PREVALENCE OF EARLY CHILDHOOD CARIES IN CHILDREN AGED 3–6 YEARS IN CIMAHI

(TINGKAT KEJADIAN EARLY CILDHOOD CARIES PADA ANAK USIA 3-6 TAHUN DI KOTA CIMAHI)

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ABSTRACT

Early Childhood Caries (ECC) is the occurrence of one or more tooth decay, whether the tooth has cavitary lesions or not, tooth loss due to caries, or tooth surface fillings in primary teeth of children under 6 years old. Severe Early Childhood Caries (S-ECC) is the severe form of Early Childhood Caries (ECC). S-ECC can be determined by assessing one or more smooth surfaces of primary cavities, teeth lost due to caries, and fillings that can be determined by dmfs score. The purpose of this research is to discover the incident's description. Severe Early Childhood Caries in children aged 3-6 years in Cimahi City. The design of this study used a descriptive method with a cluster random sampling technique with children aged 3-6 years as research subjects. Early Childhood Caries can be determined by dmfs score, and Severe Early Childhood Caries can be assessed with dmfs score of more than 4 in children aged 3-4 years, a dmfs score of more than 5 in children aged 4-5 years, and a dmfs score of more than 6 in children aged 5-6 years. The results of this study were that Severe Early Childhood Caries is the most common type of ECC experienced by children aged 3-6 years, with a percentage of 57.8% and most commonly occurs in children aged 5 years, with a percentage of 54%. This study concludes that the

prevalence of SECC in children aged 3-6 years in Cimahi City is the highest prevalence compared to the prevalence of non-ECC and ECC events, which is 57.8%.

Keywords: children; Cimahi; early childhood caries; prevalence

ABSTRAK

Early Childhood Caries (ECC) adalah kejadian satu atau lebih kerusakan gigi baik gigi yang memiliki lesi kavitas maupun tidak, kehilangan gigi akibat karies, atau permukaan gigi yang ditambal pada gigi sulung anak berusia dibawah 6 tahun. *Severe Early Childhood Caries (S-ECC)* merupakan bentuk parah dari *Early Childhood Caries (ECC)*. S-ECC dapat ditentukan dengan menilai satu atau lebih permukaan halus gigi sulung yang berlubang, gigi yang hilang akibat karies, dan gigi yang ditambal yang menggunakan skor dmfs. Tujuan peneitian ini adalah untuk mengetahui gambaran kejadian *Early Childhood Caries* pada anak usia 3–6 tahun di Kota Cimahi. Rancangan penelitian ini menggunakan metode deskriptif dengan teknik cluster random sampling dengan subjek penelitian anak berusia 3-6 tahun. *Early Childhood Caries* dapat ditentukan dengan skor dmfs dan *Severe Early Childhood Caries* dapat dinilai dengan skor dmfs lebih dari 4 pada anak usia 3-4 tahun, skor dmfs lebih dari 5 pada anak usia 4-5 tahun, dan skor dmfs lebih dari 6 pada anak usia 5-6 tahun. Hasil dari penelitian ini adalah *Severe Early Childhood Caries* merupakan tipe ECC yang paling banyak dialami oleh anak berusia 3-6 tahun yaitu dengan persentase 57,8 % dan paling banyak terjadi pada anak usia 5 tahun dengan persentase 54%. Kesimpulan dari penelitian ini adalah prevalensi penyakit SECC pada anak usia 3-6 tahun di Kota Cimahi merupakan prevalensi tertinggi dibandingkan prevalensi kejadian non ECC dan ECC yaitu sebesar 57,8%.

***Kata kunci**: anak; Cimahi; early childhood caries; prevalensi*

INTRODUCTION

Dental and oral diseases commonly found in the community that affect hard dental tissues such as enamel, dentin, and cementum are referred to as dental caries. Dental caries is a complex, multifactorial, and chronic disease that is prevalent in both developing and industrialized countries and is the most dominant disease during childhood. According to the American Academy of Pediatric Dentistry, primary teeth with one or more decayed, missing, or filled surfaces due to caries in children under six years of age are defined as Early Childhood Caries (ECC). The American Academy of Pediatric Dentistry (AAPD) further states that children under three years of age who show signs of caries on smooth tooth surfaces are classified as having Severe Early Childhood Caries (S-ECC). Various factors such as race, culture, ethnicity, socioeconomic status, lifestyle, dietary patterns, oral hygiene practices, and regional differences contribute to the wide variation in ECC prevalence across countries and regions.[1-3]

