Research Article
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Impact of Early Childhood Caries (ECC) on quality life pre school children

Abstract

Early Childhood Caries (ECC) is a form of caries lesions in the presence of one or more caries, loss of teeth due to caries or teeth that have been stuck on deciduous teeth, in children under 71months of age. The consequences of ECC are high-risk of new caries lesions, increased costs and time for treatment, risk of delayed growth and development of children, loss of school attendance time, and increased activity limitations which will ultimately affect the quality of life of children. The purpose of this study was to determine the impact of ECC on the quality of life of pre-school children (CAST and ECOHIS index studies).

This study uses an observational research design with a cross-sectional approach. Large sample of 239children with cluster sampling techniques. Data were collected through clinical examination for caries (CAST index) by observers (inter and intra-observer alpha Cronbach 0.8). ECOHIS questionnaire for quality of life. Analysis of Pearson-correlation test and chi- square.

Statistic test results showed a negative relationship between healthy teeth with pain and functional disorders, p-value 0.00<0.05. There is a positive and significant relationship between dentin caries and pulp caries with pain and functional disorders, p-value=0.00<0.05. There is no meaningful relationship between caries with psychological and emotional disorders. There is a significant relationship between caries with the quality of life of children, p-value (0.00)<0.05

Caries status is related to the quality of life of children to pain and functional disorders but is not related to psychological disorders and emotional disorders of pre-school children.

Keywords: dental caries, quality of life, children, psychological, emotional

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Abbreviations: ECC, early childhood caries; CAST, caries assessment spectrum and treatment; ECOHIS, early childhood oral health impact scale

Introduction

Early Childhood Caries (ECC) is a form of carious lesions with one or more caries, loss of teeth due to caries or teeth that have been clogged in deciduous teeth, in children under 71months of age. Whereas in children under the age of 3years, the presence of carious lesions on the smooth surface of the teeth is referred to as Severe ECC. The characteristic of ECC is that the pattern of rapid caries development can occur immediately after the milk teeth erupt, affecting many teeth, and often on the surface of the teeth which is at low risk for carious lesions such as the facial surface of the upper incisors and the buccal or lingual surfaces of the mandibular molars.[1]

The instrument used to measure the quality of life in children aged 3-6years is the Early Childhood Oral Health Impact Scale[2] The main objective of ECOHIS is to measure the impact of dental and oral health on daily life including family members. ECOHIS shows a high success rate in the assessment of oral effects in children such as medical conditions, traumatic injuries, dental malocclusion, children with early childhood caries.[3]

Caries Assessment Spectrum and Treatment (CAST) which is a new caries instrument that was inaugurated in 2011. This index illustrates the complete range of stages of dental caries development, from the absence of dental caries lesions, the protection against caries in this case sealants and caries treatment (restoration), carious lesions in enamel and dentin, carious lesions that have penetrated the pulp and tissue around the teeth (abscess / fistula), and tooth loss due to caries. The CAST concept follows the pathophysiology of dental caries in someone who is in accordance with the concept of positive healthy indicators. This index is built on the strength of the ICDAS, DMF and (PUFA) indexes.[4,5] In this hierarchical structure the surfaces of teeth that have been well realized or patched are considered healthy surfaces. The strengths of the CAST index are the visual, hierarchical examination of the code system, including the total spectrum of stages of development of carious lesions and abscesses / fistulas, as well as sealants and restorations making it possible to facilitate communication among health professionals and policy makers and facilitate the development of adequate health policies and dental and oral care planning for the community.[5]

The face and content validity of CAST has been proven using a modification of the RAND e-Delphi method by 56 researchers from 24 countries including one of them in Indonesia.[6] In addition, construct validity has been carried out in vitro and in vivo which is performed visually with Micro-Computed Tomography (Micro-CT) and histological examination as Gold Standard with sensitivity and specificity results for the healthy vs sick category (code 0-2 vs code 3-6) 92.9%-100% for Micro-CT as the gold standard, 83%-96.6% for histology. Sensitivity and specificity values for categorizing dentin

and nondentin lesions (codes 0-3 and codes 4-6) 90-100% for Micro-CT as gold standard and 81% 100% for histology.[4]

Preschool is a phase of individual development at 2-6 years old, development at this time is a short development period but is a very important period. According to the psychology of the development of children aged 6years, namely the emergence of abstract thinking and starting to build self-image. At this age children begin to compare their physical characteristics and personalities with other children. The growth of a child's teeth begins at the age of 6months and is complete at the age of 24months. The influence of eating patterns in this modern era which has a tendency to soft, sweet and sticky foods and the habit of bottle milk causes children 3-6years to become vulnerable to dental caries. Milk teeth not only function as aesthetics, chewing which has an impact on the quality of life of preschoolers today, but also serves to lead the growth of permanent teeth which has a major effect on children's quality of life in the future.

