

## The Correlation between Age and Periodontal Diseases

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### Abstract

Periodontal disease is among the most prevalent oral diseases worldwide. There is a tendency for the disease to increase in severity as people age. Epidemiology data on periodontal disease can be used to create a treatment and prevention plan for the disease. However, in Indonesia, such data is still lacking.

To discover the distribution of periodontal disease and investigate the correlation between age and periodontal disease among groups.

Ethical approval gathered from The Ethical Committee of Dental Research (KEPKG). This study design is cross sectional, using 2,069 medical records (period 2004-2014). Age was classified into seven groups: early adolescence (12-16 years), late adolescence (17-25 years), young adult (26-35 years), late adult (36-45 years old), early elderly (46-55 years old), late elderly (56-65 years old) and senior (> 65 years).

Chronic periodontitis is predominantly distributed in adolescence (59%), adults (73%) and seniors (82%). Certain types of periodontal disease have a tendency to link certain age groups. Gingival disease is mostly seen in late adolescence (35%), chronic periodontitis occurred among those in the early elderly group (23%), whereas aggressive periodontitis among late adults (33%). Significant difference ( $p=0.000$ ) and positive correlation ( $r=0.251$ ) were found between periodontal disease and age (Spearman's rho correlation test).

The most prevalent form of periodontal disease is chronic periodontitis. Even though positive-weak-correlation was found, periodontal disease has a tendency to relate with age. This study might reveal the starting-age of disease initiation and the disease's progression pattern.

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### Introduction

Periodontal disease is a term that refers to infection in the periodontal tissues.<sup>1</sup> *American Academy of Periodontology (AAP)*, on *International Workshop for a Classification of Periodontal Diseases and Condition* in 1999 classified periodontal disease into gingival disease, chronic periodontitis, aggressive

periodontitis, periodontitis as a manifestation of systemic disease, necrotizing periodontal disease, periodontal abscess, periodontal disease associated to endodontic lesion and developmental/acquired deformities and condition.<sup>2</sup>

Dental plaque bacteria is the main etiology of periodontal disease.<sup>1,3</sup> Damage to periodontal tissue is caused by the host response to the presence of bacteria and also by the toxin produced by the bacteria itself.<sup>1,3</sup> Besides the main etiology, there are several factors that may increase the risk of periodontal disease, referred to as risk factors, which may enhance the host response to the bacterial infection in periodontal tissue. These risk factors can be categorized as local and systemic factors.<sup>1</sup>

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Age is among systemic factors that influence the occurrence of periodontal disease. According to the Ministry of Health Republic of Indonesia as described by Akbar and Pratiwi (2016), age can be classified into seven groups, namely early adolescence (12-16 years), late adolescence (17-25 years), young adult (26-35 years), late adult (36-45 years old), early elderly (46-55 years old), late elderly (56-65 years old), and senior (> 65 years).<sup>4</sup> The prevalence and severity of periodontal disease tends to increase with patient age. Degenerative changes in periodontal tissues are assumed to be the cause of this condition. In addition, prolonged exposure to the accumulation of risk factors during one's life is also assumed to be associated with this condition. It stated that elderly patients who followed preventive activities had minimal attachment loss.<sup>5</sup> In contrast, other in-vivo studies reported that aged mice had produced a greater adaptive immune response compared to young mice.<sup>6</sup> It can be concluded that the process of aging or degenerative change had not caused an increase in the prevalence and severity of periodontal disease.<sup>2</sup>

Some studies suggest that there are differences in the prevalence of periodontal disease in each age group. Gingivitis is the most common periodontal disease among children and adolescence in China, with an increase in severity with age.<sup>7</sup> In contrast, a report by Idrees et al. (2014) confirmed no relationship between age and gingivitis.<sup>8</sup> Among adults in the United States, periodontitis is the most frequently occurring periodontal disease (47%), with 30% of such cases deemed moderate. Among the elder population in US, periodontitis is also the most common periodontal disease.<sup>7</sup>

An epidemiological study can be carried out to show the distribution of periodontal disease in each age group. The distribution is displayed in a polygon, table or histogram. By displaying the distribution of periodontal disease, the pattern of periodontal disease in a population can be seen and interpreted easily.<sup>9</sup> The general concept of an epidemiology study it to gain information to promote, protect and restore health based on evidence.<sup>10</sup> However, since epidemiology data on periodontal disease related to age in Indonesia lacks clarity, this study aims to serve as a source of consideration in creating a treatment and prevention plan to tackle the disease.

