

Relationship between Periodontal Health and Adolescent Physical Performance

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Abstract

Background: Oral health problems, including periodontal tissue problems, are important issues that need attention because they can affect a person's quality of life and performance. The prevalence of the periodontal disease in all age groups in Indonesia is 96.58%. **Purpose:** This study aims to determine the effect of periodontal disease on adolescent physical performance. **Method:** This research was conducted in an analytic observational manner. The population of this research is adolescents aged 12-14 years in junior high schools in Surabaya, East Java, Indonesia as many as 101 students. Data collection used the Modified Gingival Index (MGI) method and the International Physical Activity Questionnaire (IPAQ). The data analysis used was the ETA correlation test. **Result:** In the distribution of dental health knowledge, most of the respondents had a low level of knowledge of 88.1%, low physical activity of 44.6%, and good gingival health based on the Modified Gingival Index of 52.5%. **Conclusion:** There is a significant difference in the level of respondents' Modified Gingival Index based on the respondent's experience of getting dental and oral care and the last time he received dental and oral care.

Keywords: *periodontal, performance, adolescent physique, Modified Gingival Index, International Physical Activity Questionnaire*

Introduction

Periodontal disease is an infectious disease caused by bacteria that accumulates in plaque causing the gingiva to become inflamed^{1,2}. Factors that affect plaque formation is oral hygiene, diet, composition, and flow rate of the saliva. Two types of periodontal disease are commonly named gingivitis and periodontitis^{3,4}.

In Indonesia, the problem of periodontal tissue the second highest in Indonesia after dental caries on dental and mouth diseases. Periodontal tissue problems is a dental and oral health problem that has a fairly high prevalence in people with the prevalence of 96.58%⁵. Based on the 2018 Basic Health Research, the prevalence of the periodontal disease in Indonesia is

74.1%⁶. Meanwhile, almost 90% of people in Indonesia suffer from periodontal disease⁷. Oral health problems, including periodontal tissue problems, are important issues that need attention because they can affect a person's quality of life and performance^{8,9}.

According to WHO, adolescence or young adults is a phase of rapid and active growth in physical activity¹⁰. This is due to the participation in school activities, as well as the development of hormones that make adolescents more active in carrying out activities. In adolescence, there are some changes both physically and mentally¹ and this indirectly affects their health and behavior towards health itself¹⁰. To achieve this good performance an overall healthy body is required^{11,12}. One that can support the overall health of the body is

oral health^{8,13}. Therefore, this study was conducted to analyze the relationship between periodontal health and adolescent performance.

Method

This type of research uses an observational analytic method with a cross-sectional approach. The population of this study was students of 12-14 years of age in junior high schools in Surabaya, East Java, Indonesia. The sampling technique used was cluster random sampling. The sample size was used with the correlation test to analyze the relationship between variables, with a total sample of 101 students. The data collection procedure used was direct observation and questionnaire method. Measurement of the severity of student gingivitis was

measured by the Modified Gingival Index (MGI) method on six teeth with the surface examined, a score of 0 for good, a score of 1 and 2 for moderate, and a score of 3 and 4 for poor. While the evaluation of the level of physical activity was carried out using the International Physical Activity Questionnaire (IPAQ) questionnaire, students were asked to report the number of days and duration of high-intensity activity (vigorous activity), moderate activity (moderate activity), light activity (walking activity) and the total score of physical activity combined. (IPAQ, 2020). The data was analyzed using the ETA correlation test. Furthermore, the data obtained were processed to analyze the relationship between periodontal health and adolescent performance.

Result

Table 1 Distribution of individual characteristics, history of dental and oral problems, and dental health care in adolescents.

Variables	Frequency	Percentage
Individual Characteristic		
Gender		
Man	49	48,5%
Woman	52	51,5%
Blood group		
A	19	18,8%
B	29	28,7%
AB	13	12,9%
O	40	39,6%
Characteristics of medical history and dental health care		
Medical history of dental and oral problems		
Yes	79	78,2%
Never	22	21,8%
Type of dental and oral problems		
Cavity	37	36,6,%
Retained root	2	2,0%
Inflamed and painful cavity	14	13,9%
Inflamed and painful retained root	1	1,0%
Broken tooth/loose due to falling	5	5,0%

Cont... Table 1 Distribution of individual characteristics, history of dental and oral problems, and dental health care in adolescents.

Gum bleeding	7	6,9%
Canker sore	24	23,8%
Other complaints	2	2,0%
Never had any complaints	9	9,0%
Recent complaint of dental and oral problems		
<1 month	38	37,6%
>1 months	63	62,4%
Oral healthcare experience		
Yes	63	62,4%
Never	38	37,6%
Recent oral healthcare		
<6 months	18	17,8%
6 months to 1 year	32	31,7%
>1 years	51	50,5%

Based on table 1, the majority of respondents were female, namely 52 students (51.5%). This group was found to have the most type of blood type O, namely 39.6%. In the characteristics of the history of illness and treatment of students, it was found that 78.2% claimed to have experienced complaints in the teeth and oral cavity, the most common complaint was cavities, which was

36.6%, and most of the students experienced complaints of teeth and cavities. The last complaint occurred more than 1 month ago was 62.4%, most of the respondents (62.4%) said they had received dental and oral care and as many as 50.5% of respondents said they had received oral healthcare treatment more than 1 year ago.

