Sociodemographic relationship with the prevalence of caries using ICDAS in children aged 12-16 years

Hubungan sosiodemografi dengan prevalensi karies menggunakan ICDAS pada anak usia 12-16 tahun

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ABSTRACT
This study is aimed to determine the relationship between parental occupation, education level, and household income with the prevalence of dental caries in children aged 12-16 years. This analytic observational research uses cross sectional study method and samples were determined with purposive sampling. Survey was conducted in Bantaeng regency with target population were adolescents aged 12-16 years, which amounts to 531, consisted of 233 boys and 298 girls. Seven children with incomplete data were excluded. Data are analysed with Chi-Square test; gets the prevalence of dental caries in children frequently found in girls than boys and based on sociodemography, there was no significant relationship. It is concluded that there was no significant relationship between sociodemographic and dental caries prevalence in children aged 12-16 years in Bantaeng Regency except in the father's and mother's education categories.
Keywords: caries, demographic factor, child, ICDAS

ABSTRAK
Kajian ini dimaksudkan untuk mengetahui hubungan pekerjaan orang tua, tingkat pendidikan, dan pendapatan rumah tangga dengan kejadian karies gigi pada anak usia 12-16 tahun. Penelitian didesain observasi analitik dengan metode studi *cross sectional* dan sampel ditentukan dengan *purposive sampling*. Survei dilakukan di Kabupaten Bantaeng dengan populasi sasaran adalah remaja usia 12-16 tahun yang subjek berjumlah 531, terdiri atas 233 laki-laki dan 298 perempuan. Tujuh anak dengan data yang tidak lengkap dikeluarkan. Data dianalisis dengan uji Chi-Square; diperoleh prevalensi karies gigi lebih banyak terjadi pada anak perempuan daripada anaklaki-laki dan berdasarkan sosiodemografi, tidak ada hubungan yang signifikan. Disimsimpulkan bahwa tidak ada hubungan yang signifikan antara sosiodemografis dengan prevalensi karies gigi pada anak usia 12-16 tahun di Kabupaten Bantaeng kecuali pada kategori pendidikan ayah dan pendidikan ibu.
Kata kunci: karies, faktor demografi, anak, ICDAS
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BACKGROUND

Dental caries is the most common chronic disease in the oral cavity, which affects the population of children, adults and elderly. The prevalence of dental caries is influenced by various factors, one of which is sociodemographic such as education, employment and income of parents.[1,2]

Many studies have reported risk factors for dental caries in children focusing on biological and habitual factors, such as colonization of cariogenic microorganisms, use of fluoride, eating and oral health habits. Because socioeconomic factors more often affect the prevalence of dental caries in children through their effects on oral health practices, parental knowledge and attitudes regarding oral health, in recent years this has gained increasing attention in studies on caries prevention and control.[3]

In recent decades, various new methods have been developed to assess caries. An index often used today is the *International Caries Detection and Assessment* (ICDAS) index. The ICDAS is a valid and reliable index, made to assess caries based on the stage of development in six distinct categories ranging from the initial clinical changes seen in enamel to the wider cavity.[4,5]

Based on 2018 Riskesdas, oral and dental health problems including caries in Indonesia reached 57.6% and 45.3% respectively, while South Sulawesi was the second highest province after Central Sulawesi which had oral and dental health problems reaching 68.9% with 55.5% prevalence of caries. However, from this relatively high prevalence, only approximately 13.0% received treatment from dental personnel so that dental caries is still a health problem that greatly require more attention.[6]

The purpose of this study is to examine the relationship between parental occupation, education level, and household income with the prevalence of dental caries in children aged 12-16 years in Bantaeng Regency.

METHOD

This is an analytic observational research design

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using the cross-sectional study method and purposive sampling as the sampling technique.

This research was conducted on 2-5 September 2019 in two districts of Bantaeng regency, i.e. Bisappu District (SD 25 Panaikang, SD 22 Beloparang, SD Inp Mattoanging, SD Inp Kaili) and Uluere District. (SD Inp Loka, SD Inp Tamanona, and SD 32 Bungloe). Survey target population were adolescents aged 12-16 years. Total subjects in this study were 531, consisted of 233 boys and 298 girls. Total 7 children with incomplete data on the variables studied were excluded from this study, leaving 524 data available for analysis.

