

The Relationship Between Smoking Habits And Periodontal Disease Status Among Adolescents At Sma Negeri 2 Semarang City

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ABSTRACT

Background: Oral health is an important part of general health, but is often neglected in adolescents. One common problem is periodontal disease, an inflammation of the supporting tissue of the teeth that can progress from gingivitis to periodontitis. Smoking is a risk factor that can worsen periodontal conditions. This study aims to analyze the relationship between smoking habits and periodontal disease status in adolescents.

Method: This study used an observational analytical design with a cross-sectional approach. The study sample consisted of 83 eleventh-grade students of SMA Negeri 2 Semarang City, selected using purposive sampling. Data were obtained through a smoking habits questionnaire and periodontal chart examination, then analyzed univariately and bivariate.

Result: The study showed that most respondents were light to moderate smokers, with the most common periodontal status being gingivitis. Bivariate analysis showed a significant relationship between smoking habits and periodontal disease status in adolescents ($p < 0.05$). The higher the smoking habit, the worse the respondent's periodontal condition.

Conclusion: this study shows that smoking habits are significantly related to periodontal disease status in adolescents.

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INTRODUCTION

Dental and oral health are important components of overall health. Nevertheless, various dental and oral health problems are still commonly found in the community, one of which is periodontal disease. Problems such as dental caries, gingivitis, and periodontal disease are still frequently found in the community, particularly among adolescents. Based on data from the 2023 Indonesian Health Survey (Survei Kesehatan Indonesia/SKI), the prevalence of dental and oral health problems in Indonesia was reported to be as high as 56.9%, indicating that awareness and efforts to maintain oral health still need to be improved.

One of the dental and oral health problems with a relatively high prevalence is periodontal disease. This disease is a progressive inflammation of the tissues supporting the teeth, beginning with gingivitis and potentially progressing to periodontitis if not properly treated. This condition can lead to damage to the supporting tissues of the teeth and eventually result in tooth loss. The high prevalence of periodontal disease is influenced by various factors, both local and systemic, including poor oral hygiene and unhealthy lifestyle habits.^{4, 5, 6}.

Adolescents are one of the age groups at high risk of developing periodontal disease. This condition is associated with various behavioral changes during adolescence, including a lack of attention to oral and dental hygiene and increased exposure to risk factors that may affect periodontal health. These risk factors include the consumption of high-sugar foods and smoking habits.

Data indicate that most individuals begin smoking between the ages of 15 and 19, and the increasing use of electronic cigarettes also contributes to the high prevalence of smoking among adolescents ^{7, 8}.

Smoking habits among adolescents today are not limited to the use of conventional cigarettes but also include the use of electronic cigarettes or vapes.

Although they differ in form and method of use, both contain nicotine and various chemicals that may pose health risks. Conventional cigarettes produce various toxic compounds through the combustion of tobacco, whereas vapes contain nicotine, propylene glycol, glycerin, and flavoring agents that may generate harmful compounds when heated⁸.

Smoking is known to have negative effects on oral health, particularly on periodontal tissues. These substances can affect oral health, especially the periodontal tissues. Nicotine and other toxic substances can impair blood flow in the gingival tissues, reduce immune responses, increase oxidative stress, and accelerate periodontal tissue destruction. Consequently, smokers have a higher risk of developing periodontal disease compared with non-smokers^{16, 17}.

The frequency and technique of tooth brushing also play an important role in influencing periodontal health status. Poor oral hygiene practices can lead to the accumulation of dental plaque and calculus, which are major contributing factors to inflammation of the gingival tissues. Therefore, a comprehensive evaluation of periodontal conditions is essential to determine disease severity and identify contributing risk factors^{1, 3}.

One examination method that can be used to comprehensively assess periodontal conditions is a periodontal chart. This method allows the recording of various clinical parameters, such as probing pocket depth (PPD), bleeding on probing (BOP), and clinical attachment loss (CAL), thereby providing a more accurate representation of an individual's periodontal status^{11, 15}. Research on the relationship between smoking habits and periodontal disease status among adolescents remains relatively limited, particularly studies that use periodontal charting as a measurement instrument. Most previous studies have relied on simple indices, which may not adequately represent periodontal conditions comprehensively^{17, 18}.

Based on this background, this study aims to analyze the relationship between smoking habits

and periodontal disease status among high school adolescents using the periodontal chart method. The results of this study are expected to provide a more comprehensive overview of the periodontal conditions of adolescents and serve as a basis for efforts to prevent periodontal disease and improve dental and oral health.