Table 2 Distribution of dependent variable level of knowledge of dental health, level of physical activity, and gingival health of respondents

Variables	Frequency	Percentage
Knowledge in oral welfare		
Low <75%	89	88,1%
High >75%	12	11,9%
Physical activity level		
Low	45	44,6%
Moderate	23	22,8%
High	33	32,7%
Gingiva condition according to Modified Gingival Index		
Good	53	52,5%

Cont... Table 1 Distribution of individual characteristics, history of dental and oral problems, and dental health care in adolescents.

Moderate		39	38,6%
Bad		9	8,9%
Variables	Range	Mean	Standard Deviation
Modified Gingival Index score	0 – 3,75	1,21	±0,663
Oral welfare knowledge	26,67-93,33	57,75	±16,091

Based on table 2, shows that most of the respondents had a low level of knowledge, as much as 88.1%. Most of the research respondents had low physical activity, namely 44.6%. Meanwhile, students who have good gingival health based on the Modified Gingival Index are 52.5%.

Table 3 Correlation test data on individual characteristics, history of dental and oral problems, and dental health care to the MGI score

Variables	Modified Gingival Index score						Total		p-value
	Good		Moderate		Bad		n	%	
	n	%	n	%	n	%			
Individual characteristics									
Gender									
Man	22	44,9%	21	42,9%	6	12,2%	49	48,5 %	0,163
Woman	31	59,6%	18	34,6%	3	5,8%	52	51,5 %	
Blood group									
A	7	36,8%	11	57,9%	1	5,3%	19	18,8%	0,219
B	16	55,2%	12	41,4%	1	3,4%	29	28,7%	
AB	9	69,2%	3	23,1%	1	7,7%	13	12,9%	
O	21	52,5%	13	32,5%	6	15,0%	40	39,6%	
Medical history and oral healthcare experience									
Medical history of oral and dental problems									
Yes	38	48,1%	33	41,8%	8	10,1%	79	78,2%	0,168
Never	15	68,2%	6	27,3%	1	4,5%	22	21,8%	
Types of complaint									

Cavity	20	54,1%	12	32,4%	5	13,5%	37	36,6%	0,159
Retained root	1	50,0%	0	0	1	50,0%	2	2,0%	
Inflamed and painful cavity	6	42,9%	8	57,1%	0	0%	14	13,9%	
Inflamed and painful retained root	0	0%	0	0%	1	100%	1	1,0%	
Broken/loose tooth due to falling	2	40,0%	3	60,0%	0	0%	5	5,0%	
Gum bleeding	3	42,9%	3	42,9%	1	14,3%	7	6,9%	
Canker sore	13	54,2%	10	41,7%	1	4,2%	24	23,8%	
Other complaints	2	100,0%	0	0%	0	0%	2	2,0%	
Never had any complaints	6	66,7%	3	33,3%	0	0%	9	8,9%	
Recent complaint of dental and oral problems									
<1 month	20	52,6%	13	34,2%	5	13,2%	38	37,6%	0,123
>1 months	33	52,4%	26	41,3%	4	6,3%	63	62,4%	
Oral healthcare experience									
Yes	33	52,4%	24	38,1%	6	9,5%	63	62,4	0,029
Never	20	52,6%	15	39,5%	3	7,9%	38	37,6	
Recent oral healthcare									
<6 months	10	55,6%	6	33,3%	2	11,1%	18	17,8%	0,049
In between 6 months to 1 year	16	50,0%	13	40,6%	3	9,4%	32	31,7%	
>1 years	27	52,9%	20	39,2%	4	7,8%	51	50,5%	

Based on Table 3, shows that the group of students who had received dental care obtained p-value was 0.029, which means that there was a significant difference in the level of the respondents' Modified Gingival Index based on the respondent's experience of getting dental and oral care. The group of students who last received the most

dental and oral care was more than 1 year ago, p-value of 0.049, which means that there is a significant difference in the level of respondents' Modified Gingival Index based on the experience of the last time the respondent received dental and oral care.

