The Relationship Between Dental Caries And Oral Hygiene On Patients Of The Pediatric Dental Clinic At Dental Hospital Of Jember University

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ABSTRACT

Introduction: The most prevalent dental and oral diseases in Indonesian society are dental caries and periodontal disease. Children become the most vulnerable group to these problems due to their eating habits to high cariogenic foods as well as less awareness and knowledge about oral health care. Objective: The purpose of this study was to determine the relation and the value of caries index and oral hygiene on patients of Pediatric Dental Clinic at Dental Hospital Jember University. Materials and Methods: The type of this research was analytic survey with cross sectional approach. The samples were 98 people selected by purposive method sampling. The study was conducted on the samplesby oral examination to observe dental caries and oral hygiene. The measurement method of dental caries was carried out using def-t index and DMF-T index while for oral hygiene using OHI-S index. Result and Conclusion: The average of def-t index on patients of Pediatric Dental Clinic at Dental Hospital Jember University was 10.7 (very high) while the average of DMF-T index was equal to 1 (very low) and the average value of OHI-S index was 1,37 (moderate). The result of Correlation Test did not show any significant relation ($p > 0.05$) between dental caries and oral hygiene on patients of Pediatric Dental Clinic at Dental Hospital of Jember University. It is concluded that there is no significant correlation between dental caries and oral hygiene on patients of Pediatric Dental Clinic at Dental Hospital of Jember University.

Keywords : def-t index, dental caries, DMF-T index, OHI-S index, oral hygiene.

INTRODUCTION

Oral health is an integral part of general health that may affect a person's quality of life. In Indonesia oral health problems still remain as a major constraint to both adults and children. The most oral and dental diseases suffered by Indonesian people are caries and periodontal disease [1]

Children are the most susceptible groups to oral health problems. It is caused by their bad eating habits especially on snacking cariogenic foods as well as lack awareness

and knowledge about appropriate oral health care. These habits will bring bad impacts on children's oral cavity, the food remains, the kind sucrose, is retained on the surface of teeth. Without proper cleanup efforts, it will be fermented by microorganisms in the plaque into acid that can dissolve the enamel and accelerate the process of caries development [2]

Oral health status in general is expressed in the prevalence of dental caries and periodontal disease. Observation of oral health status, in the case of dental caries, is conducted using Index Decay Missing Filled Teeth (DMF-T) [3] According to WHO the rate of dental and oral hygiene is carried out using the Simplified Oral Hygiene Index (OHI-S) [4]

Sufiawati *et al.* (2002) stated that elementary school students of class I, II and III treated in the students' clinic of Dentistry Faculty of Padjajaran University had poor dental and oral health with the average def-t index score of 10.2. In his research on elementary students, Manurung (2014) stated that there was no student with good oral hygiene, 60% of elementary school students had poor oral hygiene with an average score of OHI-S of 3.89, while the 40% of primary school students had moderate oral hygiene with an average score of OHI-S 2.58. Based on this condition the author intends to conduct an epidemiological study to determine the value of the index of dental caries and oral hygiene in patients at the Pediatric Dental Clinic of Dental Hospital of Jember University and their mutual relationship.

METHODS

Type of the study was analytic survey with cross sectional approach. The study population was the patients of Pediatric Dental Clinic of Dental Hospital of Jember University in 2014. The sample selection was done by purposive sampling and sample number was calculated using the formula of Slovin and obtained 98 samples. This research was conducted October to December 2015 at Pediatric Clinic of Dental Hospital of Jember University.

The first phase of this research is the preparation of tools and materials. The oral examination of samples was subsequently conducted to observe caries and oral hygiene samples. The measurement method used for dental caries was an index of def-t and DMF-T while oral hygiene using the OHI-S index.

Caries scoring was carried out by observing the components of caries decay visually using mouth mirror and straight explorer to observe whether there were dental cavities in the samples. Exfoliated components were observed visually using mouth mirror in primary teeth of patients to determine whether there were missing teeth due to caries. Missing components was observed visually using mouth mirror in the permanent dentition of the patients to determine whether there were missing teeth due to caries or for other reasons. Filling components was observed visually using mouth mirror to determine whether there were teeth been that had been filled due to caries which were still in good condition. Subsequently the data resulted were calculated based on the formula as below.

Score of def-t index/ individual = d+e+f
Score of DMF-T index/ individual = D+M+F
Mean of def-t/DMF-T indices = $\frac{\text{total def/DMF}}{\text{Number of samples examined}}$

In this study, the oral hygiene was measured by OHI-S index according to Green and Vermilion [5]. The examination was carried out on six tooth surfaces i.e. buccal surface of the first molars of right maxilla (tooth 16), the labial surfaces of the first incisor teeth of right maxilla (tooth 11), the labial surfaces of left molars of maxilla (tooth 26), the lingual surfaces of the left molars of mandible (tooth 36), labial surface of first left incisor tooth of mandible (tooth 31) and the lingual surface of right molars of the mandible (tooth 46).

