Stage and grade determination of periodontitis accompanied by systemic conditions and diseases according to American Academy of Periodontology 2017 Classification: Study at Dental Hospital, Faculty of Dentistry, Universitas Indonesia

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Abstract

Objective: Periodontitis is an inflammatory disease of the supporting tissues of the teeth caused by specific microorganisms, resulting in decay of the teeth and damaging of supporting tissues. Systemic conditions and increasing age will affect the periodontal tissue due to amongst others changes in the immune defense system. The classification for periodontal diseases used today is the 1999 American Academy of Periodontology (AAP) classification. The latest development was in 2017, when the AAP published a new classification that classifies periodontitis based on stage and grade and is the classification that is widely used today. Research on determining the stage and grade of periodontitis using the 2017 AAP classification is still very rare in Indonesia.

Material and Methods: In this study, a cross sectional analytical descriptive approach was used to determine the stage and grade of periodontitis according to the classification of periodontal disease based on the 2017 AAP in relation to the age of patients with systemic conditions and diseases. A total of 331 medical records from patients treated at the RSKGM FKG UI in the 2017 – 2019 visit were researched.

Results: The results have shown that the highest stage and grade in all research subjects was stage III grade C, this stage and grade was found in subjects who smoke. Different results were found in research subjects with Diabetes Mellitus or Hypertension namely stage III grade B.

Conclusion: Patients with hypertension without any systemic disease and non smoking should be advised to request a test for diabetes mellitus.

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Introduction

Periodontitis is an inflammatory disease of the tooth supporting tissue caused by specific microorganisms or specific groups of microorganisms, resulting in progressive deteroration of the periodontal ligament and alveolar bone with periodontal pocket formation, gingival recession, or both.[1] Tonetti et al.[2] reported that according to the Recent Global Disease Study, severe periodontitis has the sixth highest prevalence worldwide, which is 11.2% with around 743 million affected patients and periodontal disease increased by 57.3% from 1990 to 2010. In Indonesia, the 2018 Basic Health Research (Riskesdas) reported, the prevalence of dental and oral problems nationwide was 57.6%.[3] This finding shows that dental and oral health in Indonesia still needs attention to be improved. Meanwhile, of all dental and oral problems, the prevalence of periodontitis in Indonesia is 74.1%.[3] This is what underlines the need for further research on periodontitis in Indonesia.

The occurrence of periodontitis is the result of bacterial infection and the body's response modified by the environment, innate risk factors, and a person's genetic resistance.[1] The occurrence of periodontitis due to the initiation process by microbes in dental plaque.[4] These microbes will trigger the body's response resulting in destruction of the periodontal tissue. This mechanism is related to various cytokines, cells in the tissue that are not inflamed, and cells involved in inflammatory processes such as PMN, monocytes, and other cells that trigger the destruction of collagen and bone.[5] Systemic condition factors will modify periodontitis, especially the effects of dental plaque microbes. On the body's immune defense and inflammation.[4]

The role of systemic disease in initiating and modifying the development of periodontal disease is complex.[5] That in a previous study 10% of children with diabetes mellitus had an increase in attachment loss and bone loss compared to the

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control group, while plaque scores were comparable.[6] In addition, patients with cardiovascular disorders epidemiologically also have a relationship with a person's periodontal condition. Patients with cardiovascular disorders have a 20% greater risk of developing periodontal disease.[7] Periodontitis and poor oral hygiene are also associated with the incidence of pulmonary infections, especially nosocomial pneumonia.[8] In general, blood disorders are not a predisposing factor for periodontal disease, however should be considered in periodontal therapy.[5] Vascular changes as well as changes in the function of fibroblasts and neutrophils, such as in patients who smokes; increase the likelihood of periodontal disease.[9] Patients with diseases that suppress normal immune mechanisms, such as those with HIV/AIDS, are also a predisposing factor in the destruction of periodontal tissues.[4] Hormonal conditions will also affect a person's periodontal condition, as happens in pregnant women.[8] Approximately 40% of pregnant women suffer from periodontal disease.[10]

The classification of periodontal disease has continued to develop from time to time since 1971. The classification of periodontal disease was revised again in 1999, namely Gingival Disease, Chronic Periodontitis, Aggressive Periodontitis, Periodontitis as a Manifestation of Systemic Diseases, Necrotizing Periodontal Diseases, Abscesses of the Periodontium, Periodontitis Associated with Endodontic Lesions, and Developmental or Acquired Deformities and Conditions.[11] This classification is still the most frequently used classification, especially at Dental Hospital, Faculty of Dentistry, Universitas Indonesia. After nearly twenty years of the 1999 AAP classification being used in the world, it turns out that in its use there are many shortcomings.

