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Research Report

The correlation between untreated caries and the nutritional status of 6–12 years old children in the Medan Maimun and Medan Marelan sub-district

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ABSTRACT

Background: *In Indonesia, dental caries constitute one of the most common dental health problems in children. Untreated dental caries will cause both pain and inconvenience when eating, resulting in a reduced appetite which can negatively affect the body mass index (BMI).* ***Purpose:*** *This study aimed to investigate the correlation between untreated caries and nutritional status in children aged 6-12 years old in the Medan Maimun and Medan Marelan sub-districts.* ***Methods:*** *An analytical observation study with cross-sectional design was adopted. The number of child subjects totaled 350, divided into two groups, namely; the PUFA/pufa group (n=172) and the Non-PUFA/pufa group (n=178). Samples were selected on the basis of purposive sampling. Oral examination was subsequently performed using the PUFA/pufa index. The height and weight of the subjects were assessed according to the Indonesian Ministry of Health's BMI criteria of 2011. Thereafter, Chi square, Spearman and Mann-Whitney tests were all performed as analytical tests.* ***Results:*** *The results of this research revealed a significant correlation between caries status and BMI ($p<0.001$) in both the PUFA/pufa and Non PUFA/pufa groups ($r=-0.515$), as well as between the mean PUFA/pufa score and age. However, there was no significant correlation between the mean PUFA/pufa score and gender.* ***Conclusion:*** *It can be concluded that a correlation exists between untreated caries and the nutritional condition of children aged 6-12 years old in the Medan Maimun and Medan Marelan sub-districts.*

Keywords: *PUFA/pufa index; body mass index; caries*

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INTRODUCTION

The Global Oral Health Program of the World Health Organization (WHO) emphasizes that dental and oral health is integrated with general health.[1] Caries represent one of the most common dental health problems affecting the world's population. Caries are formed through a process of demineralization of hard tooth tissue, followed by damage to organic matter caused by various mutually-influencing factors (host, substrate, bacterium, time factor and immune response). Caries can affect individuals within most populations around the world at various ages, in a range of cultures and ethnicities and socioeconomic situations.[2–4] According to the WHO, 60–90% of cases of caries were found in school-aged children and a certain number of adults worldwide.[5] Based on statistics from the RISKESDAS of North Sumatra, in 2007 the prevalence of dental and oral problems among the Medan municipal population amounted to 18.8%, increasing to approximately 19.4% in 2013 - data indicating an increase in such problems. These conditions also suggested that dental and oral problems, especially caries, should receive greater attention.[6,7]

The continuous caries process, if untreated, can make various microbes in the oral cavity expand into the pulp tissue via open dentine tubules, leading to acute and chronic inflammatory responses in the pulp possibly accompanied by lesions around the soft tissue.[8–10] Children with caries are likely to tolerate their condition as long as the caries do not interfere with their activities. Moreover, the limited access to hospital and high cost of oral health services lead

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to a lack of consciousness on the part of parents regarding dental and oral care for their children.[11] These conditions are exacerbated by health policies that consider caries a low priority health issue since they are rarely reported as causing death.[12]

Children with severe caries are reported as experiencing frequent toothache and problems when eating certain foods, feeling embarrassed about smiling, as well as no longer playing with other children.[12] Another piece of research showed that 88.7% of the children studied were experiencing dental problems, affecting at least one of their eight daily activities. Activities that have the highest impact are eating (81.3%), keeping the mouth clean (40.5%) and smiling (32.2).[13] The pain and discomfort experienced by children when eating can even lead to a decrease in their appetite and life quality affecting their growth and development.[3,9,14] Decreased food intake due to the pain experienced by children when chewing can reduced nutritional intake compromising their nutritional status. The nutritional status of children is usually indicated by their body mass index (BMI).[12]

Several pieces of research have actually revealed there to be a correlation between the severity of caries (PUFA/pufa) and BMI. A recent investigation even suggested that children with odontogenic infections are at increased risk of weight loss compared to those without odontogenic infections.[3] Thus, preventing severe caries is important since it can affect general health, life quality, productivity and growth in children. This study aimed to analyze the correlation of untreated caries and nutritional status in children aged 6–12 years old in the Medan Maimun and Medan Marelan sub-districts.

