The results of this study can be used as a reference and input for further research or research that compares it with other dietary measurement instruments and can be used as guidelines in developing further government policies related to the efforts to improve dental and oral health in early childhood.

## CONCLUSION

As much as 44.45% of the children experience ECC. Cariogenic food dietary habit distribution of kindergarten students are snacks, bread and cakes while the highest distribution of non-cariogenic food dietary habit are rice, fruits, and vegetables.

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