The Relationship of Nutritional Status and Gingivitis in Elementary School Children

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Abstract

Background: Gingivitis is an inflammatory condition that occurs in oral cavity soft tissue named gingiva. Inflammation of the oral cavity can affect the general condition of the body, both in adults and children. Children's general condition can also be influenced by nutritional status. In Surabaya, Indonesia, underweight is a serious nutritional problem with a high prevalence in elementary school children.

Objective: Analyzing the relationship between nutritional status and gingivitis in children aged 11-12 years in the city of Surabaya.

Method: This observational analytic study was conducted on elementary school age children in 5 regions in Surabaya. The gingiva is examined by probing the gingival sulcus. Nutritional status checks were carried out by measuring Body Mass Index which was then converted to z scores. The data was then processed through descriptive statistical method and cross tabulation between gingivitis and nutritional status in children.

Results: The prevalence of gingivitis in Surabaya in elementary school children is 46.30%. Most children in Surabaya have normal nutritional status. However, the problem of underweight nutrition in Surabaya is classified as a high prevalence of 11.11%. These conditions indicate a serious nutritional problem.

Conclusion: From this study, it can be concluded there is no significant relationship between gingivitis and the nutritional status of children. However, descriptively, children who have less nutritional status are more likely to experience gingivitis.

Keywords: *Gingivitis, Nutritional Status, Children.*

Introduction

Gingivitis is a periodontal disease that is often overlooked. Indonesian Basic Health Survey data shows that there are more than half the cases of gum disorders in Indonesia do not get treatment[1]. Gingivitis can be experienced by children and adults. The gingivitis cases and its severity increases from childhood to adolescence and adulthood.[2] The peak prevalence of gingivitis from children is in children aged 11-13 years which is 80%[3]. Beimstein et al. and Amran et al. show that the prevalence of gingivitis in puberty children are higher than in children aged 5 years[2,3]. In East Java, the prevalence of gum disorders in 12-year-old children is 1.2%[4].

Underweight in East Java is still a serious public health problem. WHO shows that public health problems are considered serious if severe travel is less than 10-14%, and is considered very high if it is 15%[5]. The prevalence of lean according to BMI/A (Body Mass

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Index by Age) in children aged 5-12 years in East Java is 11.2% which consists of 4% very thin and 7.2% thin. The prevalence of thinness in East Java is higher than the national prevalence[6].

Gingivitis can be prevented and reversible. However, if it is left untreated, it causes more complex damage to the resorption of alveolar bone called periodontitis. Based on epidemiological studies, 60-70% of cases of gingivitis in children with infectious diseases at a young age will develop into periodontitis as adults. This is related to the risk of microbial-host interactions at a young age[3]. Periodontitis is one of the most common causes of tooth loss[7]. In addition, periodontitis has a relationship with cardiovascular disease[8]. Early diagnosis and immediate treatment can effectively prevent the development of this disease. WHO in the Global Goal 2020 dental and oral health encourages national, regional, and local governments set dental and oral health standards, one of which relates to periodontal disease[9].

Gingivitis is an inflammatory condition in the gingiva. Even, minor inflammatory reactions can affect the overall condition of the body with a systemic immune response. Goehler et al. state that interleukin-1β is the main inflammatory mediator in gingivitis[10]. Circulation of interleukin in the blood affects the vagus abdominal nerve and causes depression in the appetite mechanism. Decreased appetite causes reduced food intake, resulting in decreased nutritional status[4]. Interleukin-1β also causes an increase in corticotropin releasing factor (CRF) in blood circulation and a decrease in neuropeptide y (NPY) in the blood which can cause a weight loss effect[11]. In addition, interleukin-1β activates mitochondria in cells that are inflamed so that the release of energy at these locations increases causing weight loss[12]. Weight loss is an indicator of decreased nutritional status.

Nutritional status affects the life and development of children. Children with underweight or underweight conditions have a greater risk of mortality. Children who experience growth disorders or shortness caused by poor diet and recurrent infections have a higher risk of morbidity and mortality. These conditions also affect school performance, intellectual capacity, and affect mental development[13].