MATERIALS AND METHODS

This research was conducted from March to August 2016 and represented- an observational analytic study with cross-sectional design. The research population consisted of elementary-school children aged 6–12 years resident in the Medan Maimun and Medan Marelan sub-districts. Sampling was then performed using a purposive sampling technique. The child samples selected for this research numbered 350, consisting of 178 (50.9%) males and 172 (49.1%) females. These children were drawn from the students of SDN 060788 and SDS Al-Falah in Medan Maimun sub-district, as well as from those attending SDN 064007 and SDS Mandiri in Medan Marelan sub-district. They were then divided into two groups, namely: a non-PUFA/pufa group consisting of 172 children and a PUFA/pufa group comprising 178 children.

Oral examination was performed using a PUFA/pufa index, assessing oral cavity conditions caused by untreated caries, such as: infection with pulp involvement (P/p), ulceration of the oral mucosa due to root residual tooth fragments (U/u), fistula (F/f) and abscesses (A/a). Lesions around tissue without pulp involvement due to untreated caries were not recorded in this research. One score was given for each tooth. Uppercase (PUFA) was used to assess permanent teeth, while lowercase (pufa) was used to assess decidual teeth. One score was given if there was a permanent tooth has problematic. However, if decidual and permanent teeth proved to be problematic, both would be given a score. Non PUFA/pufa criteria consisted of dental caries that did not involve pulp.[9]

The nutritional status of children was subsequently assessed by calculating the BMI, dividing body weight (in kilograms) by height (in meters) squared. The BMI criteria used in this research related to age and sex in children aged 5–18 years and was based on those of Kemenkes RI 2011 which assigned them to one of three nutritional status categories, namely: underweight, normal and overweight.

RESULTS

The total number of research samples amounted to 350 children aged 6–12 years old in Medan Maimun and Medan Marelan sub-districts. The samples consisted of 178 (50.9%) male children and 172 (49.1%) female children (Table 1). Moreover, the research results indicated that the largest percentage of the underweight category, as many as 90 samples, was found in groups of children with PUFA/pufa (Table 2). Furthermore, based on the Chi-Square test results, there was a significant correlation between the PUFA/pufa group and the non-PUFA/pufa group with BMI ($p<0.001$). The results revealed that the highest mean of PUFA/pufa score was in the underweight category (Table 3).

A normality test was subsequently performed by means of a Kolmogrov-Smirnov test the results of which showed that the variables of PUFA/pufa score and BMI were not normally distributed (p value <0.001). Consequently, a Spearman's correlation test was conducted whose results confirmed a significant correlation with moderate correlation strength between the mean PUFA/pufa score and the mean BMI score (r=-0.515) with a p value of less than 0.001. According to Sopiyudin, the mean correlation

Table 1. Characteristics of the research samples

Age	Males	Females	n (%)
6	17	29	46 (13.2)
7	22	27	49 (14.0)
8	32	18	50 (14.3)
9	24	24	48 (13.7)
10	26	27	53 (15.1)
11	26	26	49 (14.0)
12	31	24	55 (15.7)
Total	178	172	350 (100)

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Table 2. Correlation of PUFA/pufa and BMI in children aged 6–12 years

Group of children	Body mass index			Total	p
	Underweight n (%)	Normal n (%)	Overweight n (%)		
Non PUFA/pufa	9 (5.2)	129 (75.0)	34 (19.8)	172	<0.001
PUFA/pufa	90 (50.6)	82 (46.1)	6 (3.4)	178	
Total	99 (28.3)	211 (60.3)	40 (11.4)	350	

* p value <0.05 = the result of the chi-square statistical test was meaningful

Table 3. Distribution of the mean PUFA/pufa score to body mass index in children aged 6-12 years

Body mass index		Mean pufa score	Mean PUFA score	Mean PUFA + pufa score
I.	Underweight	4.04±2.65	0.64±1.42	4.68±2.27
II.	Normal	2.75±1.73	0.14±0.41	2.89±1.62
III.	Overweight	1.33±1.21	0.33±0.51	1.66±0.81

strength is supposedly in the range of 0.40–0.599. The negative sign indicates the direction of correlation, which means the result is in the opposite direction. In other words, the higher the PUFA/pufa score, the smaller the BMI score in the samples.

