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THE INFLUENCE OF ORAL CAVITY CONDITION AND BEHAVIOR ON CARIES RISK IN CHILDREN

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ABSTRACT

Caries prevalence on school children can be categorized as high at 1.4. Therefore, it was necessary to identify risk factors that affect it. Caries risk factors in children consist of direct risk factor, which include the condition of oral cavity, and indirect risk factor, that was the child's behavior. The study was to identify factors that influence the occurrence of caries in children. This was an observational research with cross-sectional design. The samples were 430 children between the ages of 10-12 years. The evaluated caries risk factors included pH level of saliva, the amount of plaque, caries experience, the child's knowledge about dental and oral health, the child's behavior in maintaining dental health, and dietary habit. The data were then analyzed using *chi-square test* and *multiple logistic regression*. Chi-square test showed that the condition of oral cavity and child's behavior were significantly related to caries risk factor, with p value of 0.000. The result of *multiple logistic regression analysis* indicated that the pH level of saliva ($p=0.036$; $POR=1.923$), the amount of plaque ($p=0.005$; $POR=2.382$), caries experience ($p=0.000$; $POR=4.048$), child's knowledge about dental and oral health ($p=0.016$; $POR=2.107$), child's behavior in maintaining dental health ($p=0.014$; $POR=2.103$), and child's dietary habit ($p=0.000$; $POR=3.316$) also significantly influenced the occurrence of caries. The study showed that pH level of saliva, the amount of plaque, caries experience, the child's knowledge about dental and oral health, the child's behavior in maintaining dental health, and dietary habit influenced the risk of caries in children.

Keywords: condition of oral cavity, child's behavior, caries risk in children

INTRODUCTION

Dental caries is one of dental and oral diseases in children which is commonly caused by poor dental care that might affect a child's growth and development.¹ Poor dental care might be caused by lack of knowledge about dental and oral health care.²

Dental caries is a multifactor disease which can be caused by both direct and indirect factor.³ Some of the factors that can directly influence caries are dental plaque, microorganism, and carbohydrate intake. It also takes time for caries to form. Indirect factors that can cause caries are dietary habit and dental care.³ Children are not yet developed proper skill and habit to maintain dental health which can lead to high oral hygiene index.⁴ It is essential to practice dental care in since early childhood so that children can learn the importance of dental hygiene to reduce the risk of caries in permanent teeth.⁵

Cognitive development in children starts with processing information, unraveling, making connection, and decision making. In normal growth, the thinking skill develops gradually until the age of 12. The memory becomes stronger and children can memorize at higher level. In this period, children will gain more knowledge and skills until they develop certain habits. Therefore, children can understand how caries forms, the effects, and how to prevent it.^{6,7}

This study aimed to identify factors and behaviors which might influence the incident of caries in school children.

MATERIAL AND METHODS

This was an observational research with cross-sectional design. The samples were 430 children between the ages of 10-12 years in the Province of Yogyakarta. The data were collected with stratified random sampling. The inclusion criteria were children with caries who were willing to participate in the study and had received consent from the parents. The research was conducted after receiving ethical clearance from Ethics and Advocacy Unit of the Faculty of Dentistry UGM.

The materials to analyze the condition of oral cavity were 1) disclosing solutio, 2) Catton swab, and 3) toothpaste. The instruments were 1) pH meter, 2) small glass, 3) dental diagnostic tools such as dental tweezers, dental explorer, spoon excavator, and mouth mirror, and 4) DMF/def-t index scoring form and PHPM. Questionnaire was used as instrument to assess the child's behavior, in this case their knowledge about dental health which consisted of six question items, behavior in maintaining dental health which consisted of four question items, and dietary habit which consisted of five question items.

To identify factors that influenced caries risks, the data were analyzed with chi-square test and multiple logistic regression.

RESULT

The samples in this study were 430 children, which consisted of 218 boys (50.69%) and 212 girls (49.31%). The condition of oral cavity was focused on the pH level of saliva which was mostly base (53.73%), the amount of plaque (58.60%), and caries experience (51.86%). Based on chi-square test, there was significant relationship between pH level of saliva ($p=0.000$ and $X^2= 12.160$), the amount of plaque ($p=0.000$ and $X^2= 22.304$), and caries experience ($p= 0.000$ and $X^2= 37.874$) with the risk of caries in children (Table 1).