Indonesia, as a developing country, reported a dental caries prevalence of 88.8% across all age groups based on the 2018 Riset Kesehatan Dasar Kemenkes RI (Riskesdas). Additionally, 10.4% of children aged 1–4 years experienced oral health problems according to the 2013 Riskesdas. In Cimahi City, the prevalence of dental caries ranked 14th highest in West Java Province at 46.06% based on Riskesdas 2018 data. Interestingly, Cimahi City ranked fourth in West Java for correct tooth-brushing behavior, with a prevalence of 4.75%. Previous studies reported that ECC prevalence can reach up to 70% in developing countries and among underprivileged populations in developed countries. Dental damage, cavities, or pain remain the most common dental problems in West Java Province, with the highest prevalence observed in children aged 5–9 years (55.52%), while the lowest prevalence occurred in children aged 3–4 years (35.37%).[1,4]

ECC is classified into three types based on severity and etiology. The first type (mild to moderate) presents as isolated carious lesions involving incisors and/or molars (Figure 1), generally caused by a combination of semi-solid or solid food consumption and poor oral hygiene. The second type (moderate to severe), known as labiolingual lesions (Figure 2), primarily affects maxillary incisors with or without molar involvement and is commonly associated with improper bottle-feeding or unrestricted breastfeeding, with or without poor oral hygiene. The third type (severe) affects nearly all teeth, including mandibular incisors (Figure 3), and is

caused by a combination of cariogenic food intake and poor oral hygiene. [1]

Figure 1. Mild early childhood caries.[2]

Figure 2. Moderate early childhood caries.[2]

Figure 3. Severe early childhood caries.[2]

A study of discussions with parents often revealed inappropriate eating patterns in children. One example is the frequent feeding of children in bottles or sugary foods at bedtime, in the afternoon, or in the evening. When children sleep, fluid pools around the teeth, and this carbohydrate-containing fluid provides an excellent culture medium for cariogenic microorganisms. Furthermore, salivary flow decreases during sleep, resulting in a decrease in the cleansing process by saliva in the oral cavity. Childhood is divided into two periods: early childhood (ages 2-6) and late childhood (ages 6-11). Children aged 0-8 are considered to be in the golden period of human psychological development, also known as the "Golden Age." According to Martani, the golden age encompasses all aspects of human development, from brain development to physical development, cognitive development, emotional development, and social development.[2,5,6]

ECC in children can impact quality of life and lead to poor health because this is the age at which brain, physical, cognitive, emotional, and social development occurs. ECC can lead to poor health in children, causing pain, infection, sleep disturbances, impaired growth and development, difficulty chewing, weight loss, and behavioral changes, all of which can negatively impact a child's quality of life.[7]

The HI-BOGI application “Hello Indonesia with Dentists” is a form of application of the development of digital technology 4.0. This application was

created by Putri et al. to support the improvement of habits of maintaining dental and oral hygiene. HI-BOGI, which functions as teledentistry, telesurvey, telepromotion, and teleprevention, was created due to many problems that occur, namely dental and oral diseases caused by a lack of knowledge about dental and oral health. HI-BOGI has many features, as can be seen in Figure 4, including independent dental and oral examinations (teledentistry), surveys to determine the level of knowledge and attitudes in maintaining dental and oral health (telesurvey), toothbrushing alarms, telepromotion, and teleprevention of dental and oral health. The telesurvey feature in the HI-BOGI application can be used to document the condition of the oral cavity and can then be assessed directly, so researchers are interested in using the HI-BOGI application for easy data archiving and assessment related to dental and oral hygiene in children. The HI-BOGI application has several limitations, namely, it can only be downloaded on Android-based smartphones and is only available in Indonesian.[8]

Figure 4. HI-BOGI Application.

Caries occurrence can be seen by determining the dmf index. The dmf index, as a caries determinant index that can be used, includes determining the total number of dmf teeth (dmft) and by determining the total number of dmf tooth surfaces (dmfs). All tooth surfaces with cavities, missing teeth, and filled teeth can be calculated using the dmfs index. The dmfs index is an index of tooth surfaces with cavities, missing teeth, and filled teeth due to caries. S-ECC can be measured using the dmfs score in primary teeth of children aged 3-6 years. The dmfs score can be calculated from all surfaces of primary teeth that are crowned or extracted due to caries. ECC is

calculated using the dmfs score to differentiate each type. In the severe type, the DMFS score found based on the child's age is greater than 4 in children aged 3-4 years, greater than 5 in children aged 4-5 years, and greater than 6 in children aged 5-6 years.[9–11]

Based on the above problems, researchers are interested in examining the incidence of Early Childhood Caries in children aged 3-6 years in Cimahi City to provide information related to this for various purposes in the fields of science and dentistry. The study will be conducted by examining the surfaces of children's teeth using the HI-BOGI application.