Method

The research design used was an observational cross-sectional approach, to study the dynamics of the correlation between risk factors and effects in the form of health status.[7] In this study, the risk factor was dental caries in preschool children (ECC) as measured by the CAST index. Whereas the effect is quality of life as measured by ECOHIS.[8,9]

The sample in this study were preschool children and parents of these children. The sample size in this study was determined using the Lomeshow formula for the correlation test with the Cross-Sectional approach, where the population size is unknown, namely: Sastroasmoro et al.[9]

A sample calculation is performed using the GPower version 3.1.9.2 application. The calculation results obtained a sample size of 319 preschool children, to prevent the possibility of drop-out then the number of samples added 10% of the sample count, then the number of samples was 350 preschool children.

Sampling was done in a cluster manner. In this study the sample must meet the inclusion criteria as follows:

i. Children with good general health
ii. Children who get parental consent to participate as respondents
iii. Cooperative children
iv. Children aged 4-6 year

While the exclusion criteria are:

i. Children with systemic diseases and weak physical conditions
ii. Children who do not get the consent of parents to participate become respondents
iii. Children who are not cooperative

Data collection

Training and calibration: The implementation of this research was assisted by 2 dental nurses and 5 students. Before the study was conducted, observers were trained to examine dental caries using the CAST index and interviews using ECOHIS. The training is carried out until agreement, understanding and agreement between observers are obtained. Then after all observers have the same perception about the code in the CAST and ECOHIS indexes, a calibration is performed to equalize the ability of the observer (kappa value>0.8).

Informed concent: Two days before research informed concent format (attached) was submitted to the teacher for distribution to students. The Informed Concent must be signed by a parent or guardian as an agreement to participate in the research. Informed Concent format was collected a day before the study and the informed concent results were known to the number of children who were willing to participate in the study.

Clinical examination (CAST): Clinical examination is an examination of caries experience using the CAST index conducted by 9 observers (2 researchers + 2 dental nurses + 5 students). Before the study was conducted, observers were trained to examine dental caries using the CAST index. The training is carried out until agreement, understanding and agreement between observers are obtained. Then after all observers have the same perception about the code in the CAST index, a calibration is performed to show the inter and intra-consistency of the observer (kappa value>0.8).

Subjects were examined one by one where the examination began from the right jaw, upper left, lower left and lower right. The examination is done using a mouth glass and head-light. The examination results are recorded in the examination format (attached) according to the code from the CAST index, namely 0=Healthy, 1=Sealant, 2=Patch (Maintenance), 3=Email Lesions, 4=Dentin Lesions (Sealant / Restoration), 5=Dentin Lesions which are deep but still covering the pulp, 6=lesion is already on the pulp 7=abscess / fistula, 8=loss due to caries. Where code 0-2 is categorized as healthy 3 category is premorbidity, 4–7 morbidity, code 8 is categorized as mortality (Figure 1).

Figure 1 Mouth Glass t and head-light.

Quality of life assessment (ECOHIS)

Quality of life assessment is carried out using the ECOHIS index, which is the impact on children (pain disorders, functional disorders, psychological disorders, emotional disorders / social interactions). Quality of life assessment was carried out using a questionnaire that was filled out by parents. The questionnaire contained data on children (sex, age and number of children in the family), data on parents (age of parents, level of education, work of parents), data on quality of life (ECOHIS). This quality of life assessment questionnaire was previously validated to obtain the Indonesian version of ECOHIS because it was still a Malay (Malaysian) version with Cronbach 0.8 alpha. The questionnaire has 5 answer choices 0=never, 1 almost never, 2 sometimes, 3 often, 4 very often. Impact (quality of life) is said to be a good score<mean, and bad>mean.

