

Relationship between Consumption Behavior of Vegetables High in Vitamin a and Vitamin C with Gingivitis in Mixed Dentition Children

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Abstract: Lack of consumption of vegetables that contain high vitamins is one of the factors for the occurrence of periodontal problems, including in children. This study aims to determine the relationship between the behavior of consuming vegetables high in vitamins A and C with gingivitis in children with mixed dentition. The study used a cross sectional approach. The subjects of this study were 100 students of Madrasah Ibtidaiyah (MI) in Situbondo district. Data analysis using Chi Square test. The results showed that 48% of children had moderate gingival index and 6% severe. As many as 62% of children consume vegetables high in vitamin A less than 1.5 servings per day and 62.7% children consume vegetables high in vitamin C less than 1.5 servings per day. The results of statistical tests showed that there was a positive correlation between the behavior of consuming vegetables high in vitamin A and the gingival index ($p=0.038$) and there was a positive correlation between the behavior of consuming vegetables high in vitamin C and the gingival index ($p=0.020$). In conclusion, the less consumption of vegetables high in vitamins A and C, the higher the risk of children experiencing gingivitis.

1 INTRODUCTION

The mixed dentition phase, which occurs in children between the ages of 6 and 12, serves as a transitional period between the replacement of primary teeth and the replacement of permanent teeth (Proffit, 2013). The characteristic of the dental period can be seen in the appearance of permanent teeth and the loss of deciduous teeth. Furthermore, oral health issues are more likely to develop at this time (Ilyas and Putri, 2012).

Oral health is an integral part of general health that requires attention since it can affect the health of other organs (Endang, 2012). A healthy oral cavity will have an impact on one's activities, such as enjoying all kinds of food, increasing the quality of life, being fluent in communication, and having a better social life. One of the dental health issues that still frequently affect elementary school students is gingivitis (Zefanya et al, 2021). Gingivitis is swelling of the gingival margin which is reddish to bluish red, enlargement of the gingival contour due to edema, and easy bleeding (Fatmasari et al, 2020).

According to Riskesdas data, the prevalence of dental and oral problems in Indonesia was 25.9 percent in 2013, 28.9 percent in the 5 to 9 age group, and 25.2 percent in the 10 to 14 age group. This number increased to 45.3 percent in 2018, 54 percent in the 5 to 9 age group, and 41.4 percent in the 10 to 14 age group. According to the features of swollen gingiva and easy-to-bleed gingiva, the proportion of oral health issues in Indonesia is 14.0 percent and 13.9 percent, respectively (Riskesdas, 2018). Situbondo District Health Profile data in 2010 showed that the proportion of dental caries at the age of preschool children and elementary school students was 77.37%, while in 2018 the proportion of the population aged 3 years who had dental and oral problems and required treatment by medical personnel teeth in Situbondo Regency by 65.37% (Riskesdas, 2018). Situbondo District Health Profile data in 2019 showed that the 4 sub-districts with the highest dental and oral health cases were Arjasa (16.6%), Jangkar (11%), Asembagus (9.2%), and Banyuputih (7.6%) (Situbondo District Health Office, 2019).

The main risk factors for gingivitis are dental plaque retention and other factors such as specific malnutrition (Murakami et al., 2018). Consuming vegetables that are rich in fiber will stimulate and increase saliva production, the flow of saliva that comes out can clean food debris on the teeth so that it can prevent oral health problems (Kidd and Bechal, 2013). Vegetables are also one of the sustenance that contain high vitamins A and C, however, in the mixed dentition period, children rarely consume them (Mohammad, 2015; Indry et al., 2013). Vitamin A helps maintain oral health and prevents dental plaque while vitamin C plays a role in curing infections in the oral cavity (Soediatama, 2012). Deficiency of vitamin A and vitamin C can cause gingivitis (Ghutaimeh et al, 2014, Soediatama, 2012).

Furthermore, vegetables are foods that are high in vitamins A and C, although children rarely eat them during the mixed dentition phase (Mohammad, 2015; Indry et al., 2013). The proportion of less consumption of vegetables in Indonesia in the 5–9-year age group in Indonesia was 96.9% in 2018 (Riskekdas, 2018). Therefore, this study aimed to investigate the relationship between the habit of consuming vegetables high in vitamins A and C with mixed gingivitis in children.

2 METHOD

This research is a cross-sectional analytic study. The population of this study was students of Madrasah Ibtidaiyah (MI) in Situbondo Regency. The results of the preliminary study showed that the prevalence of MI students who had dental caries was higher than elementary school students, namely 59.3% compared to 46.5%. The number of study samples was calculated using the OpenEpi program, with the following criteria: children aged 6-12 years, had not had their teeth checked for the last 6 months, did not use fixed orthodontic appliances, and were willing to be researched subjects. Based on these criteria, the minimum total sample required is 98 subjects. Then by rounding to 100 subjects.