METHOD

This study was conducted after obtaining ethical approval from the Research Ethics Committee of Universitas Padjadjaran (Approval No. 1299/UN6.KEP/EC/2022). A descriptive study design was used to determine the prevalence of Early Childhood Caries among children aged 3–6 years in Cimahi City.

Several schools representing the three districts of Cimahi (North, Central, and South Cimahi) were selected using a random sampling technique. A minimum sample size of 96 children was calculated using a proportion estimation formula. A total of 109 children who met the inclusion criteria and did not meet the exclusion criteria were included in the study.

Inclusion criteria consisted of children whose parents/guardians and teachers provided consent, children willing to undergo examination using the HI-BOGI application, and children who were physically and mentally healthy. Exclusion criteria included children with one or more erupted permanent teeth, unassessable photographs, and uncooperative behavior during examination. Dental images of primary teeth were captured using smartphones through the HI-BOGI application to assess decayed, missing, and filled surfaces.

Children who met the inclusion criteria and did not meet the exclusion criteria were then given informed consent by their parents/guardians before the study was conducted. The results were then calculated for the number of cavities, missing teeth, and filled teeth due to caries using the dmfs score. The number of children without caries and those with ECC and SECC was then compared using Microsoft Excel, using the dmfs score calculation as described by the AAPD.

RESULT

A total of 109 children aged 3-6 years old, out of 41,941 children aged 0-4

years in Cimahi City, and 41,961 children aged 5-9 years in Cimahi City, participated in this study.[11,12]

Based on the results of the study, the majority of the subjects were 5-year-olds. Two 3-year-olds (1.8%) participated in the study, followed by 17 4-year-olds (15.6%), 61 5-year-olds (56.0%), and 29 6-year-olds (26.6%). The majority of the subjects came from the South Cimahi sub-district, representing 59 children (54.1%).

Table 1. Characteristics of Research Subjects in children aged 3-6 years in Cimahi City

Characteristics	n	Percentage (%)
Age		
3 years	2	1.8
4 years	17	15.6
5 years	61	56.0
6 years	29	26.6
Total	109	100.0
Region		
South Cimahi	29	26.6
Mid Cimahi	59	54.1
North Cimahi	21	19.3
Total	109	100.0

Caries status examination in primary teeth can be determined using the dmft index. Based on the dmft index calculation, it is known that the results of the caries status examination in children aged 3-6 years in Cimahi City are classified as high, at 6.15. Table 2 shows that the dmft index in three other sub-districts, namely North Cimahi, Central Cimahi, and South Cimahi, is also classified as high. The highest dmft index of 6.4 occurred in Central Cimahi, the dmft index was 5.86 in South Cimahi, and the lowest dmft index of 5.45 occurred in North Cimahi.[13]

Table 2. Description of dental caries status in children aged 3-6 years in Cimahi

Region	DMFT Index	Category
South Cimahi	5,86	High
Mid Cimahi	6,4	High
North Cimahi	5,45	High
Cimahi	6,15	High

The results of the study on the frequency of children aged 3-6 years who were or were not affected by SECC in Table 3 show that the majority of children aged 3-6 years in Cimahi were affected by SECC. The number of children aged 3-6 years in Cimahi City who were affected exceeded half of the total research subjects, namely 63 people (57.8%). The table also explains that there were 14 children (12.8%) of 109 children who were not affected by caries. The greater number of children affected by SECC compared to those not affected by ECC may be caused by the comparison of dental and oral problems that occur in Cimahi City being greater compared to the treatment received from medical personnel, namely 64.20% compared to 22.15%.[4]

Table 3. Prevalence of ECC and non-ECC cases in children aged 3-6 years

Case	Frequency	Prevalence(%)
Free caries	14	12.8
ECC	32	29.4
SECC	63	57.8

Fourteen children were found to be free of ECC. Table 3 shows that four 4-year-old children (28.6%) did not experience ECC, and the majority of 5-year-old children (9 children, 64.3%) did not experience ECC. Only one 6-year-old child (7.1%) did not experience ECC.

The study found that 32 children had ECC. Table 3 also shows that five 4-year-old children (15.6%) had ECC. ECC was most common in 5-year-old children (18 children, 56.3%), followed by 9-year-old children (28.1%).

Table 4 shows that 63 of the 109 children had SECC. It is known that as many as 2 children aged 3 years (3.2%) experienced SECC, in children aged 4 years it was known that as many as 8 people (12.7%) were affected by SECC, in children aged 5 years it was known that as many as 34 people (53.9%), and in children aged 6 years as many as 19 people (30.2%).

