

Analysis of Risk Factors of Biopsychosocial with Early Childhood Caries (ECC) in Indonesian Pre-School Children

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Abstract

Objective: To describe the Early Childhood Caries (ECC) in Indonesian preschool children based on biopsychosocial risk factors. **Material and Methods:** This research is an analytic observational with a cross sectional design toward 506 preschool children aged 2-6 years at East Luwu Regency, Indonesia. The biopsychosocial data studied were gender, ethnicity, personal hygiene, child psychology, age, nutritional status, and dental and oral health behavior. These data were obtained through a questionnaire and clinical examination (nutritional status). Multiple linear regression analysis was performed. The statistical tests were performed at the significance level of 0.05. **Results:** Characteristics of respondents based on parents' origin, found that the majority of respondents were parents from Bugis tribes (68.4%) with ECC frequency of 72.2%. Regarding the visit to the dentist, 12.6% were afraid of the dentist, with ECC frequency of 71.9%. Most children had normal nutritional status (67%) with ECC frequency of 69.3%. Biopsychosocial factors, which significantly affect the Early Childhood Caries, were parents' tribe ($p=0.022$) and age ($p=0.011$). There was an association between ECC with brushing teeth before going to bed ($p=0.049$), use of mouthwash ($p=0.002$) and consumption of snacks ($p<0.001$). **Conclusion:** Biopsychosocial factor indicators are affect the Early Childhood Caries towards Indonesian preschool children.

Keywords: Child, Preschool; Dental Caries; Social Determinants of Health.

Introduction

The biopsychosocial concept is a concept that involves the interaction between biological, psychological, and social factors in an effort to understand the process of disease and the illness of someone who views the mind and body as a whole. This approach leads to the understanding that sick conditions are not only from a physical medical aspect but also from psychological conditions that are influenced by environmental factors [1]. The biopsychosocial model has dominated research and theory in health psychology [1].

Everyone wants a healthy life and is free from various diseases. Healthy according to the World Health Organization (WHO) includes physical, spiritual and socio-economic health. Oral and dental health is part of physical health that cannot be separated from one another because it will affect the body, as a whole [2]. Dental health is important, especially for children development.

Dental caries is a disease of the hard tissues of teeth, namely dentinal enamel and cementum [3]. The Ministry of Health of the Republic of Indonesia reports that the DMF-T index in Indonesia at 4.6 and the dental health of Indonesian people has not developed significantly since 2007 described in the Basic Health Research (RISKESDAS). Indonesia's DMF-T index is greater than the world DMF-T average of 2.1; this has been analyzed from 190 countries who are members of WHO [4]. Based on the 2013 RISKESDAS data from the Ministry of Health of the Republic of Indonesia, the national prevalence of dental and oral problems is 25.9 percent, as many as 14 provinces have a prevalence of dental and oral problems above the national figure. The three provinces with the highest rates of dental and oral problems in general were South Sulawesi at 36.2%, South Kalimantan at 36.1% and Central Sulawesi at 35.6% [5,6].

Caries can affect primary teeth and permanent teeth, but primary teeth are more susceptible to caries because of the different structure and morphology of primary teeth with permanent teeth [7,8]. Early Childhood Caries (ECC) defined as the state of one or more surfaces of deciduous teeth that are damaged, lost or patched in children aged 71 months or younger [9-11].

The purpose of this study is to describe the Early Childhood Caries in Indonesian preschool children based on biopsychosocial risk factors.

Material and Methods

Study Design and Sample

An observational analytical study with cross-sectional design was conducted in Luwu Timur District, Indonesia, in July 2018. Luwu District, with its capital in Malili, is geographically located in the south of equator with area 6,944.88 km² and around 11.1% of South Sulawesi Province is the area of Luwu District District.

The study was conducted on 506 students of Early Childhood Education (PAUD) and their parents. The sample size was determined by the purposive sampling method, which determined the sample had certain considerations in accordance with the inclusion criteria. The sample inclusion criteria were preschoolers aged 2-6 years, parents and PAUD students who were willing to become

research respondents as well as cooperative parents and PAUD students following and completing a series of research processes ranging from registration, filling out questionnaires, and examining.