Result

Table 1 above shows that the average preschooler in the city of Bukittinggi has 13.6 healthy teeth, at least no healthy teeth, the most children have 20 healthy teeth. The average email caries in preschool

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children in the city of Bukittinggi is 2.2. This means that each child has 2 enamel caries, at least 0 teeth, and at most 11 enamel caries. The average dentin caries in preschool children in Bukittinggi City is 2.6 meaning that each child has 3 teeth with dentin depth, most children have 14 teeth with dentin depth. The average pulp caries in preschool children is 1.1 meaning that every child experiences 1 tooth by entering the pulp, most children have 10 teeth by entering the pulp. While for teeth lost due to caries there is an average of 0.1.

Table 1 The average of dental caries is based on the CAST index of Bukittinggi preschool children

Status	Average	Minimum	Maximum
Healthy teeth	13.6	0	20
Caries Email	2.2	0	11
Caries Dentin	2.6	0	14
Pulps caries	1.1	0	10
Tooth lost due to caries	0.1	0	4

Differences in pre-school caries status of children by sex

Based on the results of the normality test data show caries status data and sex are not normally distributed for the test used is Chi-Square.

The cross table above shows that of the 112 men, the majority were 54% with caries status at the morbidity level, whereas in women it was 64%. This means that the proportion of morbidity is highest among women. While the proportion of healthy teeth is higher in males than females, which is 22% in males and only 16% in females. Although in proportion there is a difference in caries status between men and women it has not been proven statistically. To see the significance of differences in caries status by sex in preschool children in Bukittinggi City statistically, the chi squre test was performed. Table 2 shows the results of the chi-square statistical test that there was no difference in caries status between men and women, as evidenced by the p-value (0.39)>0.05.

Differences in the quality of life of pre-school children by sex

Table 3 shows that out of 127 girls, 62% had a good quality of life, while in boys 55%. This means that the highest proportion of good quality of life is women. Although in proportion there is a noticeable difference in the quality of life between men and women it has not been proven statistically. To see the significance of the difference in quality of life by sex in preschool children in Bukittinggi City statistically, the chi-squre test was performed. Table 4 shows the results of the chi-square statistical test that there was no difference in quality of life between men and women, evidenced by the value of p (0.31)>0.05.

Relationship of healthy teeth, email caries, dentine caries, pulp caries and missing teeth due to caries with pain disorders, functional disorders, psychological disorders and emotional disorders in preschool children

To see the relationship of Healthy Teeth, Email Caries, Dentin Caries, Pulp Caries and Missing Teeth due to caries with Pain Disorders, Functional Disorders, Psychological Disorders and Emotional Disorders in Preschool children the Pearson product-moment r test with p-value is <0.05 as the data is numeric, the results of data analysis are illustrated in the following Table 4

Pearson correlation test

The results above show that there is a significant negative relationship between healthy teeth and pain disorders as evidenced by the value of r=-0.46 with the strength of the relationship in the moderate category, p-value 0.00<0.05. Likewise the relationship of healthy teeth with functional disorders there is a negative relationship with the value of r=-0.32 but the strength of the relationship in the weak category, p value 0.00<0.05. This means that the healthier teeth in pre-school children, the smaller the occurrence of pain and functional disorders in children. While the relationship of healthy teeth with psychological disorders and emotional disorders there is no meaningful relationship. Table 4 shows that there is no significant relationship between email caries with pain disorders, functional disorders, psychological disorders and emotional disorders.

The results also showed that there was a positive relationship between dentin caries and pain disorders in preschool children, the value of r=0.41 means the strength of the relationship in the moderate category with a p-value of 0.00<0.05. There was also a positive and significant relationship between dentin caries and functional disorders with a value of r=0.30 but the strength of the relationship was weak, p-value 0.00<0.05. These results indicate that the more children experience dentinal caries, the greater the child will experience pain and functional disorders. While the relationship of dental caries and psychological disorders and emotional disorders are not significant.

Pulpary caries also showed a positive and significant relationship with pain disorders, r value=0.47 means that the strength of the relationship in the medium category, p-value 0.00<0.05. There is also a positive and significant relationship between pulp caries and functional impairment r=0.27 but the strength of the relationship is weak in the category p 0.00<0.05. These results indicate that the more children experience pulp caries the greater the child experiences pain and functional disorders. But there is no significant relationship between pulp caries with psychological and emotional disorders in preschool children. For variable teeth missing because caries there is a positive and significant relationship with pain and functional disorders but the strength of the relationship is very weak p<0.05. As with other variables, there was no significant relationship between teeth lost due to caries and psychological and emotional disorders.