The sampling technique in this study used a cluster random sampling technique to determine the school as a place of research. The number of MI schools studied was 50% of the total MI in each sub-district where the selection of schools was randomly selected using Microsoft Excel. This research was conducted in 9 Islamic elementary schools out of a total of 19 MI in the sub-districts of Arjasa, Jangkar, Asembagus, and Banyuputih, Situbondo district. The schools selected were MI Al Falah, MI Makarimal

Akhlaq, MI Sunan Bonang, MI Darurrahmah Pillow, MI Nahdlatul Ulama, MI Muhammadiyah, MIN 2 Situbondo, MI Miftahun Najah, and MI Al-Ikhlash Situbondo Regency. Determination of the proportion of subjects per school using proportional random sampling and the subject selection used simple random sampling.

Data collection was done using questionnaires and interviews with respondents and their parents. This includes characteristic data, consumption behavior of vegetables high in vitamin A and vitamin C. Vegetables are considered to be high in vitamin A if the vitamin A content is 300 RE/100 g, aside from that vegetables are considered high in vitamin C if the vitamin C content is 30 mg/100 g (Amalia, 2008). Vegetable consumption is categorized as sufficient if 2.5 servings or 250 grams per day is consumed, and is categorized as less if the consumption is less than the above-mentioned figure (Permenkes, 2014). The vegetable high in vitamin A and vitamin C consumption in the last 6 months were observed using a Semi-qualitative Food Frequency questionnaire whose validity has been tested and the Cronbach alpha value is 0.79.

The cariogenic food consumption in the last 6 months were observed using a Semi-qualitative Food Frequency questionnaire whose validity has been tested and the Cronbach alpha value is 0.89. Consumption of cariogenic food is categorized as frequent if it is consumed 3 or more times a week, rarely if it is consumed less than 3 times per week, and never if it is not consumed at all (Rekawati and Frisca, 2020). The data on brushing habits were obtained from filling out a questionnaire whose validity had been tested and the Cronbach alpha value was 0.83. This questionnaire includes 25 questions and the assessment is done using a Likert scale of 0-4 (never, rarely, often, always). A gingival index examination was carried out by a dentist.

Behavioral data on the consumption of vegetables high in vitamin A and vitamin C, as well as gingival index, were processed using SPSS version 23 software and analyzed using the Chi-Square test. The data is significant if the p-value is <0.05. This research has received ethical approval from the Ethics Commission Health Research (KEPK) Universitas Sebelas Maret No: 107/UN27.06.6.1/KEP/EC/2021.

3 RESULTS

3.1 Respondent Characteristics

Table 1: Frequency Distribution of Respondents Characteristics.

Variable	N	%
Age		
6	4	4%
7	12	12%
8	12	12%
9	11	11%
10	20	20%
11	22	22%
12	19	19%
Gender		
Male	43	43%
Female	57	57%
The habit of brushing teeth		
Good	79	79%
Poor	21	21%

Table 2: Overview of the glyceimic index.

Variable	N	%
Indeks Gingiva		
Mild	45	45%
Moderate	49	49%
Severe	6	6%

Table 3: Overview of the distribution of consumption habits of vegetables and cariogenics foods.

Variable	N	%
The habit of consuming vegetables high in vitamin		
Less	38	38%
Adequate	62	62%
The habit of consuming vegetables high in vitamin		
Less	36	36%
Adequate	86	86%
Consumption of Cariogenic Foods		
Never	0	0%
Rarely (<3x/week)	12	12%
Often (≥3x/week)	88	88%

Table 1 shows the characteristics of respondents according to age and sex. The results showed that most of the respondents were 10 years old (20%) and the least respondents were 6 years old (4%). Most of the respondents are female (57%). The majority of respondents have a good tooth-brushing habit (79%) and often consume cariogenic foods (88%). Table 2 shows most of the respondents have a moderate glyceimic index (49%).

The majority of respondents have a habit of consuming vegetables high in vitamin A in less than 2 servings per day (62%) and have a habit of consuming vegetables high in vitamin C in less than 2 servings per day (64%). The majority of respondents often consume cariogenic foods (88%) and all respondents have at least consumed cariogenic foods.

3.2 Relationship of High Vitamin a Vegetable Consumption Habits with Gingival Index

Table 4: Relationship of High Vitamin A Vegetable Consumption Habits with Gingival Index.