The biopsychosocial data studied were gender, ethnicity, personal hygiene, child psychology, age, nutritional status, and dental and oral health behavior. This data was obtained through an extraoral questionnaire and examination in the form of height measurement (HM), body weight (BW), and length of nails. Questionnaires were given to parents to obtain data on gender, ethnicity, child psychology, age, and dental and oral health behavior.

Measurement of nutritional status using HM and BW data included in the body mass index formula according to age (BMI/U) with WHO AnthroPlus application with categories: underweight = <18.5, normal underweight = 18.5-24.9, overweight = 25-29.9, obesity = BMI of 30 or greater and personal hygiene observed was the length and shortness of the child's nails. Intraoral examination with oral diagnostic disposable was done to get an ECC picture.

Data Analysis

Data were analyzed using IBM SPSS Statistics for Windows Software, version 22 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to calculate the absolute and relative frequencies, mean and standard deviation. Multiple linear regression analysis was performed. The statistical tests were performed at the significance level of 0.05.

Ethical Aspects

This research project was approved by the Ethics Research Committee of the Hasanuddin University (Protocol No. UH17120067). Informed consent containing an explanation of the research was given to parents before intraoral examination.

Results

Regarding the biopsychosocial variable distribution, Table 1 shows that the number of girls (54.6%) was higher than boys (45.4%). The frequency of ECC among females was 67.8%, while in boys it was 72.2%. Based on parents' origin, the majority were parents from Bugis tribes (68.4%) with ECC frequency of 72.2%.

Table 1. Distribution of children according to the biopsychosocial variables and the presence of ECC.

Variables	ECC		Non ECC		Total		p-value
	N	%	N	%	N	%	
Child Gender	353	69.8	153	30.2	506	100.0	0.388
Male	166	72.2	64	27.8	230	45.4	
Female	187	67.8	89	32.2	276	54.6	
Parent Tribe	353	69.8	153	30.2	506	100.0	0.022
Bugis	250	72.2	96	27.8	346	68.4	
Toraja	41	65.1	22	34.9	63	12.4	
Java	32	72.7	12	27.3	44	8.7	
Other Tribes	30	56.6	23	43.4	53	10.5	

Personal Hygiene (Nails)	353	69.8	153	30.2	506	100.0	0.764
Short	214	70.2	91	29.8	305	60.3	
Long	139	69.2	62	30.8	201	39.7	
Psychological to the Dentist	353	69.8	153	30.2	506	100.0	0.228
Afraid	46	71.9	18	28.1	64	12.6	
Not Afraid	76	72.9	29	27.6	105	20.8	
Don't Know	231	68.5	106	31.4	337	66.6	
Nutritional Status	353	69.8	153	30.2	506	100.0	0.101
Normal	235	69.3	104	30.7	339	67.0	
Overweight	45	64.3	25	35.7	70	13.8	
Underweight	46	82.1	10	17.9	56	11.1	
Obesity	27	65.9	14	34.1	41	8.1	
Group of Age (Months)	353	69.8	153	30.2	506	100.0	0.011
13 up to 24	0	0.0	1	100.0	1	0.2	
25 up to 36	2	33.3	4	66.7	6	1.2	
37 up to 48	19	50.0	19	50.0	38	7.5	
49 up to 60	84	71.2	34	28.8	118	23.3	
61 up to 72	248	72.3	95	27.7	343	67.8	

Data on personal hygiene characteristics showed that most children had short nails (60.3%) with ECC frequency of 70.2%. Characteristics of respondents based on children's psychology during a visit to the dentist showed 12.6% were afraid of the dentist, with an occurrence of ECC of 71.9%. The percentage of respondents who did not feel afraid of dentists was 20.8%, with ECC frequency of 72.4%. Most children had normal nutritional status (67%) with ECC frequency of 69.3% (Table 1).