In addition, the results of this research also demonstrated that there was no correlation between the severity of caries, as indicated by the PUFA/pufa score, and gender (p=0.606). However, the mean PUFA + pufa score was higher in males than in females. Moreover, the results of this research also revealed that the mean PUFA + pufa score in the 6-8 years age group was 4.50 ± 2.255, while that in the 9-12 years age group was 3.08 ± 1.869 with p value <0.001. This suggests a correlation between caries severity status based on PUFA/pufa score and age group (Table 4).

DISCUSSION

The results of this research found that there was a significant correlation (p <0.001) between the PUFA/pufa group and the non-PUFA/pufa group with BMI. The underweight children, numbering as many as 90 individuals, tended to be more commonly found in the PUFA/pufa group. Nevertheless, in the non-PUFA/pufa group there were evidently still a number of children within the underweight category. This indicates that caries may affect BMI since the growth of children depends on their diet and metabolism factors that can be affected by caries.[15] Thus, children with many caries that do not extend to the pulp can, nonetheless, experience inefficient mastication with the result that the food is not processed perfectly, eventually resulting in a challenge for the body in absorbing food efficiently (Table 2).

The results of this research also indicated a negative correlation between the mean PUFA + pufa score and BMI (r=-0.515) as illustrated in Table 4. This suggests a close correlation between PUFA/pufa and BMI. Therefore, the higher a child's PUFA/pufa score, the lower the value of his/her BMI. In other words, a child with a significant amount of PUFA/pufa in his/her oral cavity will lose weight. Similarly, research conducted by Benzian in 2011 revealed that children with caries extending to their dental pulp have a higher risk of decreased BMI than children with caries that do not affect the pulp in their teeth.[3] As with previous investigations, in this research the mean PUFA/pufa score in children falling within the underweight category was 4.68 ± 2.27, higher than with that in children constituting the overweight category (1.66 ± 0.81) as shown in Table 3. This is because caries has a number of impacts on the daily activities of children, one of which is a reduced appetite. Toothache renders mastication difficult for them, so they will be fastidious in selecting food. In the long term, this condition can impede their nutritional intake, with the resulting lack of nutrient intake, ultimately, having an impact on their BMI.

However, unlike the results reported here, research conducted in Surabaya argued that there is no correlation between pufa or PUFA and BMI in children aged 6–12 years.[16] According to Hooley,[17] there are several factors causing the absence of correlation between caries and BMI. One of these is a failure to categorize samples into various categories of BMI when assessing samples with lower weight, average weight and higher weight. In this research, the distribution of variables based on body weight was not normal.

Age also affects the occurrence rate of caries. The results of this research indicated that the mean pufa score was higher in children aged 6–8 years, while the mean PUFA score was higher in children aged 9–12 years (Table 4). Similarly, research conducted by Jain in 2014 indicated that the highest mean pufa score, as much as 2.63, is found in children aged 5–8, while the mean PUFA score increases at age 9–12 and 13–16, to 0.18 and 0.99 respectively.[18] This condition may occur since at the age of 6–8 years the number of decidual teeth exceeds that of permanent teeth and these decidual teeth have been exposed far longer to caries factors in the oral cavity.

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Table 4. Correlation of the mean PUFA/pufa score and the age group

Age (years)	n	Mean pufa	p	Mean PUFA	p	Mean PUFA+pufa	p
6–8	85	4.48 ± 2.25	<0.001	0.02 ± 0.152	<0.001	4.5 ± 2.255	<0.001
9–12	93	2.33 ± 1,936		0.75 ± 1.404		3.08 ± 1.869	

* p value <0.05 = the result of the Mann-Whitney statistical test was meaningful

The mean PUFA + pufa score in this research was higher in the 6–8 years age group than in that of 9–12 years. This means that the mean PUFA + pufa score will decrease with age. This finding is consistent with a theory suggesting that the risk of caries decreases with age since, as children mature, their knowledge of dental health will expand, causing them to strive to maintain healthy teeth.[11] As a result, it can be concluded that there is a correlation between untreated caries and nutritional status in children aged 6–12 years old in the Medan Maimun and Medan Marelan sub-districts.

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