RESEARSH METHODS

This study was an analytical observational study using a cross-sectional approach. This method was employed to test the hypothesis regarding the relationship between exposure, namely smoking habits, and periodontal disease among adolescents within a specific period of time³. The study was conducted to determine the relationship between smoking habits and periodontal disease status among students of SMA Negeri 2 Kota Semarang using a periodontal chart^{3,4}. The respondents were administered a questionnaire and underwent a clinical examination to measure periodontal tissue depth using a periodontal chart instrument. The periodontal conditions were classified as healthy gingiva (1-3 mm) with normal probing depth, gingivitis (1-3 mm) with a pseudopocket, and periodontitis (>3 mm) with a true pocket⁴.

The population in this study consisted of 432 students of SMAN 2 Kota Semarang. The sampling method used was purposive sampling, which involves selecting samples based on specific criteria in accordance with the objectives of the study³. The inclusion criteria were male students who were willing to participate as respondents, had provided informed consent, and were in good physical and mental health. The exclusion criteria were students who were unwilling to participate in the study or who were unable to attend during the research process. The total sample size was calculated using the Slovin formula with a margin of error of 10%, resulting in a total of 83 respondents. The study was conducted at SMA Negeri 2 Kota Semarang starting on February 13, 2026, and was carried out over a period of three days with the assistance of a five-person research team. The research instrument

consisted of a questionnaire on smoking habits and tooth-brushing behavior, comprising 10 true-or-false questions using the Guttman scale. Before being distributed, the questionnaire was subjected to validity and reliability testing involving 30 respondents to assess the clarity and appropriateness of the questions. A clinical examination was also performed using periodontal chart software³.

The validity test results for the 10 questionnaire items showed that all items were valid, with the calculated r-value (r-count) greater than the r-table value (r-count > r-table). This indicated that all 10 questionnaire items had a significant correlation with the total score. The reliability test results for the 10 questionnaire items showed a Cronbach's Alpha value of 0.939. These results indicated that the questionnaire items were reliable because the value was higher than 0.700. Data collection was carried out using questionnaire forms and periodontal chart examinations. The independent variable in this study was smoking habits, while the dependent variable was periodontal disease status. The research process began with the administration of the questionnaire, which was completed by the respondents within 5-10 minutes, followed by a clinical examination using a periodontal chart⁴. The data obtained were analyzed using SPSS software. Univariate analysis was conducted to describe the characteristics of the respondents, while bivariate analysis was performed to determine the relationship between smoking habits and periodontal disease status. The statistical test used was the Spearman rank correlation test to measure the strength and direction of the relationship between the variables³. This study received ethical approval under number 012/RSGM.KEPK/PE/2026 from the Health Research Ethics Committee of the Dental Hospital of Universitas Muhammadiyah Semarang. All respondents also provided written informed consent before participating in the study.

RESEARCH RESULT

Univariate Analysis

a) Respondent Characteristics

Table 1. Distribution of Respondent Characteristics

Variable	Frequency (N)	Percentage (%)
Gender		
Male	83	100.0
Female	0	0
Age (Years)		
16	27	32.5
17	49	59.0
18	7	8.4
Class		
XI-4	21	25.3
XI-5	19	22.9
XI-6	16	19.3
XI-10	14	16.9
XI-11	13	15.7
Type of Cigarettes		
Smoker	79	95.2
Konvensional		
Vape/ vapor	4	4.8
IQOS	0	0
Smoking Habit		
Light Smoker (0-6)	52	63.9
Moderate Smoker (6-12)	26	31.3
Heavy Smoker (>12)	4	4.8
Plak		
Yes	83	100.0
No	0	0

Cigarette Duration

<1 Tahun	55	66.3
1-3 Tahun	26	31.3
>3 Tahun	2	2.4

Tooth-brushing Behavior

Good	0	0
Currently	23	27.7
Bad	60	72.3

Periodontal Disease Status

Health	0	0
Gingivitis	50	60.2
Periodontitis	33	39.8

Table 1. Based on the table, all respondents were male (83 students; 100%), with 59.0% aged 17 years. Most were from Class XI-4 (25.3%) and used conventional cigarettes (95.2%). Most were light smokers (63.9%), had smoked for less than one year (66.3%), and had good tooth-brushing behavior (72.3%). Gingivitis was the most common periodontal condition (60.2%)

Tabel 2. Smoking Habits and Periodontal

Smoking Habit * Periodontal Disease Status Category Crosstabulation

		Periodontal Disease Status				r	P-Value
		Healthy	Gingivitis	Periodontitis	Total		
Smoking Habit Category	Light smoker	0	42	11	53	0,664	0,000
	n%	0.0%	50.6%	13.3%	63.9%		
	Moderate Smoker	0	8	18	26		
	n%	0.0%	9.6%	21.7%	31.3%		
	Heavy Smoker	0	0	4	4		
	n%	0.0%	0.0%	4.8%	4.8%		
			50	33	83		
		0.0%	60.2%	39.8%	100.0%		