Based on this background, the relationship between nutritional status and gingivitis in children aged 11-12 years in Surabaya is important to be investigated. Therefore, it can provide information and additional knowledge and become the basis for consideration of strategies for improving nutritional status through oral and dental health.

Method

This research used observational analytic cross-sectional study design. The study population was all elementary school students aged 11-12 years in Surabaya in August 2017. The number of research subjects was determined by cluster sampling technique with a minimum number of 34 children. In this study, gingivitis is an independent variable with a nominal data scale. Gingivitis was measured by a modified WHO Community Periodontal Index (CPI). Nutritional status is a dependent variable with a nominal data scale. Nutrition status classification is based on BMI/A.

The data collection process begins by providing an explanation of the aims and objectives of the study, as well as agreement with the guardian's parents that the children will be the subject of the study. Research subjects and guardian parents were welcomed to fill out questionnaires containing about age, sex, food intake, activity, and history of the child's illness, as well as the level of parental education. Research subjects measured height and weight using a stepping scale and microtoise. Subsequent research subjects were examined by gingiva using a mouthpiece and probe. After the data collection has been completed proceed to the data processing. Data were processed and tested using descriptive and cross-sectional statistics to determine the relationship between gingivitis and nutritional status.

Results

The study was conducted in 6 elementary schools in the Surabaya region which were randomly selected with a total of 54 research subjects. In the primary school group, 23 children (27.38%) are boys and 31 children (36.90%) are girls. The results of the examination are presented below.

Table 1. Nutritional Status of Respondents

Nutritional Status	N	%
Underweight	2	3.70
Light	4	7.41
Normal	26	48.15
Overweight	11	20.37
Obesity	11	20.37
Total	**54**	**100**

Table 1 shows that most respondents had normal nutritional status, while the least was light nutritional status.

Table 2. Distribution of respondents based on Nutrition Status by sex

		Nutritional Status				
		Underweight	Light	Normal	Overweight	Obesity
Sex	Male	2(8.7%)	0(0.0%)	9(39.1%)	4(17.4%)	8(34.8%)
	Female	0(0.0%)	4(12.9%)	17(54.8%)	7(22.6%)	3(9.7%)
Total		2(3.7%)	4(7.4%)	26(48.1%)	11(20.4%)	11(20.4%)

Table 2 shows that the majority of respondents' nutritional status of men and women is normal. The distribution of very thin nutritional status is mostly in men. Distribution of thin nutritional status is mostly in women. Table 3. Gingiva Status among Elementary Students

Group	N	Gingivitis		No gingivitis	
		n	%	N	%
Elementary School	54	25	46.30	29	53.70

Table 3 shows the status of gingiva in elementary school students showing that respondents experiencing very high gingivitis.

Table 4. Distribution of gingival status by sex

		Gingival Status		Total	OR
		No Gingivitis	Gingivitis		
Sex	Male	10(43.5%)	13(56.5%)	23(42.6%)	
	Female	1961.3%	1238.7%	31(57.4%)	2.058
Total		2953.7%	2546.3%	54(100%)	

Table 4 shows that men have a 2-fold higher risk of gingivitis than women.

Table 5. The risk of gingivitis is based on the nutritional status of children

Nutritional Status	Gingival Status		Total	Prevalence Ratio	CI
	No Gingivitis	Gingivitis			
	n (%)	n ((%)	N (%)		
Less	16(50%)	16(50%)	32(100%)	0,846	(0,518-1,382)
Good	13(59,1%)	9(40,9%)	22(100%)		

Table 5 shows the percentage of gingivitis in nutritional status that is more or less higher, when compared with good nutritional status. However, based on the value of the Prevalence Ratio, nutritional status is not a risk factor for gingivitis.

Discussion

In this study, gender was not a risk factor for poor nutritional status because the intake of food in boys and girls was the same. These results are different from the research by Ndiku et al. (2011) which state that the nutritional status of men is better than women. In this case, the amount of food intake of men is greater than women[14].

The results of the measurement of nutritional status in elementary school students show the problem of underweight and obese nutritional status. Referring to WHO, this condition is classified as a nutritional problem with a very high prevalence because it is ≥15%. While

the prevalence of underweight nutritional status in the elementary group is 11.11%. According to WHO, this condition is classified as a serious nutritional problem because its prevalence is in the range of 10-14%. The prevalence of elementary school students is 20.37% which shows a serious nutritional problem.