Table 1.
Result of Chi-square Analysis on the Condition of Oral Cavity Factor with Caries Risk in School-aged Children

Risk Factor	Criteria	Caries Risk				p-value (sig)	X ²
		Low		High			
		n	%	n	%		
pH level of saliva	High	58	25.11	173	74.89	0.000	12.160
	Low	12	12.06	173	87.94		
Amount of plaque	High	29	11.51	223	88.29	0.000	22.304
	Low	53	29.78	125	70.22		
Caries experience	High	18	8.07	205	91.93	0.000	37.874
	Low		30.92	143	69.08		

p<0.05

Based on the result of chi-square test, there was a significant relationship between the child's knowledge about dental health ($p=0.000$ and $X^2=14.257$), behavior in maintaining dental health ($p=0.000$ and $X^2=12.294$), and dietary habit ($p= 0,000$ and $X^2=30.863$) with the risk of caries in children (Table 2).

Table 2.
Relation between Behavior Factors and Caries Risk on School-aged Children

Risk Factor	Criteria	Risk Factor				p-value (sig)	X ²
		Low		High			
		n	%	n	%		
Child's knowledge about dental health	Good	54	26.60	149	73.40	0.000	14.257
	Poor	28	12.33	199	87.67		
Child's behavior in maintaining dental health	Good	42	28.97	103	71.03	0.000	12.294
	Poor	40	14.04	245	85.96		
Child's dietary habit	Good	64	29.09	156	70.91	0.000	30.863
	Poor	18	8.57	196	91.43		

P < 0.05

The result of logistic regression analysis indicated that the condition of oral cavity factors, which consisted of pH level of saliva (p=0.036 and POR=1.932), the amount of plaque (p=0.005 and POR=2.382), and caries experience (p=0.000 and POR=4.408), influence the risk of caries in children (Table 3).

The child's behavior factors, which consisted of the child's knowledge about dental health (p=0.016 and POR=2.107), behavior in maintaining dental health (p=0.014 and POR=2.103), and dietary habit (p=0.000 and POR=3.13) significantly influenced the risk of caries in children (Table 3).

Table 3.
The Result of Logistic Regression Analysis on the Condition of Oral Cavity and Behavior of School-aged Children

Variable	Coefficient	p	POR	95 % CI	
pH level of saliva	0.658	0.036	1.932	1.046	3.568
Amount of Plaque	0.868	0.005	2.382	1.301	4.365
Caries experience	1.398	0.000	4.048	2.137	7.668
Knowledge about dental health	0.745	0.016	2.107	1.151	3.858
Behavior in maintaining dental health	0.743	0.014	2.103	1.162	3.805
Dietary habit	1.119	0.000	3.316	1.742	6.315
Constantan	-2.335	0.000	-	-	-

-2Log likelihood = 146,7813
R = 0.299
R² = 0.026

Additional notes:

POR : Prevalence Odds Ratio

CI : Confidence interval

p < 0.05

The result of the research indicates that 57% of the children did not know that vegetables and fruits could help dental hygiene and 81% of the children did not know that removing plaque could prevent cavity (Table 4).

Table 4.
Child's Knowledge Distribution Regarding Dental Health

Question	Aware		Unaware	
	n	%	N	%
Dental caries is cavity on the surface of the tooth	327	76	103	24
Brushing teeth regularly can prevent dental caries	383	89	47	11
Over eating candies and chocolate can cause cavity	245	57	185	43
Fruits and vegetables help to keep the teeth clean	185	43	245	57
Brushing teeth before going to bed can prevent cavity	310	72	120	28
Removing plaque can prevent cavity	82	19	348	81

Child's behavior analysis concerning dental and oral health indicated that 46% of the children occasionally brushed their teeth after breakfast, 35% rarely brushed their teeth before bed, 98% always brushed their teeth with toothpaste, and 34% never went to the dentists with their parents for checkup.

Table 4.
Child's Behavior Distribution on Maintaining Dental and Oral Health

Behavior	Always		Occasionally		Rarely		Never	
	n	%	N	%	n	%	n	%
Brush teeth after breakfast	116	27	198	46	95	22	21	5
Brush teeth before going to bed	21	5	133	32	151	35	125	29
Brush teeth with toothpaste	421	98	9	2	0	0	0	0
Go with parents to the dentists for checkup	52	12	129	30	103	24	146	34

The result of the research indicates that 39% of the children consumed sweets and cookies more than three times per day, 54% rarely ate fruits, and 43% rarely ate vegetables. 53% of the children occasionally drank water after meal (Table 5).