Most children had never visited the dentist (66%), with ECC frequency of 68.5%. Dental toothbrushing was started after being over one year old (60.9%) with ECC frequency of 71.5%. The percentage of children who brushed their teeth twice a day was 78.7% with ECC frequency of 68.1% (Table 2). More than half of the children (56.7%) began brushing their teeth with parental supervision at age 2 years or less, with ECC frequency of 65.51%. Regarding the use of fluoride dentifrice, 75.7% brushed the teeth with toothpaste with a CEC frequency of 69.8%. Regular toothbrushing before bed was 65.8%, with ECC frequency of 69.4%. Regarding the use of mouthwashes, most children never used mouthwash (81.8%) with ECC frequency of 89.8%. The percentage of children belonging to the low category ate snacks (2 times a day or less) was 64.2% with ECC frequencies of 64.3%. Most respondents did not have finger sucking habits (Table 2). There was an association between ECC with brushing teeth before going to bed ($p=0.049$), use of mouthwash ($p=0.002$) and consumption of snacks ($p<0.001$).

Table 2. Distribution of characteristics of dental and oral health behavior.

Dental Health Habits	ECC		Non ECC		Total		p-value
	N	%	N	%	N	%	
Visit to Dentist	353	69.8	153	30.2	506	100.0	0.066
Never	231	68.5	106	31.5	337	66.6	
When there are problems (pain, holes, etc.)	113	74.8	38	25.7	151	29.8	
Routine to the dentist	9	50.0	9	50.0	18	3.6	
The child starts brushing teeth on:	353	69.8	153	30.2	506	100.0	0.584
Age above 1 year	220	71.4	88	28.6	308	60.9	

Age less than 1 year	82	66.7	41	33.3	123	24.3	
Since the first primary teeth grew	51	68.0	24	32.0	75	14.8	
How often do children brush their teeth a day?	353	69.8	153	30.2	506	100.0	0.386
Do not brush your teeth	5	71.4	2	28.6	7	1.4	
Once a day	94	74.6	32	25.4	126	24.9	
2 times a day	254	68.1	119	31.9	373	73.7	
How old are children brushing their teeth with parental supervision	353	69.8	153	30.2	506	100.0	0.057
3 years or more	65	74.7	22	25.3	87	17.2	
2-3 years	100	75.8	32	24.2	132	26.1	
2 years or less	188	65.5	99	34.5	287	56.7	
When brushing your teeth, do you use fluoride toothpaste?	353	69.8	153	30.2	506	100.0	0.971
Do not use toothpaste	8	72.7	3	27.3	11	2.2	
Irregular (sometimes use sometimes not)	79	69.3	35	30.7	114	22.5	
Always use toothpaste	266	69.8	115	30.2	381	75.3	
Does your child brush your teeth before going to bed?	353	69.8	153	30.2	506	100.0	0.049
Never	18	94.7	1	5.3	19	3.8	
Irregular (sometimes no toothbrush)	231	69.4	102	30.6	333	65.8	
Every day	104	67.5	50	32.5	154	30.4	
Has your child ever used mouthwash?	443	87.5	63	12.5	506	100.0	0.002
Every day	12	85.7	2	14.3	14	2.8	
Irregular	59	75.6	19	24.4	78	15.4	
Never	372	89.9	42	10.1	414	81.8	
Frequency of children eating snacks (candy, etc)	353	69.8	153	30.2	506	100.0	<0.001
High (3 times a day or more)	144	79.6	37	20.4	181	35.8	
Low (2 times or less)	209	64.3	116	35.7	325	64.2	
Finger sucking habits	353	69.8	153	30.2	506	100.0	0.224
Yes	37	75.5	12	24.5	49	9.7	
No	316	69.2	141	30.8	457	90.3	

Discussion

The prevalence data of Early Childhood Caries (ECC) in preschool children in East Luwu District showed a significant difference among boys and girls. Similar results revealed that male gender is more at risk of experiencing dental caries and ECC compared to female [11,12]. The gender variable partially had no significant effect on ECC in preschool children in Luwu Timur District. This statement is supported by previous research that there is no significant relationship between gender and dental caries [13].