Inclusion of the samples are fully participate in a series of research and dental examination, can communicate and be cooperative, and oral health surveys; exclusion criteria is not to follow fully examination.

Parents' occupations are classified according to the Indonesian Standard Work classification and grouped into 5 major groups, that is civil servants, farmers, fishermen, entrepreneurs/traders, private employees, and unemployed. The level of education of father and mother is classified into 4 categories: not attending school/not graduate from primary school, graduated from junior high school/MTs/equivalent, graduated from high school/equivalent, higher education diploma/bachelor/master. Household income classified into 4 categories that is less than 1.500.000, 1.500.000-2.500.000, 2.500.000-3.500000, and 3.500.000 rupiah per month.[5-7]

Caries measurement is based on ICDAS, namely 0 = no caries after the teeth have been air dried for a long time (5 seconds); 1 = first visual change in enamel after prolonged air drying, turbidity or discoloration of caries (white or brown lesions) seen; 2 = clear visual changes of the enamel. In wet condition, there is a carious opacity (white spot lesion) and or brown caries discoloration wider than the fissure/fossa; 3 = enamel decay is localized without involving the underlying dentin; 4 = underlying dark shadow of dentin with or without localized enamel decay; 5 = cavity in an opaque or discolored enamel involving the dentin underneath; 6 = loss of tooth structure, the cavity is deep and wide, dentin is clearly visible. Broad cavities involve at least half of the tooth surface or reach the pulp.[4] Data were analyzed by SPSS 22.0, using Chi-Square tests.

Table 1 Subjects distribution based on socio-demographic characteristics

Variable		n	%
Gender	Boys	231	44.1
	Girls	293	55.9
Age	12	100	19.1
	13	93	17.7
	14	110	21.0
	15	89	17.0
	16	132	25.2
Fathers' occupation	Civil servants	63	12.0
	Farmers	218	41.6
	Fishermen	73	13.9
	Entrepreneurs/traders	128	24.4
	Private employees/BUMN	23	4.4
	TNI/Polri	17	3.2
	Unemployed	2	0.4
Mothers' occupation	Civil servants	51	9.7
	Farmers	91	17.4
	Fishermen	8	1.5
	Entrepreneurs/traders	45	8.6
	Private employees/BUMN	12	2.3
	Unemployed	317	60.5
Fathers' education	Not attending school/Not graduating primary school	53	10.1
	Graduating primary school/equivalent	154	29.4
	Graduating junior high school/ equivalent	106	20.2
	Graduating senior high school/equivalent	106	20.2
	Higher education/Diploma/Bachelor/Master	105	20.0
Mothers' education	Not attending school/Not graduating primary school	51	9.7
	Graduating primary school/equivalent	180	34.4
	Graduating junior high school/ equivalent	102	19.5
	Graduating senior high school/equivalent	113	21.6
	Higher education/Diploma/Bachelor/Master	78	14.9
Household income	<1.5 million	332	63.4
	1.5-2.5 million	92	17.6
	2.5–3.5 million	60	11.5
	>3.5 million	40	7.6
Total		16768	100.0

Source: (primary data, 2019)

Table 2 Mean of caries using ICDAS criteria of Bantaeng District in 2019

Code	Number of teeth		Mean	SD
	n	%		
0	4941	29.50%	9.43	5.47
1	1692	10.10%	3.23	6.26
2	2716	16.20%	5.18	7.01
3	3340	19.90%	6.37	7.3
4	1786	10.70%	3.41	5.14
5	1467	8.70%	2.8	4.7
6	826	4.90%	1.58	3.43

0 = No caries after the teeth have been air dried for a long time (5 seconds); 1 = first visual change in enamel after prolonged air drying, turbidity or discoloration of caries (white or brown lesions) seen; 2 = clear visual changes of the enamel. In wet condition, there is a carious opacity (white spot lesion) and or brown caries discoloration wider than the fissure/fossa; 3 = enamel decay is localized without involving the underlying dentin; 4 = underlying dark shadow of dentin with or without localized enamel decay; 5 = cavity in an opaque or discolored enamel involving the dentin underneath; 6 = loss of tooth structure, the cavity is deep and wide and dentin is clearly visible. Broad cavities involve at least half of the tooth surface or may reach the pulp.