In 2017, the AAP published an updated classification of periodontal and periimplant diseases and conditions. In general, periodontal diseases and conditions are divided into Periodontal Health, Gingival Diseases and Conditions; periodontitis; Other Conditions Affecting the Periodontium. Periodontitis is reclassified based on stage, grade, as well as its extent and distribution.[12] This latest classification has not been used in the medical records of Dental Hospital, Faculty of Dentistry, Universitas Indonesia.

There have been many studies performed in the field of periodontology using the 1999 classification of periodontal disease. However, based on the results of a literature study by the researchers, there has been no research done on the distribution of periodontitis based on the AAP 2017 classification in Indonesia, especially in relation to the patient's systemic condition, so researchers became inspired to research this at the Dental Hospital, Faculty of Dentistry, Universitas Indonesia.

Material and Methods

This study uses a descriptive cross-sectional approach to the occurance of periodontitis in patients with systemic conditions and diseases according to the classification of periodontal disease based on the American Academy of Periodontology 2017. The studied data are secondary data from the medical records of the Dental Hospital, Faculty of Dentistry, Universitas Indonesia in the 2017-2019 with a common mention of periodontitis. Research samples taken from the population are medical records with a history of systemic conditions and diseases. Sample selection was done by consecutive sampling technique. The research was conducted at the Periodontics Department of the Dental Hospital, Faculty of Dentistry, Universitas Indonesia in August – October 2019. Inclusion criteria in this study were medical record cards which included information on data on name, age, gender, history, clinical attachment loss, number of missing teeth, diagnosis of periodontitis, and history of systemic conditions and diseases. The exclusion criteria in this study were incomplete medical record data. The independent variable in this study was the status of systemic conditions and diseases in the data with the dependent variable being the status of periodontitis in the medical record data according to the classification of periodontal disease according to the Academy of Periodontology 2017. Data analysis in this study was performed using statistical data processing software (SPSS) with univariate analysis to describe the occurance and Kendall bivariate analysis to describe the relationship between age and stage and grade of periodontitis.

Results

The study was conducted using secondary data in the form of medical record status cards of the integration clinic and the periodontics specialist clinic of Dental Hospital, Faculty of Dentistry, Universitas Indonesia with the visit year 2017-2019. Data collection was carried out from September to October 2019. The data search was carried out by collecting 1,067 medical record cards as the population. Examination of the data found several status cards that showed the exclusion criteria. 331 subjects were obtained that matched the inclusion criteria. The results of the data obtained are shown along with their explanations in the following tables.

Table 1 Demographic variables and OHIS status of research subjects

Variable	Subject (N)	Percentage (%)
Gender		
Male	210	63.4
Female	121	36.6
Age		
Late teens (17-25 years)	18	5.4
Early adulthood (26-35 years)	37	11.2
Late adulthood (36-45 years)	58	17.5
Early seniors (46-55 years)	104	31.4
Late seniors (56-65 years)	91	27.5
Seniors (>65 years)	23	6.9

Table 2 Systemic conditions and diseases suffered by research subjects

Condition – Systemic Disease	Subject (N)	Percentage (%)
Smoking	148	44.7
Hyeprtension	70	21.1
Diabetic Mellitus	59	17.8
Ulcer	10	3
Heart	9	2.7
Asthmatic	4	1.2
Hepatitis	3	0.9
Thyroid disorder	3	0.9
Cancer	3	0.9
Uric Acid	3	0.9
Down's Syndrome	2	0.6
Alergy	2	0.6
Osteoporosis	2	0.6
Blood Disorder	2	0.6
Kidney	2	0.6
Alcohol Consumption	1	0.3
Crohn's Disease	1	0.3
Menopause	1	0.3
Endometriosis	1	0.3
Cholesterol	1	0.3
Rheumatism	1	0.3
Pregnant	1	0.3
Stroke	1	0.3
Obesity	1	0.3

Table 1 shows that the highest percentage of gender in this research subject is male (63.4%), the largest age category is the early elderly (31.4%).

Table 2 shows that the most common systemic conditions and diseases found was smoking habit (44.7%).

Table 3 shows that the highest percentage of periodontitis by stage in study subjects with smoking habits was stage III (74.3%), the highest percentage of periodontitis by grade was grade C (69.6%). The highest percentage of periodontitis based on the 2017 American Academy of Periodontology classification in research subjects with smoking habits was stage III grade C (52.7%).