In each of the surface, the measurement was performed on *debris score simplified index* (DI-S) score and *simplified calculus index* (CI-S) score, while the OHI-S score is obtained by summing the scores of DI-S and CI-S.

The data obtained were subsequently tested for normality and homogeneity using *Kolmogorov-Smirnov Test* and *levene Test*. If the data obtained were normal and homogeneous distribution, they were subsequently assessed using *Pearson correlation test-Correlation Test*. If the data obtained were not normally and homogenously distributed, they were assessed using *Spearman-Correlation Test*.

RESULTS

Results of the study associated with dental caries and oral hygiene in patients at the Pediatric Dental Clinic of Dental Hospital of Jember University is presented as below.

Table 1 shows that the average score of OHI-S in female patients is 1.27 (good) and male patients is 1:46 (medium), it can descriptively be concluded that female patients have better oral hygiene than male patients.

Table 2 shows that the patients possessing the finest oral hygiene were those aged 12 years with an average score of OHI - S of 0.67 (good).

Table 3 shows that the average score of def-t index of the patients at the Pediatric Dental Clinic of Jember University is 10.7 (very high). The male patients possess higher scores i.e. 11.5 (very high) compared to female patients with a score of 9.8 (very high).

Table 4 shows a decline of index scores of def - t in line with the age of the patient.

Table 5 shows that the average DMF - T index score of the patients of the Pediatric Dental Clinic of Jember University is 1 (very low). It is also found that the female patients also have higher DMF-T index score of 1.1 (very low) as compared to male patients with a score of 0.8 (very low).

Table 1 Results of oral hygiene the examination using OHI - S index based on gender

Gender	n	OHI-S Score	Mean of OHI-S Score	OHI-S Criteria					
				Good		Moderate		Poor	
				n	%	n	%	n	%
Male	53	77,41	1.46	23	43	29	55	1	2
Female	45	57,12	1.27	23	51	21	47	1	2
Total	98	134,53	1.37	46	47	50	51	2	2

Table 2. Results of the oral hygiene examination using OHI - S index based on age

Age	n	OHI-S Score	Mean of OHI-S Score	OHI-S Criteria					
				Good		Moderate		Poor	
				n	%	n	%	n	%
6	11	12,67	1,15	6	55	5	45	0	0
7	47	65,34	1,39	24	51	22	47	1	2
8	31	43,38	1,40	12	39	19	61	0	0
9	7	10,64	1,52	3	43	3	43	1	14
10	1	1,83	1,83	0	0	1	100	0	0
12	1	0,67	0,67	1	100	0	0	0	0
Total	98	134,53	1,37	46	47	50	51	2	2

Table 3 Results of the dental caries and def - t index examination based on gender

Gender	Dental Examination						
	n	d	e	f	∑deft-t	Mean	Criteria
Male	53	453	152	2	607	11,5	Very High
Female	45	294	146	1	441	9,8	Very High
Total	98	747	298	3	1048	10,7	Very High

Table 4 Results of dental caries - def t index examination by age group

Age	n	Dental Examination					
		d	e	f	∑deft-t	Mean	Criteria
6	11	95	43	0	138	12,54	Very Low
7	47	424	155	2	581	12,36	Very Low
8	31	181	81	1	263	8,5	Low
9	7	38	19	0	57	8,14	Low
10	1	6	00	0	6	6	Very Low
12	1	3	0	0	3	3	Very Low
Total	98	747	298	3	1048	10,69	Very Low

Table 5 Results of the dental caries examination and DMF - T index based on gender

Gender	n	Dental Examination					
		D	M	F	∑DMF-T	Mean	Criteria
Male	53	53	44	1	45	0,8	Very Low
Female	45	45	46	0	50	1,1	Very Low
Total	98	98	90	1	95	1	Very Low

Table 6 Results of the dental caries examination and DMF - T index based on age group

Age	n	Dental Examination					
		D	M	F	∑DMF-T	Mean	Criteria
6	11	2	0	0	2	0,2	Very Low
7	47	30	0	0	30	0,6	Very Low
8	31	46	4	1	51	1,7	Low
9	7	11	0	0	11	1,6	Low
10	1	1	0	0	1	1	Very Low
12	1	0	0	0	0	0	Very Low
Total	98	90	4	1	95	1	Very Low

Table 6 shows that the patients with lowest average score of DMF - T index is group age of 12 years with average score of 0 (very low)

The data obtained were further assessed using correlation test. It is known that the data of def-t and OHI-S index are normally distributed and homogeneous while the data of DMF- T index is not normally distributed and homogeneous. The results of correlation tests show no significant relationship between the def - t index and OHI-S index p = 0.664 (p >

0.05), and there is also no significant relationship between the DMF-T index and OHI-S index p = 0.173 (p > 0.05) in the patients of Pediatric Dental Clinic of Dental Hospital of Jember University.