Table 3 Percentage of community caries based on sociodemographic characteristics using ICDAS criteria of Bantaeng Regency
Source: (primary data, 2019)

Variables		ICDAS							Total
		0	1	2	3	4	5	6	
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
Gender	Boys	2299 (31.1%)	701 (9.5%)	989 (13.4%)	1442 (19.5%)	757 (10.2%)	796 (10.8%)	408 (5.5%)	7392 (100.0%)
	Girls	2638 (28.1%)	991 (10.6%)	1730 (18.5%)	1898 (20.2%)	1029 (11.0%)	671 (7.2%)	419 (4.5%)	9376 (100.0%)
Age	12	1032 (32.3%)	343 (10.7%)	480 (15.0%)	540 (16.9%)	351 (11.0%)	352 (11.0%)	102 (3.2%)	3200 (100.0%)
	13	970 (32.6%)	190 (6.4%)	357 (12.0%)	602 (20.2%)	362 (12.2%)	315 (10.6%)	180 (6.0%)	2976 (100.0%)
	14	1084 (30.8%)	263 (7.5%)	693 (19.7%)	636 (18.1%)	406 (11.5%)	326 (9.3%)	112 (3.2%)	3520 (100.0%)
	15	767 (26.9%)	203 (7.1%)	387 (13.6%)	735 (25.8%)	309 (10.8%)	231 (8.1%)	216 (7.6%)	2848 (100.0%)
	16	1084 (25.7%)	693 (16.4%)	802 (19.0%)	827 (19.6%)	358 (8.5%)	243 (5.8%)	217 (5.1%)	4224 (100.0%)
Fathers' occupation	Civil servants	825 (40.9%)	271 (13.4%)	196 (9.7%)	142 (7.0%)	150 (7.4%)	401 (19.9%)	31 (1.5%)	2016 (100.0%)
	Farmers	1568 (22.5%)	683 (9.8%)	1206 (17.3%)	1828 (26.2%)	606 (8.7%)	553 (7.9%)	532 (7.6%)	6976 (100.0%)
	Fishermen	628 (26.9%)	162 (6.9%)	493 (21.1%)	559 (23.9%)	226 (9.7%)	145 (6.2%)	123 (5.3%)	2336 (100.0%)
	Entrepreneurs/traders	1438 (35.1%)	394 (9.6%)	697 (17.0%)	633 (15.5%)	646 (15.8%)	179 (4.4%)	109 (2.7%)	4096 (100.0%)
	Private employees/BUMN	236 (32.1%)	144 (19.6%)	69 (9.4%)	132 (17.9%)	60 (8.2%)	78 (10.6%)	17 (2.3%)	736 (100.0%)
	TNI/Polri	220 (40.4%)	35 (6.4%)	51 (9.4%)	38 (7.0%)	87 (16.0%)	111 (20.4%)	2 (0.4%)	544 (100.0%)
	Unemployed	22 (34.4%)	3 (4.7%)	7 (10.9%)	8 (12.5%)	11 (17.2%)	0 (0.0%)	13 (20.3%)	64 (100.0%)
Mothers' occupation	Civil servants	686 (42.0%)	142 (8.7%)	118 (7.2%)	136 (8.3%)	18 (1.1%)	496 (30.4%)	36 (2.2%)	1632 (100.0%)
	Farmers	718 (24.7%)	139 (4.8%)	569 (19.5%)	772 (26.5%)	275 (9.4%)	204 (7.0%)	235 (8.1%)	2912 (100.0%)
	Fishermen	62 (24.2%)	7 (2.7%)	55 (21.5%)	92 (35.9%)	3 (1.2%)	24 (9.4%)	13 (5.1%)	256 (100.0%)
	Entrepreneurs/traders	462 (32.1%)	222 (15.4%)	187 (13.0%)	221 (15.3%)	265 (18.4%)	59 (4.1%)	24 (1.7%)	1440 (100.0%)
	Private employees/BUMN	133 (34.6%)	109 (28.4%)	36 (9.4%)	27 (7.0%)	13 (3.4%)	63 (16.4%)	3 (0.8%)	384 (100.0%)
	Unemployed	2876 (28.4%)	1073(10.6%)	1754 (17.3%)	2092 (20.6%)	1212 (11.9%)	621 (6.1%)	516 (5.1%)	10144(100.0%)