Table 4 Correlation test data on individual characteristics, history of oral and dental problems, and dental healthcare to the IPAQ score

Variables	IPAQ Score						Total		p-value
	Good		Moderate		Bad		n	%	
	n	%	n	%	n	%			
Individual characteristics									
Gender									
Man	18	36,7%	9	18,4%	22	44,9%	49	48,5%	0,253
Woman	27	51,9%	14	26,9%	11	21,2%	52	51,5%	

Blood group									
A	9	47,4%	4	21,1%	6	31,6%	19	18,8%	0,181
B	15	51,7%	9	31,0%	5	17,2%	29	28,7%	
AB	5	38,5%	4	30,8%	4	30,8%	13	12,9%	
O	16	40,0%	6	15,0%	18	45,0%	40	39,6%	
Medical history and oral healthcare experience									
Medical history of oral and dental problems									
Yes	35	44,3%	17	21,5%	28	34,2%	79	78,2%	0,071
Never	10	45,5%	6	27,3%	6	27,3%	22	22%	
Types of complaint									
Cavity	15	40,5%	8	21,6%	14	37,8%	37	36,6%	0,117
Retained root	1	50,0%	0	0%	1	50,0%	2	2,0%	
Inflamed and painful cavity	7	50,0%	4	28,6%	3	21,4%	14	13,9%	
Inflamed and painful retained root	0	0%	0	0%	1	100%	1	1,0%	
Broken/loose tooth due to falling	2	40,0%	1	20,0%	2	40,0%	5	5,0%	
Gum bleeding	2	28,6%	2	28,6%	3	42,9%	7	6,9%	
Canker sore	13	54,2%	3	12,5%	8	33,3%	24	23,8%	
Other complaints	1	50,0%	0	0%	1	50,0%	2	2,0%	
Never had any complaints	4	44,4%	5	55,7%	0	0%	9	8,9%	
Recent complaint of dental and oral problems									
<1 month	18	47,4%	6	15,8%	14	36,8%	38	37,6%	
>1 months	27	42,9%	17	27,0%	19	30,2%	63	62,4%	
Oral healthcare experience									
Yes	37	42,9%	12	19,0%	24	38,1%	63	62,4%	
Never	18	47,4%	11	28,9%	9	23,7%	38	37,6%	
Recent oral healthcare									
<6 months	7	38,9%	4	22,2%	7	38,9%	18	17,8%	0,181
In between 6 months to 1 year	10	31,3%	8	25,0%	14	43,8%	32	31,7%	
>1 year	28	54,9%	11	21,6%	12	23,5%	51	50,5%	

Based on table 4, shows that all variables have a p-value > 0.05, which means that there is no significant difference in the IPAQ score level with gender, age, the experience of dental and mouth problems, experience in getting dental and oral care, the last time the respondent received dental and oral care, and the types of dental and oral care that were received.

Table 5 Distribution of Modified Gingival Index Level based on Respondents' IPAQ Score Level

Variables	Modified Gingival Index score						Total		p-value
	Good		Moderate		Bad				
	n	%	n	%	n	%	n	%	
IPAQ score									
Low	24	53,3%	17	37,8%	4	8,9%	45	44,6%	0,048
Moderate	11	47,8%	11	47,8%	1	4,3%	23	22,8%	
High	18	54,5%	11	33,3%	4	12,1%	33	32,7%	
Total	53	52,5%	39	38,6%	9	8,9%	101	100%	

Based on table 5, the eta test obtained a p-value of 0.048 which indicates a significant difference between the two variables of the Modified Gingival Index level and the physical activity level of adolescents.

Discussion

Based on the results of the research group of students who had received dental and oral care, there was a significant difference in the level of respondents' Modified Gingival Index based on the respondent's experience of receiving dental and oral care and the last time they received dental and oral care. Dental care is very important in maintaining dental health, in previous studies, it was stated that if you never do dental care, it will affect dental health because it is related to disease development which is considered to be an important etiology¹⁴⁻¹⁶.

In this study, it shows that the distribution results of the Modified Gingival Index based on the IPAQ Score Level of the Respondents indicate that there is a significant difference between the level of the Modified Gingival Index and the level of student physical activity. Periodontal disease usually occurs in adolescence and early adulthood¹⁷. In adolescence, a person will experience the development of the nervous system, psychological, and social changes. One of the things that will be experienced by adolescents is stress and mental stress¹⁰. Increase in stress results in diet changes, nutrition, and affects oral health which can lead to gingival and periodontal disease¹⁸. So that it can affect the performance of adolescents in their daily activities.

The pathogenesis of periodontal disease is an inflammatory process involving natural immune responses and adaptive immunity¹⁹. There are several cells that play a role in periodontal disease, namely Interleukin-1, Interleukin-6, Tumor necrosis factor α , and Interferon-gamma. IL-6 plays a role in bone resorption. These cytokines were first found to stimulate the formation of multinucleate cells similar to osteoclasts and are known to be the potential stimulators of osteoclast differentiation, bone resorption and inhibiting bone formation. IL-6 is also known to be elevated in gingival crevicular fluid in patients with refractory periodontitis. If there is any bone resistance, it will affect the physical condition of adolescents related to their ability to use the muscles to accept loads during their daily activities²⁰. Physical strength plays an important role, because it is the driving force of every activity and is required to increase the quality of life.

Conclusion

Based on the results, it can be concluded that the group of respondents who had a low and high IPAQ score level had a good Modified Gingival Index level, while the group of respondents who had a moderate IPAQ score level had a good and moderate Modified Gingival Index level. The eta test obtained a p-value of 0.048 which indicates a significant difference between

IPAQ scores based on the level of Modified Gingival Index.

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