Data on the distribution of ECC prevalence of preschool children based on parental ethnicity showed that there were quite different percentages between the four ethnic groups (races) with the highest prevalence, namely Java 72.7%, Bugis 72.2%, Toraja 65.1% and some tribes belonging to other ethnic groups amounting to 56.7%. This study is in line with research which examined the prevalence of ECC in children aged 71 months and under with racial variables divided into Ras Filipino, Hawaii, Asia, Pacific Island, White Race, and other races [14]. Biopsychosocial variables had a significant effect on ECC in preschool children ($p < 0.05$). The factors that affect dental and oral

health in the community, both as providers and users, according concept influenced by 4 main factors: environment, behavior, health and hereditary services [15].

Personal hygiene includes the state of the nails. Data on ECC prevalence showed that children who had short fingernails and experience ECC as much as 70.2% and respondents who had long nails and experienced ECC as much as 69.2%. The results showed that the personal hygiene variable did not affect ECC in preschool children ($p>0.05$). A previous research showed no relationship between hygiene / hygiene and dental and oral health [16]. Personal hygiene can be assessed by the length, cleanliness and color of nails [17]. Previous study used nail hygiene examination to determine individual hygiene [18].

The psychological characteristics of children towards dentists was 12.6% feeling scared and 20.8% were not afraid and no significant effect on ECC in preschool children ($p>0.05$) was observed. The results of this study that there is no relationship between children's fear of dental care and dental and oral hygiene [19].

Data on the distribution of nutritional status showed that most of the children who became respondents had normal nutritional status, with ECC frequency of 69.3%, while 82.1% of underweight children had ECC. These results indicated the tendency that the lower the nutritional status of the child, the more at risk of experiencing ECC. It was found that the variable type of nutritional status had no effect on ECC in preschool children ($p>0.05$). The results of this study are also used the Body Mass Index as an indicator of the assessment of nutritional status in children and WHO Anthroplus Application as a measure of nutritional status assessment [20].

As children grow older, the more susceptible to caries can occur. This can be seen from the data of the distribution of ECC prevalence based on age groups, which showed that the age group of 61 up to 72 was the most affected. The age group significantly affected the ECC of preschool children ($p<0.05$). A previous study has shown that 3-year-olds children had ECC prevalence of 48.9%, four-year-old had a prevalence of 72.5%, and 80.8% of children aged 5 years [21].

The results showed that dental and oral health behavioral variables had a significant effect on ECC in preschool children ($p<0.05$). Some studies have shown that there was a significant relationship between dental and oral health behavior and caries index [22,23].

The R-value in this study was 0.238. This showed that there was a weak relationship between biopsychosocial indicator variables with ECC in preschool children. The value of R^2 obtained amounting to 0.055 (5.5%). In other words, ECC variables can be explained or influenced together by variables of gender, ethnicity, personal hygiene, psychological children, nutritional status, age and dental and oral health behavior of 5.5% and the remaining 94.5% was explained or influenced by other variables not examined.

The biopsychosocial variables studied consisted of gender, ethnicity, personal hygiene, children's psychology, nutritional status, age and dental and oral health behavior simultaneously or together had an effect on ECC ($p<0.001$).

Conclusion

Four of the seven biopsychosocial factors studied did not have a significant effect on ECC such as gender, personal hygiene, child psychology, and nutritional status, while three factors that significantly affected the ECC included parental, age, and behavior rates. Dental and oral health and the results of simultaneous analysis showed that seven biopsychosocial risk indicators (gender, ethnicity, personal hygiene, child psychology, age, nutritional status, and dental and oral health behaviors) studied affected ECC in preschool children in Luwu Timur District.

It is recommended that further research be carried out on the risk factors for biopsychosocial Early Childhood Caries by expanding caries risk indicators that are more diverse so that it helps to prevent dental and oral health problems that occur in preschoolers from an early age.

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