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Table 4 Relationship of sociodemographic and dental caries prevalence of ICDAS on children aged 12-16 years in Bantaeng District

Characteristics		ICDAS		Total	P value
		Not caries	Caries		
		n (%)	n (%)	n (%)	
Gender	Boys	43 (18.6%)	188 (81.4%)	231 (100.0%)	0.423
	Girls	64 (21.8%)	229 (78.2%)	293 (100.0%)	
Age	12	16 (16.0%)	84 (84.0%)	100 (100.0%)	0.172
	13	13 (14.0%)	80 (86.0%)	93 (100.0%)	
	14	29 (26.4%)	81 (73.6%)	110 (100.0%)	
	15	20 (22.5%)	69 (77.5%)	89 (100.0%)	
	16	29 (22.0%)	103 (78.0%)	132 (100.0%)	
Fathers' occupation	Civil servants	8 (12.7%)	55 (87.3%)	63 (100.0%)	0.320
	Farmers	44 (20.2%)	174 (79.8%)	218 (100.0%)	
	Fishermen	18 (24.7%)	55 (75.3%)	73 (100.0%)	
	Entrepreneurs/traders	31 (24.2%)	97 (75.8%)	128 (100.0%)	
	Private employees/BUMN	5 (21.7%)	18 (78.3%)	23 (100.0%)	
	TNI/Polri	1 (5.9%)	16 (94.1%)	17 (100.0%)	
	Unemployed	0 (0.0%)	2 (100.0%)	2 (100.0%)	
Mothers' occupation	Civil servants	4 (7.8%)	48 (92.2%)	52 (100.0%)	0.099
	Farmers	21 (23.3%)	69 (76.7%)	90 (100.0%)	
	Fishermen	3 (37.5%)	5 (62.5%)	8 (100.0%)	
	Entrepreneurs/traders	6 (13.3%)	39 (86.7%)	45 (100.0%)	
	Private employees/BUMN	1 (8.3%)	11 (91.7%)	12 (100.0%)	
	Unemployed	72 (22.8%)	244 (77.2%)	316 (100.0%)	
Fathers' education	Not attending school/Not graduating primary school	12 (22.6%)	41 (77.4%)	53 (100.0%)	0.026*
	Graduating primary school/equivalent	37 (24.0%)	117 (76.0%)	154 (100.0%)	
	Graduating junior high school/ equivalent	29 (27.4%)	77 (72.6%)	106 (100.0%)	
	Graduating senior high school/equivalent	17 (16.0%)	89 (84.0%)	106 (100.0%)	
	Higher education/Diploma/Bachelor/Master	12 (11.4%)	93 (88.6%)	105 (100.0%)	
Mothers' education	Not attending school/Not graduated primary school	12 (23.5%)	41 (76.5%)	53 (100.0%)	0.000*
	Graduating primary school/equivalent	50 (27.9%)	129 (72.1%)	179 (100.0%)	
	Graduating junior high school/ equivalent	33 (32.7%)	68 (67.3%)	101 (100.0%)	
	Graduating senior high school/equivalent	6 (5.3%)	107 (94.7%)	113 (100.0%)	
	Higher education/Diploma/Bachelor/Master	6(7.7%)	72 (92.3%)	78 (100.0%)	
Household income	<1.5 million	63 (19.0%)	269 (81.0%)	332 (100.0%)	0.521
	1.5-2.5 million	24 (26.1%)	68 (73.9%)	92 (100.0%)	
	2.5-3.5 million	12 (20.0%)	48 (80.0%)	60 (100.0%)	
	>3.5 million	8 (20.0%)	32 (80.0%)	40 (100.0%)	
	Total	107 (20.4%)	417 (79.6%)	524 (100.0%)	