Table 4. Prevalence of ECC and non-ECC cases in children aged 3-6 years

Age	Non ECC	ECC	SECC
	n (%)	n (%)	n (%)
3	0 (0)	0 (0)	2 (3.2)
4	4 (28.6)	5 (15.6)	8 (12.7)
5	9 (64.3)	18 (56.3)	34 (53.9)
6	1 (7.1)	9 (28.1)	19 (30.2)
Total	14 (100)	32 (100)	63 (100)

DISCUSSION

Early Childhood Caries is common in countries with low socioeconomic groups. According to data from the West Java Basic Health Research (Riskesdas), the prevalence of cavities in Cimahi City ranks 14th highest in West Java province, at 46.06%. The study found that the prevalence of non-caries caries in children aged 3-6 years was 12.8%, and the prevalence of ECC in children aged 3-6 years in Cimahi City was 2.4%. SECC was the disease with the highest prevalence in children aged 3-6 years in Cimahi City, at 57.8%.[4]

A total of 109 children aged 3-6 years participated in this study, out of a total population of 41,941 children aged 0-4 years in Cimahi City and 41,961 children aged 5-9 years in Cimahi City. Most of the study subjects were 5-year-old children. The number of 3-year-old children who

were the subjects of the study was 2 people (1.8%), 4-year-old children were 17 people (15.6%), 5-year-old children were 61 people (55.9%), and 6-year-old children were 29 people (26.6%). The research subjects involved were mostly from the Cimahi Tengah sub-district, namely 59 children (54.1%).[11,12]

Caries status examination in primary teeth can be determined using the dmft index. Based on the dmft index calculation, it is known that the results of the caries status examination in children aged 3-6 years in Cimahi City are classified as high, at 6.15. The dmft index in three other districts, namely North Cimahi, Central Cimahi, and South Cimahi, is also classified as high. The highest dmft index of 6.4 occurred in Central Cimahi, the dmft index obtained a dmft index of 5.86 in South Cimahi, and the lowest dmft index of 5.45 occurred in North Cimahi.[13]

The results of the study on the frequency of children aged 3-6 years who were or were not affected by SECC in Table 4.2 show that the majority of children aged 3-6 years in Cimahi were affected by SECC. The number of children aged 3-6 years in Cimahi City who were affected exceeded half of the total study subjects, namely 63 people (57.8%). The table also explains that there were 14 children (12.8%) of 109 children who were not affected by caries. The higher number of children affected by SECC compared to those not affected by ECC may be due to the higher ratio of dental and oral problems in Cimahi City, and the treatment received by medical personnel, at 64.20% compared to 22.15%.[4]

The frequency of children aged 3-6 years who did not experience caries is shown in Table 4.3: 4 children aged 4 years (28.6%) did not experience ECC, the majority of children aged 5 years (9 children, 64.3%) did not experience ECC, and only 1 child aged 6 years (7.1%) did not experience ECC. These results are also supported by research conducted by Bafti et al., which found that the average dmft value in children increased 1.5-fold, or 32%, with a one-year increase in age.[14]

Based on data from the West Java Basic Health Research (Riskesdas), it is known that the prevalence of tooth decay, cavities, or disease in West Java province has the highest percentage of these problems occurring in the 5-9 year age group, namely 55.52%. This figure is almost the same as the results of previous research; most of the research subjects affected by tooth decay were 5-year-old children. The results of the study in Table 4.4 regarding the frequency of children aged 3-6 years found that 5 children aged 4 (15.6%) years experienced ECC. The most ECC incidents were found in 5-year-old

children, as many as 18 people (56.3%), followed by 6-year-old children, as many as 9 people (28.1%).

Most children aged 3-6 years are affected by SECC, as shown in Table 4.5. The study found that two 3-year-old children (3.2%) had SECC, eight 4-year-old children (12.7%) had SECC, and the highest incidence of SECC was in 5-year-old children (34) (53.9%) and 6-year-old children (19) (30.2%). Caries severity increases with age, partly due to increased consumption of sugary foods, changes in dietary habits, and inadequate oral hygiene.[15]

Several factors can increase the risk of caries in children, including frequent breastfeeding and bottle-feeding, parental socioeconomic status, and the child's oral health habits.[4]

CONCLUSION

The conclusion obtained from the results of the research that has been conducted is that Severe Early Childhood Caries is the type of ECC that is most often experienced by children aged 3-6 years, with the highest age of Severe Early Childhood Caries incidents occurring in children aged 5 years in Cimahi City, which exceeds half of the population.

CONFLICT OF INTEREST

We declare that there is no conflict of interest in the scientific articles.

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