## Materials and methods

This study received ethical approval from The Ethical Committee of Dental Research (KEPKG) 2016 and was conducted at the Department of Periodontology, Dental Teaching Hospital, Faculty of Dentistry, Universitas Indonesia (RSKGM FKG UI), through a cross sectional method using descriptive statistics and analytical statistics. This study used 2.069 medical records documented from 2004-2014 as a sample, with total sampling as the sampling method. The variable dependent of this study is periodontal disease. Patient age serves as the independent variable.

Age is categorized based on classification of age as early adolescence (12-16 years), late adolescence (17-25 years), young adult (26-35 years), late adult (36-45 years old), early elderly (46-55 years old), late elderly (56-65 years old), and senior (> 65 years).<sup>4</sup> Periodontal disease is categorized based on the classification of periodontal disease by the American Academy of Periodontology to include gingival disease, chronic periodontitis, aggressive periodontitis, periodontitis as a manifestation of systemic disease, periodontal abscess and other periodontal diseases including necrotizing periodontal diseases, periodontal disease associated with endodontic lesion, and developmental/acquired deformities and condition.<sup>2</sup>

This study began with the collection of medical records from 2004-2014, which were later selected from based on the criteria that the medical records must consist of information on patient age and periodontal diagnosis. The 2,069 selected medical records were then recorded and processed by *Microsoft Excel*. For bivariate analysis, the variables of periodontal disease were ranked in two categories namely gingival disease and periodontitis, including chronic periodontitis, aggressive periodontitis and periodontitis as a manifestation of systemic disease. From the 2,069 medical records, 1,974 medical records were selected to be analyzed by SPSS 16.0 with *Spearman's rho* correlation test.

## Results

Approximately 2,131 medical records were obtained during the data collection process, 62 medical records of which were excluded

owing to incomplete data. The selection process concluded with 2,069 medical records selected to be used in this study, with the following distribution: 57.6% female patients and 42.4% male patients. Chronic periodontitis is the most common periodontal disease each year. The number of cases of each periodontal disease in the 2004-2014 period include (Figure.1), 71 (3.4%) cases of localized gingivitis, 87 (4.2%) cases of generalized gingivitis, 594 (29%) cases of localized chronic periodontitis, 955 (46.2%) cases of generalized chronic periodontitis, 31 (1.4%) cases of localized aggressive periodontitis, 152 (7%) cases of generalized aggressive periodontitis, 84 (4%) cases of periodontitis as a manifestation of systemic disease, 16 (0.8%) cases of periodontal abscess not accompanied by other periodontal diseases and 79 (4%) cases of other periodontal disease, including gingival hyperpigmentation, gingival hyperplasia, NUP / NUG.

Distribution of patient age group based on classification by the Ministry of Health Republic of Indonesia (Depkes RI, 2009) in 2004-2014 shows 31 (1.5%) patients in the early adolescence group, 274 (13.2%) patients in the late adolescence group, 448 (21.7%) patients in the young adult group, 466 (22.5%) patients in the late adult group, 449 (21.7%) patients in the early elderly group, 307 (14.8%) patients in the late elderly group, and 94 (4.5%) patients in the senior group.