Table 4 shows that the highest percentage of periodontitis by stage in study subjects with diabetes mellitus was stage III (83.1%), the highest percentage of periodontitis by grade was grade B (52.5%). The highest percentage of periodontitis in research subjects with smoking habits was stage III grade B (45.8%).

Table 5 shows that the highest percentage of periodontitis by stage in the study subjects with hypertension was stage III (71.4%), the highest percentage of periodontitis by grade was grade B (60%). The highest percentage of periodontitis in research subjects with smoking habits was stage III grade B (45.7%).

Discussion

The 2017 American Academy of Periodontology classification describes periodontitis more specifically because it takes into account the severity, history of periodontitis progression, the possible risk of future progression of periodontitis, as well as an assessment of the risk of disease affecting the general condition of the body.[13] Based on the results of the author's literature study, there are currently no studies that describe the distribution of periodontitis using the 2017 American Academy of Periodontology classification, let alone studies related to systemic conditions and diseases.

Data analysis was performed using SPSS application to describe the frequency of age, gender, OHIS, systemic conditions, and grade and stage of periodontitis. Frequency calculations were carried out for all study subjects and for study subjects with three systemic conditions and diseases with the largest percentage of the number of subjects, namely smoking (44.7%), hypertension (21.1%), and diabetes mellitus (17.8%). In addition, cross tabulation was performed to describe the stage and grade of periodontitis in subjects who smoked, diabetes mellitus, and hypertension.

The results have shown that in individuals with systemic conditions and diseases, whether smoking, diabetes mellitus, hypertension, or other systemic conditions and diseases, the highest distribution of periodontitis was generalized periodontitis. This is consistent with the contribution of systemic conditions and diseases to periodontitis. In general, systemic conditions and diseases can decrease

Table 3 Periodontitis by stage and grade in research subjects who smoke

Periodontitis stage in study subjects with smoking habit	Periodontitis grade in study subjects with smoking habit					
	B		C		Total	
	N	%	N	%	N	%
I	1	0.7	3	2	4	2,7
II	7	4.7	9	6.1	16	10.8
III	32	21.6	78	52.7	110	74.3
IV	5	3.4	13	8.8	18	12.2
Total	45	30.4	103	69.6	148	100

Table 4 Periodontitis by stage and grade in research subjects with diabetes mellitus

Periodontitis stage in study subjects with Diabetes Mellitus	Periodontitis grade in study subjects with Diabetes Mellitus					
	B		C		Total	
	N	%	N	%	N	%
II	2	3.4	1	1.7	3	5.1
III	27	45.8	22	37.3	49	83.1
IV	2	3.4	5	8.5	7	11.9
Total	31	52.5	28	47.5	59	100

Table 5 Periodontitis by stage and grade in research subjects with hypertension

Periodontitis stage in study subjects with hypertension	Periodontitis grade in study subjects with hypertension							
	A		B		C		Total	
	N	%	N	%	N	%	N	%
II	1	1.4	5	7.1	1	1.4	7	10
III	3	4.3	32	45.7	15	21.4	50	71.4
IV	0	0	5	7.1	8	11.4	13	18.6
Total	4	5.7	42	60	24	34.3	70	100

resistance to infection and increase an individual's susceptibility to inflammation-induced destruction.[14] The most common periodontitis to occur in individuals with systemic conditions and diseases is periodontitis.generalis.

The results of the study show the highest occurance of periodontitis based on stage in research subjects with smoking habits is stage III. The results show that most of the patients who came to Dental Hospital, Faculty of Dentistry, Universitas Indonesia with a diagnosis of periodontitis and with smoking habits experienced attachment loss >5 mm.[13] The researcher compared with several cross-sectional studies conducted in Asia which study subjects smokers. The study by Sun et al.[15] showed that in adults aged 35-44 years in China in 2018, out of 1,458 subjects who smoked, 40.7%

had clinical attachment loss >3 mm. Another cross-sectional study at Karachi Medical and Dental College, Karachi, Pakistan also showed that 52% of 123 heavy smokers (consumption of 5 or more cigarettes per day) had severe periodontitis with pocket depth >5.5 mm.[16]