Gingival status in this study was examined by probing the gingival sulcus of each tooth. Bleeding on probing (BOP) is a sign of gingivitis. The high prevalence in elementary children can be due to hormonal factors at puberty[15]. At puberty, the volume of gingival crevicular fluid (GCF) increases. An increase in GCF volume is an indication of gingival inflammation. This is explained by the mechanism of androgen hormones that affect vascular permeability in the gingival sulcus. Hormone-related inflammation at puberty is also explained by an increase in the number of proinflammatory cytokines TNF-α and IL-1β in GCF that are affected by increased progesterone hormones in women[16].

In this study, the distribution of gingivitis was more common in boys than girls. This is because women have a higher concern for appearance than men. The results of this study are in accordance with research by Furuta (2011) stating that men have a greater risk of gingivitis. That is due to knowledge and oral hygiene behavior factors. Knowledge and behavior of maintaining good dental health can reduce plaque accumulation so that the prevalence of gingivitis in women is lower[17]. In other studies, there were no differences in the percentage of gingivitis by sex because the frequency of brushing teeth in men and women in the study was the same[18]. In this study, parental education status was not related to gingivitis in children. From the results of the cross tabulation between parent education and the frequency of children's toothbrushes, the frequency of toothbrushes for children with higher education is lacking. This can explain why in this study parental education is not a risk factor for gingivitis. This is consistent with previous studies that high parental knowledge is not a determining factor in tooth brushing habits[19].

The results of this study indicate that nutritional status is not a risk factor for gingivitis, because the inflammatory conditions in the gingiva of the study subjects are not chronic. The inflammatory immune response affects food intake and energy release in chronic inflammation which can cause weight loss[20]. In this study, there were no examinations that showed chronic gingival inflammatory conditions.

The results of cross tabulation between nutritional status with gingivitis in the elementary group showed that children with very thin nutritional status could experience gingivitis. Enwonwu (1994) statesthat children with underweight nutritional status disrupt the response of proteins to tissue damage that hinders the healing process caused by a lack of protein to form immune cells[21]. These results are consistent with the study of Muhammad (2015) which shows gingivitis in children with poor nutritional status is higher than children with good nutritional status[22].

The results of this study show that increasing nutritional status will decrease the prevalence of gingivitis. While the prevalence of gingivitis increases in the group of obesity nutritional status. Al-Zahrani et al. (2003) state that obesity is a risk factor for gingivitis[1]. In conditions of obesity, there is an increase in the number of proinflammatory cells[2]. The interaction between proinflammatory cells and bacteria in plaque is an etiological factor of gingivitis[20]. This explains the increased prevalence of gingivitis in children with obese nutritional status.One of the factors causing gingivitis is bad oral hygiene. Poor oral hygiene is characterized by plaque accumulation. One of the factors that influence plaque accumulation is tooth brushing behavior. The descriptive analysis shows that in the elementary group who seldom brush their teeth can experience gingivitis. Children with good tooth brushing frequency have a lower percentage of gingivitis. Newman (2015) states that gingivitis is an interaction between microorganisms found in dental plaque biofilms, tissue, and host inflammatory cells[23]. Therefore, if plaque accumulation is reduced, the risk of gingivitis is reduced.

This study has several limitations, namely that in cross-sectional studies, it cannot include chronic conditions of gingivitis and daily food intake. The food intake studied in this study cannot describe micronutrient intake in children. Crowded teeth and poor sanitary conditions need to be included in the exclusion criteria in the study. Based on this study, it can be concluded that there is no significant relationship between nutritional status and gingivitis. However, the nutritional status of elementary school children can have a greater chance of experiencing gingivitis. In subsequent studies, it is expected to be able to obtain socioeconomic data, chronic conditions of gingivitis, and oral hygiene data. Exclusion criteria in the form of poor sanitation conditions can be added.

Ethical Clearance: This study was approved by the Airlangga University Faculty of Dental Medicine Health Research Ethical Clearance Commission.

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