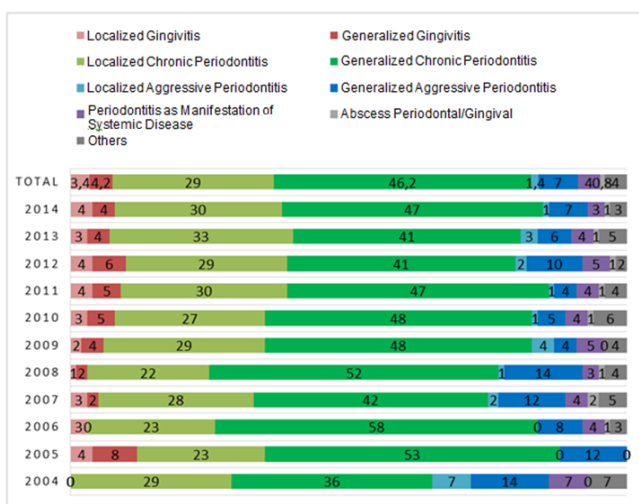


Figure 1. Distribution of Periodontal Disease Period 2004-2014 (%).

As seen in figure.2, the young adult, late adult and early elderly groups accounted for the

most patients among other age groups each year.

Types of periodontal disease have a tendency to occur more in certain age groups. Gingival disease can be found the most in the late adolescent group (35%).

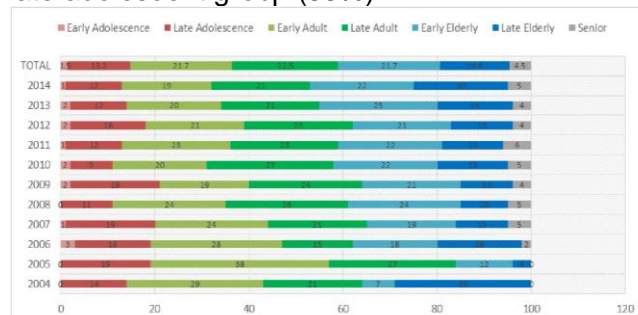


Figure 2. Distribution of Patient Age Group Period 2004-2014 (%).

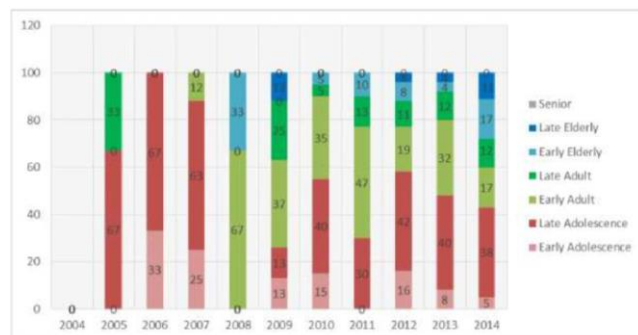


Figure 3. Distribution of Gingivitis.

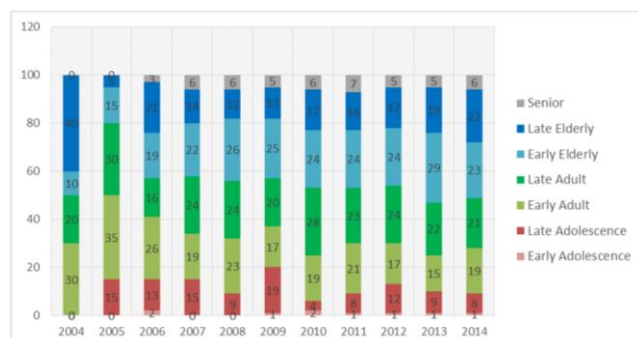


Figure 4. Distribution of Chronic Periodontitis.