Table 2. Based on the table above, the relationship between smoking habits and periodontal disease status showed that among students with gingivitis, 42 respondents (50.6%) were light smokers and 8 respondents (9.6%) were moderate smokers. Among students with periodontitis, 11 respondents (13.3%) were light smokers, 18 respondents (21.7%) were moderate smokers, and 4 respondents (4.8%) were heavy smokers. No respondents had healthy periodontal conditions among the 83 students examined. Statistical analysis showed a p-value of <0.05 , indicating a significant relationship. The data were further analyzed using the non-parametric Spearman rank correlation test.

DISCUSSION

This study involved 83 respondents and found a relationship between smoking habits and periodontal disease status based on questionnaire results and clinical examinations. This finding is consistent with previous studies showing that adolescent smokers tend to have poorer periodontal conditions than non-smokers, including increased gingival inflammation and periodontal tissue damage.

The results showed that conventional cigarettes were the most commonly used type, with 79 students (95.2%). According to the World Health Organization, conventional cigarette use among adolescents may be influenced by nicotine dependence. Conventional cigarettes deliver nicotine to the brain more rapidly than electronic cigarettes, resulting in stronger addictive effects. Conventional cigarettes contain nicotine, which can cause dependence among users. Although electronic cigarettes are often used as an alternative to reduce or quit smoking, some users continue to use or switch back to conventional cigarettes because they are perceived to provide greater sensation and satisfaction¹⁶.

The most common periodontal condition was gingivitis, found in 50 students (60.2%). Most respondents were classified as light smokers, with 52 students (63.9%), and their periodontal status was predominantly gingivitis. Gingivitis is inflammation of the soft tissues surrounding the teeth without bone destruction. Smoking can trigger gingival inflammation and increase plaque accumulation on the tooth surfaces, thereby increasing the risk of gingivitis^{16, 17, 18}.

In addition to addiction, psychological factors and habits also play an important role in maintaining smoking behavior. Smoking is not only associated with nicotine dependence but also becomes part of daily routines, such as holding and inhaling cigarettes and socializing with peers. These habits or smoking rituals are among the main reasons why individuals may find it difficult to switch to electronic cigarettes. This is consistent with the findings of this study, in which most respondents were light smokers with a smoking duration of less than one year, accounting for 55 students (66.3%). This indicates that the behavior was still at an early stage but had already been influenced by social habits^{17, 18}.

The social environment also plays an important role in influencing smoking behavior among adolescents. Adolescents tend to imitate the habits of their peers (peer groups). If their social environment is dominated by conventional cigarette users, the likelihood of adolescents adopting the same smoking behavior increases. Peer influence is one of the main factors contributing to the initiation and continuation of smoking habits among adolescents⁸.

In addition, economic factors and ease of access also contribute to the high use of conventional cigarettes. Conventional cigarettes are more readily available and do not require a large initial cost, unlike electronic cigarettes, which require a device and e-liquid. Price and accessibility are important factors in determining the choice of tobacco products, particularly among adolescents⁷.

Biologically, smoking contributes to the deterioration of periodontal conditions through impaired immune responses and alterations in the oral microbiome. Studies have shown that smoking can cause microbial imbalance (dysbiosis), increase periodontal pathogenic bacteria, and reduce commensal bacteria that play a role in maintaining healthy periodontal tissues^{3, 5}.

However, the results also indicate that periodontal disease is influenced not only by smoking habits but also by other factors, such as oral hygiene. Dental plaque remains a major factor in the etiology of periodontal disease; therefore, the interaction between smoking habits and poor oral hygiene may accelerate periodontal tissue destruction^{1, 3}.

Overall, the findings strengthen the scientific evidence that smoking is a significant risk factor for periodontal disease among adolescents. Therefore, preventive efforts through health education and early control of smoking habits are needed to prevent further periodontal tissue damage^{17, 1}.

CONCLUSION

Based on the results of the study on the relationship between smoking habits and periodontal disease status among adolescents at SMA Negeri 2 Kota Semarang, it can be concluded that there was a significant relationship between smoking habits and periodontal disease status based on the Spearman rank correlation test. These findings indicate a significant association between the two variables. Furthermore, the effect of smoking habits on periodontal disease status was influenced by smoking duration. Respondents with a history of smoking for ≥ 1 year tended to have a higher risk of developing periodontal disease compared with those with a shorter smoking duration.

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