Relationship of dental caries status with quality of life of preschool children

The caries status variable with quality of life is categorical data with abnormal data distribution, so the test used to analyze the relationship of this variable is the Chi-Square test with p<0.05. The results of the Chi-Square analysis are illustrated in the following Table 5

The cross table above shows that of 46 children who have healthy teeth 78% with good quality of life, children with caries status in the priority category 75% with good quality of life, 49% of good quality of life in children with caries status in the morbidity category and only 31% of children with caries status in the mortality category had a good quality of life. This means that the proportion of good quality of life is highest among children who have many healthy teeth. To see the significance of the relationship of caries status with quality of life in preschool children in Bukittinggi City statistically, the chi-squre test was performed. Table 5 shows the results of the chi-square statistical test that there is a significant relationship between caries status and quality of life in children, as evidenced by the p-value (0.00)<0.05.

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Table 2 Differences in pre-school caries status of children by sex

Caries status / Sex	Healthy		Premorbity		Morbidity		Mortality		P
	F	%	F	%	f	%	F	%	
Male	28	22	23	18	68	54	8	6	
Female	18	16	17	15	72	64	5	5	0,39
Amount	46	19	40	17	140	59	13	5	

Chi-Square test p(0,39>0,05)=No Different Meaning

Table 3 Differences in the Quality of Life of Pre-School Children by Sex

Quality of life / Sex	Good		No good		P	OR
	f	%	F	%		
Male	70	55	57	45		
Female	69	62	43	38	0,31	0,7
Amount	139	58	100	42		

Chi Square test p(0,39>0,05)=No Different Meaning

Table 4 Relationship of Healthy Teeth, Email Caries, Dentine Caries, Pulp Caries and Missing Teeth due to caries with Pain Disorders, Functional Disorders, Psychological Disorders and Emotional Disorders in Preschool children

Variable	Pain Disorders		Functional Disorders		Psychological disorders		Emotional Disorders	
	R	P	R	P	r	P	r	p
Healthy Teeth	-0.46	0.00	-0.32	0.00	0.01	0.83	0.02	0.71
Email Caries	0.03	0.56	0.01	0.79	0.09	0.13	0.00	0.97
Dentin caries	0.41	0.00	0.30	0.00	0.08	0.18	0.06	0.31
Pulps caries	0.47	0.00	0.27	0.00	0.02	0.72	0.04	0.48
Lost because of caries	0.15	0.01	0.14	0.02	0.01	0.85	0.04	0.53

Table 5 Relationship of Dental Caries Status with Quality of Life of preschool children

Quality of life / Status Karies	Good		No good		P
	F	%	f	%	
Healthy	36	78	10	22	**0,00**
Premorbidity	30	75	10	25	
Morbidity	69	49	71	51	
Mortality	4	31	9	69	

Chi Square test p(0,00>0,05)=Meaningful

Discussion

The results of research conducted on kindergarten students in Bukittinggi on caries status of pre-school children showed that 59% of children had caries status in the morbidity category, which means that most children with caries had reached dentin and pulp and had experienced toothache complaints. Only 19% of children experience healthy teeth, and children who have caries status in the premorbidity category are 17%, which means the child has caries to the depth of email but does not cause complaints. The average pre-school healthy teeth of children are 13.6, the average enamel caries is 2.2, dentin caries is 2.6 and the pulp is 1.1 which means that each child has an average of 14 healthy teeth, 2 teeth have enamel caries, 3 dentin caries teeth and 1 tooth had pulp caries.

The process of caries occurs is the process of demineralization caused by interactions between microorganisms, teeth, saliva, and subtraction. The process is slow so that most children and parents are not aware of and ignore the condition of the child's teeth which causes the child to suffer from caries. This study is in line with a 2014 survey in Jordan, the prevalence of caries in 6-year-old children was 76.4% with a mean def-t of 3.3 and 45.5% in 12-year-old children with a DMF-T average of 1.1.[10]

Based on sex, girls have more caries (84%) and the most is dentine caries and pulp caries which is equal to 64%. Boys experience caries by 78% and most are dentin caries and pulp caries by 54%. Although in proportion there is a difference in caries status between boys and girls but there is no statistically significant difference in the caries status of men and women with a p-value (0.39)>0.05.