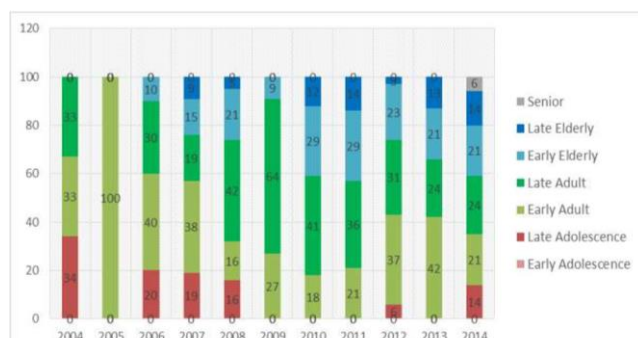
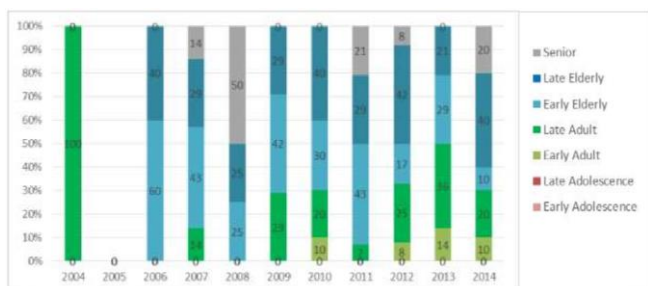


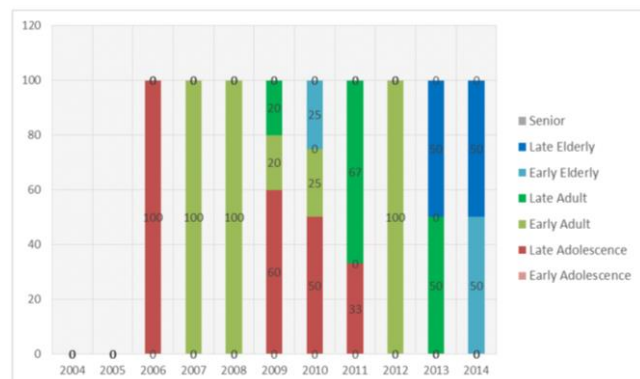
Figure 5. Distribution of Aggressive Periodontitis.

Chronic periodontitis disease occurs most frequently in the early elderly group (23%), while aggressive periodontitis disease is most prevalent in the late adult age group (33%). Periodontitis as a manifestation of systemic disease occurs the most in the late elderly group (32%).

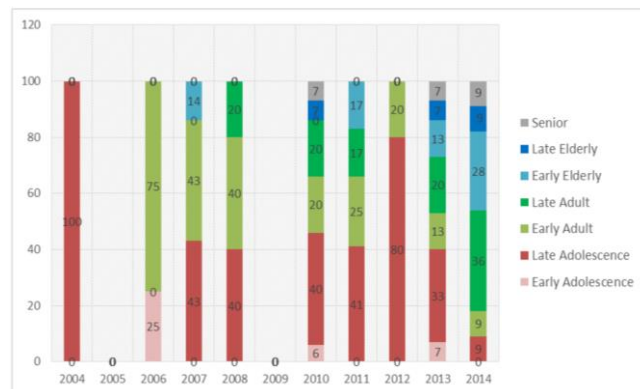
A tendency for the occurrence of periodontal abscesses and other periodontal diseases are not found in certain age groups. More detailed information is shown in the figures below. (Figure 3 – Figure 8)



**Figure 6.** Distribution of Periodontitis as Manifestation of Systemic Disease.



**Figure 7.** Distribution of Periodontal Abscess.



**Figure 8.** Distribution of Other Periodontal Disease.

		Periodontal Disease	Age Group
Periodontal Disease	Coefficient correlation (r)	1,000	0,251
	P Value	-	0,000*
	Quantity	1974	1974
Age Group	Coefficient correlation (r)	0,251	1,000
	P Value	0,000*	-
	Quantity	1974	1974

Value  $p < 0,05$  = presence of correlation. (\*Significant). Coefficient correlation  $-1 < r < 1$  shows direction and strength of correlation.

**Table 1.** Correlation between Periodontal Disease and Age Group.

Table.1 shows the value of *Spearman's rho* correlation between periodontal disease by age group is 0.000 ( $p < 0.05$ ), meaning there is a correlation between periodontal disease and age group. The coefficient correlation (r) of periodontal disease and age groups is 0.251, indicating there is a weak correlation with positive direction between these variables.