High Vitamin A Vegetable Consumption Habits	Gingival Index					
	Mild		Moderate		Severe	
	N	%	N	%	N	%
Adequate	22	47.8	16	32	0	0
Less	24	52.2	34	68	6	100
Pvalue	0.038					

Table 4 shows that there is a relationship between vegetable consumption high in vitamin A and the gingival index (p-value 0.038). The results showed that the majority of respondents with high levels of vegetable consumption in vitamin A had a moderate gingival index (47.8%) and the majority of respondents with high levels of vegetable consumption in vitamin A lacked a moderate gingival index (68%).

3.3 Relationship of High Vitamin C Vegetable Consumption with Gingival Index

Table 5: Relationship of High Vitamin C Vegetable Consumption Habits with Gingival Index.

High Vitamin C Vegetable Consumption Habits	Gingival Index					
	Mild		Moderate		Severe	
	N	%	N	%	N	%
Adequate	22	48.9	14	28	0	0
Less	23	51.1	35	71.4	6	100
Pvalue	0.020					

Table 5 shows that there is a relationship between the consumption of vegetables high in vitamin C and the gingival index (p-value 0.020). The results showed that the majority of respondents with high levels of vegetable consumption in vitamin C had a moderate gingival index (48.9%) and the majority of respondents with high levels of vegetable

consumption in vitamin C lacked a moderate gingival index (71.4%).

4 DISCUSSION

4.1 Analysis of the Relationship between the Behavior of Consuming Vegetables High in Vitamin A with Gingivitis

The results of this study indicate that the behavior of consuming vegetables high in vitamin A is associated with gingivitis. This study is in line with the research of Kidd and Bechal (2013), which states that consuming vegetables will stimulate and increase saliva production, the flow of saliva that comes out can clean food debris on the teeth to prevent oral health problems. Vegetables are a good source of various nutrients, including vitamins and dietary fiber. These compounds can affect periodontal health because they function as antioxidants and antibacterial agents such as *Streptococcus mutans* to prevent plaque formation (Zare et al., 2014). Park et al, (2017), stated that low vitamin A intake is associated with oral health.

Vitamin A is important for maintaining oral mucous membranes and oral mucosal tissue, maintaining epithelial tissue and defense against infection, and preventing plaque (Tarigan, 2012). In the salivary glands, vitamin A deficiency causes salivary gland atrophy and results in increased plaque formation due to a lack of salivary flow (Sadioetama, 2012). This collection of plaque on the surface of the teeth can cause inflammation of the gums, thus worsening the gingival index (De Vries, 2015).

4.2 Analysis of the Relationship between the Behavior of Consuming Vegetables High in Vitamin C with Gingivitis

In this study, it was shown that the behavior of consuming vegetables high in vitamin C was associated with gingivitis in children with mixed dentition. This study is in line with research by Ghutaimel et al (2014), which states that vitamin C deficiency is associated with scorbutic gingivitis. The results of this study are also in line with the study of Shimabukuro et al., (2015), who reported that vitamin C had a significant effect on patients with chronic gingivitis. The study of Munday et al (2020), also stated that vitamin C deficiency is associated with

severe periodontal disease and with systemic inflammation of the gingiva. Vegetable diets that contain lots of vitamin C have a positive effect on periodontal tissue health (Chapple, et al., 2012). Research by Brahmavar et al., (2021), stated that vitamin C injected into the gingival tissue through mesotherapy can treat inflammation of the gingiva.

The relationship between the mechanism of action of vitamin C and gingival health is related to its antioxidant properties that help reduce the production of reactive oxygen radicals formed during the inflammatory process (Iwasaki et al., 2013). The role of vitamin C in overcoming inflammation is to protect immune cells against oxidative stress generated during infection (Mitmesser et al., 2016).

Haryani et al., (2016), emphasized that adequate intake of vitamin C is very important in preventing excessive permeability of the gingival tissue, stimulating salivary secretion and collagen synthesis. Vitamin C plays a role in the formation of collagen, especially in the oral cavity (Soediatama, 2012). Collagen attaches and seals tissue exposed by injury. Vitamin C in the formation of collagen plays a role in the hydroxylation of the amino acids proline and lysine into hydroxyproline and hydroxylysine. These two compounds are the two main components of collagen. The optimal function of vitamin C in the formation of collagen is influenced by whether or not the content of vitamin C in the body is sufficient (Soediatama, 2012).

5 CONCLUSIONS

This study concludes one thing: there is a relationship between the behavior of consuming vegetables high in vitamin A and vitamin C with gingivitis in mixed dentition phased children. The less consumption of vegetables high in vitamin A and vitamin C, the more severe the glycemic index of children experiencing gingivitis.

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