Source: (primary data, 2019)

RESULTS

Table 1 show the distribution of subjects based on age, gender, fathers' and mothers' occupation, and fathers' and mothers' education with 524 subjects. Based on the age characteristics, most samples were 16 years old as many 132 people (25.2%). Based on the gender, most samples were 293 girls (55.9%). Most of the fathers worked as farmers as many as 218 people and mothers unemployed as many as 317 people.

Based on the characteristics of the education of fathers and mothers, most fathers' latest education were graduated primary school or equivalent as many as 154 people (29.4%) and mothers' latest education were graduated primary school or equivalent as many as 180 people (34.4%). Based on the income, most household income was less than 1.5 million as many as 332 people (63.4%). Based on the ICDAS there are 5.126 samples were in the moderate category.

Table 2 shows mean of the caries based on the ICDAS code of Bantaeng Regency in 2019. Code 0 is the highest with a mean of 9.34 and followed by code 3 of 6.37. For least mean was 1.58 with caries code 6.

Table 3 shows the characteristic of caries location with code 0 as many as 3899 (32.1%) in urban areas. In the girls there were more caries (code 3) as many as 1898 (20.2%). In terms of age, the largest group of subjects was 18 years with 1084 (25.7%).

In the characteristics of father's occupation, the group of farmers that experienced code 3 caries was 1828 (26.2%) while for the characteristics of mother's work, the unemployed group had code 0 as much as 2876 (28.4%) and code 3 was 2092 (20.6%). On the characteristic of father's education, subjects with a history of graduating primary school had more caries code 0 as much as 1269 (17.3%), caries code 2 as much as 1103 (22.4%), caries code 3 as much as 1139 (23.1%) whereas for characteristics of maternal education, subjects with a history graduating primary school had more

code 2 caries as many as 1544 (26.8%). On the characteristics of household income, income <1.5 million most experienced caries code 2 as many as 3421 (32.2%).

Table 4 shows the prevalence of dental caries status in the Bantaeng in 2019 based on gender, age, education and occupation of parents using the ICDAS criteria.

Based on the gender characteristics, there were more caries based on ICDAS criteria as many as 229 subjects (78.2%) in the girl gender. Besides gender-based criteria ICDAS have the results were not significant with p value = 0.423.

Based on the age characteristics, there were more caries based on the ICDAS criteria as many as 103 subjects (78.0%) at the age of 16 years. Besides the age of 12-16 years based on criteria ICDAS have the results were not significant with p-value = 0.172.

Based on characteristics of the father's job more tires caries based on criteria ICDAS many as 174 subjects (79.8%) on the father worked as a farmer, while the mother's occupation over many who have caries lesions as much as 244 subjects (77.2%) in unemployed mothers. In addition, father and mother occupations based on ICDAS criteria has insignificant results with a p-value= 0.320 for father's occupation and the results were not significant with p-value= 0.099 for mother's occupation which was statistically significant.

Based on the characteristics of the father's education more experienced caries based on ICDAS criteria as many as 117 subjects (76.0%) of fathers who graduated from primary school, while for the education of mothers more experienced caries based on ICDAS criteria as many as 129 subjects (72.1%) in mothers who graduated primary school. In addition, education of fathers and mothers based on ICDAS criteria has a significant result with a p-value = 0.026 for father's education and a significant result for a mother's education with a p-value of = 0.000 which was statistically significant.

Based on the results of income more caries based on ICDAS criteria as many as 269 subjects (81.0%) with income <1.5 million. In addition, income results based on ICDAS criteria have insignificant result (p-value= 0.521).