### Discussion

From the 2,069 medical records used in this study, there was a significant difference in quantity of medical records available for the years 2004 and 2005. The significantly low quantity of medical records in those years may be correlated to the lack of organization of medical records then. Members of the early adult (21,6%), late adult (22,5%) and early elder (21,7%) age groups suffered the most from periodontal disease each year. This condition is consistent with a report by Eke et al. (2012) that said 47.2% of the adult population in the US suffered from periodontal disease.<sup>11</sup> It is also known that chronic periodontitis was the most prevalent periodontal disease in period of 2004-2014. Data for gingival disease could not be collected entirely in this study, as medical records of those diagnosed with mild gingivitis were stored in integrated clinics instead of periodontal clinics. However, this study is still able to show the distribution of periodontal disease in the urban population because the data was taken from a dental referral center hospital under a well-known dental education institution in Jakarta, Indonesia.

The results show that gingivitis was mostly experienced by the late adolescent age group (17-25) (35%), while chronic periodontitis mostly occurred in the early elderly age group (46-55) (23%). These results are in line with a study by Eke et al. that confirmed a high prevalence of periodontitis in US adults aged 30

years and older.<sup>12</sup> Nanaiah et al. (2013) reported that only 1.5% of 1100 subjects (15-18 years old) suffered chronic periodontitis, moreover the author stated that the presence of gingivitis started to increase in adolescence (16 years old).<sup>13</sup> This distribution of chronic gingivitis and periodontitis shows there is a tendency for periodontal diseases to increase in severity in the older age group, matching the results of previous studies. The increased severity of periodontal disease is not caused by a damage rate increase in periodontal tissues, but rather caused by an accumulation of the damage in periodontal tissues.<sup>14</sup>

Aggressive periodontitis is mostly suffered by the late adult group (36-45) (33%). A study conducted by Cecilia et al. explained that although aggressive periodontitis was commonly found in young age, it still had the probability to be found in all age groups.<sup>15</sup> Another report by Fatema and Desai (2016) stated that the prevalence of aggressive periodontitis was 7% among 200 patients.<sup>16</sup>

Our results showed that chronic periodontitis occurred frequently in all age groups, with an increasing percentage in the older age groups, such as, 56% in the adolescence group, 74% in the adult group, and 88% in the elderly group. Bokhari et al. (2015) also reported that subjects aged 40 years and above were four times more likely to have periodontitis using Community Periodontal Index (CPI) methods.<sup>17</sup> This data shows that not only is the severity increasing but the prevalence of periodontal disease also increases with age.<sup>18</sup> Moreover, with aging, oral epithelial cells have reduced mitotic activity and metabolic rate. It is assumed that this condition will lead to an impaired immune system and make a patient more susceptible to bacterial infection. General deterioration in immune functions and tissue integrity in older age may serve as a hypothesis for the weakness of periodontal disease.<sup>19</sup>

The result of *Spearman's rho* correlation test between periodontal disease and age groups is  $p < 0.05$ , which means there is a correlation between periodontal disease and age groups. The correlation coefficient ( $r$ ) of periodontal disease and age groups is 0.251, meaning that the severity of periodontal disease increases with age, but the correlation is weak. This result matches previous studies stating periodontal disease increases in severity in older age

groups.<sup>14</sup> According to a study by Jiang et al. (2016), from 987 Chinese women, women  $\geq 30$  years old have a significantly greater chance to experience moderate to severe periodontitis compared to women below 30 years old (OR: 0.88).<sup>20</sup> In our finding, the weak correlation might be due the presence of other risk factors that contribute to the incidence of periodontal disease.<sup>14</sup>

## Conclusions

The most prevalent form of periodontal disease is chronic periodontitis. Even though a positive-weak-correlation was found, periodontal disease tends to relate to age. This study might reveal the starting-age of disease initiation and disease progression pattern.

## Acknowledgements

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## Declaration of Interest

The authors report no conflict of interest.

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