Table 5.
Child's Behavior Distribution Concerning Dietary Habit

Perilaku	Always		Occasionally		Rarely		Never	
	n	%	n	%	n	%	n	%
Eat sweets more than three times per day	116	27	99	23	168	39	47	11
Eat cookies more than three times per day	99	23	133	31	151	35	47	11
Eat fruits after meal	108	25	65	15	231	54	26	6
Eat vegetables in every meal	65	15	52	12	185	43	128	30
Drink water after meal	95	22	228	53	56	13	51	12

DISCUSSION

The result of the research showed that 53.72% of saliva samples had pH level > 6.5. This was comparable to the preceding studies which stated that the pH level of saliva in 9 to 11 years old was base.¹¹ This is due to high saliva secretion in children also which results in

high saliva volume.⁹ One of the functions of saliva is to serve as a buffer which helps neutralize saliva pH level after meal. Hence, high saliva volume will balance the pH level and in turn will reduce demineralization.¹⁰

The high amount of plaque (PHPM index > 30) indicated that most of the children had poor oral hygiene.⁴ The amount of plaque affects caries risk. Plaque is one of the risk factors of caries because it contains bacterial deposit and its product that forms and attaches to the surface of the tooth. Untreated plaque can lower the level of pH.¹¹ Plaque on the tooth surface is acidic, which takes 30-60 minutes to return to normal pH level of 7.¹² If it is not immediately and properly removed, plaque can reduce the pH of plaque. Sharp drop in the level of plaque pH can cause to the demineralization of the enamel in the form of white spots. If it is left untreated, it will lead to dental caries.¹³

Caries experience is the total of DMF-T and def-t index, which affects caries risk in children. This fits perfectly with the previous study which stated that children with high caries experience had bigger risk of dental caries when they grew up.¹⁴ Teeth with caries contain more bacteria that produce acid which lowers the pH more compared to tooth that do not suffer from caries.¹⁵

55.58% or 227 of the children had poor knowledge about dental health. More than half the children (57%) rarely consumed fruits and vegetables because they did not think that fruits and vegetables help to clean the teeth. 72% of the children did not know the importance of brushing teeth before going to bed and 81% had poor knowledge about caries prevention through removing the plaque (Table 5). Poor knowledge about dental health resulted in poor behavior in maintaining dental health and dietary habit.⁷

Someone's knowledge is influenced by predisposition factors which include economy status, age, sex, and family structure. Age influences the ability to learn and think. Hence, the older someone is, the more developed their learning and thinking skills are. School-aged children have started to develop logic skill.¹⁶ As the result, good knowledge will motivate them to develop good behavior as well. School-aged children with good knowledge about dental health will develop good behavior in maintaining dental and oral health. Health-conscious children tend to choose non-cariogenic food.⁷

Most of the children had poor behavior in maintaining dental and oral health. This was visible from the low number of children who brushed their teeth regularly after breakfast and before going to bed. It is necessary to brush teeth after breakfast and before bed.¹³ Children with good behavior and motivation in dental care will have low oral hygiene index and low caries index.¹⁷ Children who regularly go to the dentists for checkup will have excellent oral hygiene because they have developed the habit of brushing their teeth at least twice a day, after breakfast and before bed.¹ 46% of the children had poor dietary habit, which was noticeable from their habit of eating sweets and cookies more than three times a day (Table 6). The habit of consuming sweets more than three times per day as snack can lead to dental caries.¹⁰ In addition to that, most of the children in this study rarely ate fruits after meal. Fruits contain high protein and water which can help clean food residue. Consuming fruits and vegetables can also stimulate mastication function and increase saliva secretion.¹⁹

The result of this study indicated that more than half of the children (53.72%) had poor dietary habit. This condition stems from one of the habits of children that can cause caries, that is the habit to consume cariogenic food.²⁰ A child's dietary habit affects their caries risk. Children who prefer sweet food will have higher risk of dental caries.²¹ One of the caries risk factors in school-aged children is their dietary habit.³ This habit might be influenced by the

food options in school cafeteria. The survey on snacks for elementary school students in the Province of Yogyakarta showed that 80% of children consumed cariogenic food every day.²²

CONCLUSION

Based on the research, it can be concluded that the condition of oral cavity and child's behavior statistically affected caries risk in children. The condition of oral cavity factor measured the pH level of saliva, the amount of plaque, and caries experience. Behavioral factor assessed a child's knowledge about dental and oral health, behavior in maintaining dental health, and dietary habit.

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