DISCUSSION

Oral hygiene plays an important role in the occurrence of oral disease. If oral hygiene is not maintained properly, it will cause various diseases in the oral cavity. Both good and bad indicators of oral hygiene can be measured using OHI-S index. The goal of OHI-S index is to observe the condition of a person's oral cavity. In addition, it is also used to assess the effectiveness of tooth brushing. Thus, the poor oral hygiene does not only occur to those with poor behavior of oral and dental treatment but also to those with good behavior of dental and oral treatment, but the time and frequency of tooth brushing are still mistaken. Oral hygiene in this study was assessed using OHI-S index.

The test results of OHI-S index in the patients of Pediatric Dental Clinic of Dental Hospital of Jember University are in a category of average score 1.37 (moderate). The results also show differences of OHI-S scores between male and female patients. Oral hygiene of female patients' is better than that of male patients'. Table 1 shows female patients' average score is 1.27 (good) whereas the male patients' average score is 1.46 (moderate). These results are supported by Worang *et al.* (2014) in his research stating that girls did better in maintaining oral health than boys.

The above OHI-S score difference is allegedly influenced by the children's psychological condition. Boys tend to neglect the condition on their own, including oral health. In addition, the above difference may also be influenced by age factor because it is related to the level of maturity. Girls get mature faster than do boys. Maturity is also alleged to trigger girls to maintain dental and oral health. The results are consistent with the research conducted by Zetu in Ningsih (2015) stating that girls have more positive attitude towards oral hygiene and have high confidence to improve their oral hygiene [6]

The patients with the best oral hygiene are those aged 12 years with an average score of 0.67 (good) (Table 2). These results are consistent with the research conducted by Mawuntu et al. (2015) stating that the age of the sample (> 10-12 years) have a percentage of the most excellent oral hygiene i.e. 68.42 % compared with the other two age groups of samples. It is due to children at this age are able to maintain the cleanliness of their own including their dental and oral hygiene [7]

Caries is a disease of dental hard tissue like enamel, dentin and cementum caused by the activity of microorganisms in carbohydrate that can be fermented. Caries is marked by the demineralization of dental hard tissue which is further followed by a breakdown of the organic material, which causes bacterial invasion and death of the pulp as well as the spread of the infection to the periapical tissue leading to pain [8] In this study caries was measured using def-t and DMF-T indices.

Examination of caries based on the def-t index shows that the patients of Pediatric Dental Clinic of Dental Hospital of Jember University have an average score of def-t of 10.7 (very high). These results are consistent with the research carried out by Sufiawati *et al.* (2002) in which the study showed an average score of def-t of 10.2 (very high). The high rate of caries in children can be caused by the habits of consuming cariogenic food. The habit of consuming cariogenic food leads to increased production of acid in the mouth leading to reduced pH of saliva to 5.5 or less started in 5-15 minutes after consuming the food and stimulating the process of caries [9]

Deciduous teeth are more susceptible to dental caries than permanent teeth. The enamel of permanent teeth contains more minerals and is more dense than enamel in primary teeth. It becomes one of the reasons for the high prevalence of caries in children [10]

The results of the research also show that male patients have higher score of def-t than female patients. Male patients have average score of def-t of 11.5 (very high) while female patients have 9.8 (very high) (Table 3). These results are consistent with the research carried out by Worotitjan et al. (2013) showing that the male students have higher score of DMF-T (3.86) than female students (3.47). It occurs because girls are more willing to keep it cleans [11]

The score of def-t is decreased in line with more age of the patients examined at Pediatric Dental Clinic of Dental Hospital of Jember University (Table 4). It is associated with the patient's dentition phase change. The age of patients in this study ranged from 6-12 years. The age of 6 years is the early phase of the permanent teeth starting to grow in the oral cavity of patients initiated by one permanent molar tooth eruption and then in line with the age of the patient, the eldest of the teeth will be replaced by permanent teeth [12] It makes the assessment component of the def - t index decreased, and declines the scores of def- patients. There is a relationship between caries prevalence and age. It is associated with a time of tooth eruption, which early erupted tooth will tend to have a higher index of dental caries compared to the last erupted tooth thus it will exposed to dental caries risk factors for quite long time [13]