The highest occurence of periodontitis based on grade in study subjects with smoking habits is grade C which indicates that the acceleration of disease progression occurs rapidly.[13] Progression of periodontitis in this study was determined by primary criteria in the form of percentage of bone loss per age and modification factors in the form of number of cigarettes consumed per day. The number of cigarettes consumed per day has been investigated in a cross-sectional at Karachi Medical and Dental College, Karachi, Pakistan and showed that 96.7% of heavy smokers (≥5 cigarettes per day) had chronic periodontitis, and 66.1% of smokers had chronic periodontitis. 121 light smokers (≤5 cigarettes per day) developed chronic periodontitis.[16] This rapid progression of periodontitis is consistent with the effect of smoking on periodontal tissues. Physiologically, the condition of the periodontal tissues of smokers will be more susceptible to inflammation due to reduced lymphocyte proliferation, reduced IgG production, changes in neutrophil function and changes in vascularization. In addition, the subgingival temperature becomes lower so that the activity of periodontal cells will be reduced.[9]

The highest occurance of periodontitis by stage in study subjects with diabetes mellitus was stage III. This shows that most of the patients who come to the Dental Hospital, Faculty of Dentistry, Universitas Indonesia with a diagnosis of periodontitis and with diabetes mellitus experience attachment loss >5 mm.[13] The theory that developed shows that increased levels of proinflammatory cytokines in diabetes mellitus can reach the gingiva and cause periodontal disease conditions to become more severe.[17] The results of this study are in accordance with the results of a cross-sectional study by Khumaedi et al.[18] in Indonesia in patients with type 2 diabetes mellitus aged over 18 years showing that the majority of subjects, namely 75.3%, experienced clinical attachment loss. >5mm. This research compares the results of this study with the results of the above mentioned study[18] because the research subjects were also individuals with diabetes mellitus and living in the same country.

Determination of the grade of periodontitis based on the 2017 American Academy of Periodontology classification for patients with diabetes mellitus can be done using evidence of disease progression in the form of percentage of bone loss per age, as well as a modifying factor in the form of an HbA1C

score.[13] In this study, there was some difficulty in classifying grades of study subjects with diabetes mellitus. The grade of periodontitis could only be determined based on the percentage of bone loss per age. This is due to the fact that the data written in the medical records of Faculty of Dentistry, Universitas Indonesia do not all include the HbA1C score. Of the 59 subjects with diabetes mellitus, only 2 medical records contained HbA1C scores.

The highest occurence of periodontitis based on grade in study subjects with diabetes mellitus was grade B. The percentage of study subjects with periodontitis grade B and C only had a difference of 5%. This shows that patients who come to Dental Hospital, Faculty of Dentistry, Universitas Indonesia with a diagnosis of periodontitis and with diabetes mellitus experience moderate to rapid acceleration of disease progression, rapid periodontitis.[19] Based on the study of The Concurrent Tuberculosis and Diabetes Mellitus (TANDEM) by Soetedjo, et al.[20] in Indonesia, 71.8% of subjects had an HbA1C score of 7.0%. This shows that more individuals with diabetes mellitus in Indonesia have HbA1C 7.0%. Based on these results, it can be estimated that periodontitis patients with diabetes mellitus have a tendency to have periodontitis grade C.

The results of the study the highest occurence of periodontitis based on stage in research subjects with hypertension is stage III. This shows that most of the patients who came to Dental Hospital, Faculty of Dentistry, Universitas Indonesia with a diagnosis of periodontitis and with hypertension experienced attachment loss >5 mm.[13] The table also shows that the highest occurence of periodontitis by grade in study subjects with hypertension was grade B. This shows that most of the patients who came to the Dental Hospital, Faculty of Dentistry, Universitas Indonesia with a diagnosis of periodontitis and smoking habits experienced moderate acceleration of disease progression.[13]

This study has various limitations, such as incomplete medical record data and unclear medical record writing. In addition, some of the data needed to determine the stage and grade in the 2017 periodontitis classification were not fully explained in the medical records, one of which was the HbA1C score, the cause of tooth loss, and the details of the number of cigarettes per day. Data regarding the progression of bone loss in the last five years also could not be found in the medical records of the Dental Hospital, Faculty of Dentistry, Universitas Indonesia. These data are quite important as the primary criteria for determining the grade of periodontitis.[13] The data regarding furcation involvement are also not fully described. This is necessary as a determinant of the complexity of the stage.[13]

Conclusion

Patients with hypertension without any systemic disease and non smoking should be advised to request a test for diabetes mellitus. It is advisable to do a HbA1C test for Patients with diabetes mellitus to get a more reliable stage and grade result. Finally, all smokers light, medium and heavy are in danger of developping Periodontitis higher than Stage III grade B.

Acknowledgment

Conflict of Interest

There is no conflict of interest regarding this research.

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