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Girls grow faster than boys, including the growth of teeth, causing teeth longer exposure to cariogenic food which increases the incidence of caries in girls. This is consistent with the theory that women are more at risk of caries because dental eruptions in women are faster so they are more exposed to risk factors for caries causes.[11] The results of this study are in line with research by Gopal et al.[12] Which states that ECC increases significantly with age and is more dominant in girls.[12]

The results of this study are also supported by previous research conducted by Winda et al which states that girls suffer more caries trays than boys. Another supportive study is a study by Pontonuwu et al.[13] in Tomohon which shows that the caries status of girls is higher than that of boys.

Both girls (62%) and boys (55%) have a good quality of life. But there was no statistically significant difference in quality of life based on sex, p-value 0.31> 0.05. Previous research conducted by Khotimah et al on factors related to the incidence of dental caries in children 6-12 years old at SD Negeri 03 Karangayu Semarang showed that sex factors did not influence closely on quality of life.

The relationship between caries status with pain disorders, functional disorders, psychological disorders and emotional disorders. The results showed a negative relationship between healthy teeth with pain with a value of r=-0.46 and functional disorders with a value of r=-0.32 The more healthy teeth in pre-school children, the smaller the occurrence of pain and interference functional in children. The results also showed a positive relationship between dentin caries and pain disorders in preschool children with a value of r=0.41 with the strength of the relationship in the moderate category p 0.00<0.05, also there was a positive and significant relationship between caries detin with functional disorders with a value of r=0.30. The more children experience dentin caries, the greater the child will experience pain and functional disorders. Pulpal caries also showed a positive and significant relationship with pain, r=0.47 and functional impairment, r=0.27. While the relationship of dental caries with psychological disorders and emotional disorders is not meaningful.

The negative effects of caries on children's lives include pain, symptoms and functional changes, such as chewing and speaking disorders, educational factors such as school absenteeism, psychological problems such as sleep difficulties and irritability, factors related to social interactions, such as smiling, refrain from talking and decreased school activity. Dentine caries is caries that has affected the enamel and dentin. At this level causes symptoms such as pain when exposed to heat or cold stimulation, but will decrease if the stimulus is removed. Pulpary caries causes spontaneous pain. If not treated immediately can cause extreme pain that will affect the function of mastication. Children have difficulty drinking hot or cold drinks. Children also have difficulty eating certain foods.

Osorio et al research results in school children in the United States show that children with dental caries are at risk of having a poorer quality of life 3 times than the quality of life of a caries-free child.[14] Recent studies that conducted by Bunga et al[15] in the District of Landasan Ulin, Banjarbaru City, South Kalimantan, showed that decay rates had a significant correlation to quality of life (p: 0.001), which means that the higher the number of dental caries, the lower the quality of life of children.[15]

The results of the study of the relationship of caries status with quality of life in pre-school children in Bukittinggi showed that children with healthy teeth 78% of good quality of life, children with carious status 75% of quality of life are good, children with carious status of morbidity 49% of good quality of life, and status caries mortality is only 31% with a good quality of life. This is by following the statement of Harun et al that the deeper caries suffered by a person, the lower the quality of life they have. The depth of caries has a significant relationship with the quality of life of children. This study is in line with research conducted by Hardiyanti et al.[16] which states that there is a significant relationship between caries status and quality of life.[17,18]

Conclusion

i. The average tooth size of a preschooler is 13.6, enamel caries 2.2, dentin caries2.6, pulp caries 1.1, teeth lost due to caries 0.1

ii. Dental caries is greater in women than in men, but statistically does not show a significant relationship with p value (0.39)>0.05

iii. There is no significant difference between the quality of life of boys and girls with a value of p0.31>0.05

iv. Dentine caries is positively related to pain, r=0.41 with a relationship in the moderate category also has a positive relationship with functional disorders, r=0.30 but the strength of the relationship is weak

v. Pulpary caries shows a positive relationship with pain disorders, r=0.47 with moderate relationship strength. Pulpal caries also showed a positive relationship with functional disorders, r=0.27 with a weak relationship strength.

vi. There is no relationship of dental caries with psychological disorders and emotional disorders in preschool children

vii. Children who have healthy teeth, 78% of children have a good quality of life. Children with caries status in the premorbidity category, 75% of their lives were good. Children with caries status in the morbidity category, 49% of good living quality and children with caries status in the mortality category only 31% with good quality of life.

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Conflicts of interest

Author declares that there are no conflicts of interest.

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