Caries examination based on the DMF-T index shows that female patients have a higher score of DMF-T than male patients (Table 5). The prevalence of dental caries in women which is higher than in men is caused by tooth eruption of girls that is faster than that of boys, thus the teeth of girls are longer in the oral cavity and have more time to be exposed to risk factors causing caries [13]

The results of caries examination based on age group shows that patients with the best average score of DMF-T are the patients aged 12 years. Table 6 shows that patients aged 12 possess average DMF-T score of 0 (very low) indicating that patients age 12 possess good oral hygiene without caries in their oral cavities since a child aged 12 years has started to realize the importance of maintaining dental and oral health [14]]. The older children are the broader cognitive development they have. They have wider experience and are able to process information well because of their biological development and adaptation development of cognitive structures [15]

Correlation test conducted shows no significant relationship between the def - t index and OHI- S index ($p > 0.05$) and also no significant relationship between the DMF-T index and OHI-S index ($p > 0.05$). These results indicate that caries is not influenced by the cleanliness of the oral cavity. Rehman *et al.* (2008) states that there is no significant relationship between the DMF-T index and OHI-S index. In his study he concludes that the frequency of sugar intake, frequency of eating snacks between meals, and socio-economic status play an important role in the DMF-T index in school children aged 11-14 years [16]

Dental and oral hygiene in this study is measured using OHI-S index. OHI-S index measurement is based on the calculation of the debris index and calculus index. Debris is a soft material that is attached to the tooth surface to form plaque, material alba, and food debris while calculus is a hard deposit caused by the deposition of inorganic salts of which main composition are calcium carbonate and calcium phosphate mixed with debris, microorganisms and cells epithelial-cell desquamation [5]

Oral hygiene assessment carried out by several stages; first applying disclosing solution on the surface of the tooth to be examined, instructing the children to gargle and finally performing assessment of oral hygiene by calculating score of the dental plaque [17] In the study, researchers do not use the disclosing solution for measuring dental plaque, the researchers only use explorer after the instructing the patients to gargle thus it may affect the results.

Plaque plays an important role in the occurrence of oral disease. The bacteria present in plaque are responsible for the occurrence of tooth decay, the bacteria will metabolize the food remains left in the oral cavity. Plaque attached to the tooth surface contains a lot of bacteria, especially *Streptococcus* and *Lactobacillus*. The bacteria will metabolize the cariogenic food remains, particularly fermentable carbohydrates (sucrose, glucose, fructose and maltose). The carbohydrate possesses tiny and low weight molecules thus they are easily absorbed and metabolized by bacteria. The metabolism results can produce not only acids but also extracellular polysaccharides, polysaccharide intracellular, alcohol and carbon dioxide (CO_2) [5]

Lactic acid is the most widely produced by the bacteria, besides there are also pyruvic acid , acetic acid, propionate acid, and formic acid. These acids will be preserved by plaque on the tooth surface resulting in a reduction in plaque pH below normal. If a person frequently and constantly consumes carbohydrates that can be fermented (sugar), the plaque pH will remain below normal leading to tooth surface demineralization i.e. the solubility of calcium phosphate in tooth enamel triggering tooth decay that causes caries [5]

The decrease in plaque pH is not always followed by the process of caries, low plaque pH may return to a normal pH caused by other metabolism of foods consumed e.g. metabolic substrates containing nitrogen will produce bases, it also contains a base compound (NH3) as a result of metabolism of urea in saliva. The results of base metabolism can also cause insoluble calcium phosphate replenished (remineralization). This supports the findings that the presence of a substrate (debris) which can be metabolized by bacteria that create acidic conditions (decline of plaque pH) is not always followed by the caries

process, it depends on the individual's ability to restore the plaque pH turn to normal [5].

Some foods have protective factors to inhibit the demineralization of the tooth surface. Foods requiring more mastication that may stimulate the flow of saliva and increase the capacity of the buffer can neutralize the acid environment in the oral cavity assisting to restore the normal pH of the plaque pH within a fairly short time [18]

CONCLUSIONS AND SUGGESTIONS

The patients at the Pediatric Dental Clinic of Dental Hospital of Jember University have an average score of def - t index with very high criteria. The average score of the index of DMF-T criteria is very low and the average index score of OHI-S with the moderate criteria. Results also revealed that there is no association between caries and oral hygiene thus it can be concluded that dental caries is not affected by the cleanliness of the oral cavity.

Researchers hope the research can be used as a foundation to carry out the efforts to improve oral health education both at the Dental Hospital of Jember University and at schools around Jember Regency to realized optimum oral health in society.

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