DISCUSSION

Dental caries is a very common chronic and cumulative disease, affecting 60-90% of school children and many adults throughout the world. If left untreated, dental caries can cause severe pain and infection which affects quality of life. However, dental care for oral diseases is very expensive and can be a major socioeconomic burden on individuals and the health care system.[8]

The WHO has ranked it number three among all non-communicable chronic diseases that require worldwide attention for prevention and treatment. ICDAS is a universally accepted system for evaluating the prevalence of dental caries, in where initial enamel lesions are estimated, helps in planning early care and monitoring caries patterns at the population level.[9]

In this study showed that the prevalence of caries in the girls was more common in 2927 moderate caries lesions (31.2%) compared to the boys.

Other studies conducted at schools in Pallikkaranai, a Chennai corporate zone, show that girls have a slightly higher prevalence of caries (2.3%) than boys, which was not statistically significant. Most studies in India show more caries prevalence in girls than boys which can be attributed to parents' negative attitudes towards oral care for girls. Ismail et al., found gender as a predictor of dental caries, with boys more affected than girls, and this variation could be related to different age groups and geographical locations of the study.[9]

In table 4 this study based on age characteristics shows that 16 years of age had more caries based on ICDAS criteria compared to 12-15 years of age.

This study is different from studies conducted in schools in Pallikkaranai showing a comparison of the prevalence of dental caries in children aged 6-14 years, that study shows an increase in the prevalence of dental caries at 10 years (57-76%) with the highest prevalence of 76% occurring at 10 years, but the prevalence of caries decreased to 69% at the age of 14 years.[9]

Other studies also conducted in New Delhi, India showed an increase in prevalence occurred until the age of nine years, after which there was a decrease in the prevalence of caries until the age of 12 and 15 years. The higher prevalence of caries with increasing age can be caused by the susceptibility of newly erupted teeth to rot in poor oral hygiene conditions. However, the suggested reason for decreasing caries prevalence after the age of 10 years is because of the increased level of manual dexterity of the child improving oral hygiene, raising awareness about oral health and deciduous caries of first and second molars replaced by newly erupted premolars at 12 years of age. Other suggested reasons are an increase in salivary IgA around the age of eight, which inhibits the attachment and adherence of oral bacteria to the epithelial and dental surfaces and neutralizes bacterial exotoxins and enzymes that contribute to the disease process. The distribution of the caries code in the study population was assessed and analyzed according to ICDAS II. In a sample of 2,796 subjects, 66,900 teeth were assessed and coded with ICDAS II criteria. Among the teeth rated 58,873 coded 0, which is around 87.97%, while 8,047 (12.03%) the remainder coded 1-6 with a value of 0.69% for code 1, 4.32% for code 2, 4,13% for code 2, 4.13% for code 3, 1.37% for code 4, 1.02% for code 5, 0.50% for code 6. The high-

est percentage of coding seen in code 2. Code 2 represents the lesion non-cavitation/initial in enamel according to ICDAS criteria.[10]

In this study shows that fathers who work as farmers have more caries and mothers who do not have jobs have more caries.

This research is in agreement with research at the Kerman school, Iran which suggests that father's occupation has a significant effect on caries prevalence, students whose father is a worker are at greater risk for developing carious lesions compared to others. In addition, the mother's occupation significantly influences the prevalence of caries, mothers whose mothers are housewives are more susceptible to caries than others.[11] Working mothers have better economic status and are more knowledgeable about better health, thereby improving the dental and oral health status of their children.

In this study shows that parents with lower income <1.5 million more caries than other income. This study is in agreement with research in Italy which shows that low family income and low education level of both parents are related to the presence of caries on children. These results are consistent with the results of a similar study, which revealed the relationship between the presence of caries children and the socioeconomic level of parents. Children from low-income families often go on a diet characterized by poor nutrition and rich in sugar and fat, which affects children to caries development and obesity. Low family income and low education level of both parents are related to the presence of children's caries.[11]

Conflict of interests

The authors declare no conflict of interest.

Ethics approval

Permission was approved from the Faculty of Dentistry, Ethics and Research Advisory Committee, Hasanuddin University.

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