

Periodontitis prevalence based on the current classification system among patients attending Dental Clinic Hospital Pakar Universiti Sains Malaysia

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Abstract

Periodontal disease is among the most prevalent oral health issues globally. This condition compromises the supportive structures of teeth and is influenced by both local and systemic factors. The 2017 Diagnosis and Classification of Periodontal Diseases and Conditions characterized the severity and progression of periodontitis by staging (I to IV) and grading (A, B, C), respectively. Although this classification scheme has been gradually adopted in local settings since its introduction in 2018, data on the prevalence of periodontitis using this framework remain limited. This study intended to determine the prevalence of periodontitis and its associated factors based on the current classification system among patients attending Hospital Pakar USM (HPUSM). This is a retrospective record review study that utilized the retrieval of patients' records, spanning 2018 to 2024. Data on sociodemographic and periodontal diagnosis were collected. Data were analysed by using descriptive statistics, chi-squared tests, and an independent t-test. Of 300 records retrieved, 262 had complete periodontal records. The mean age of patients was 42.48 years (SD14.32), with 91.2% being Malays. The overall prevalence of periodontitis was 50.8%, with generalized periodontitis stage III grade C being the most reported (31.4%). Significant associations were found between periodontitis and age ($p < 0.001$), systemic diseases ($p < 0.001$), medication taken ($p = 0.001$), and smoking habits ($p < 0.001$). Within study limitations, periodontitis stage III grade C was prevalent among the study population. Age, systemic diseases, medications, and smoking habits are the possible risk factors for periodontitis.

Keywords: *periodontitis, periodontal classification system, risk factors, staging and grading*

Introduction

Periodontal disease is a chronic inflammatory disease affecting the supportive structures of the teeth, encompassing gingival tissue, alveolar bone, cementum, and periodontal ligament (Gasner & Schure, 2023). Periodontal disease can generally be classified into gingivitis and periodontitis. These

conditions may stem from developmental, inflammatory, traumatic, neoplastic, genetic, or metabolic causes, either inherited or acquired (Jordan, 2004). Gingivitis is the mildest form of periodontal disease confined to inflammation of the gingiva and can be found in most of the population (Pihlstrom *et al.*, 2005). Periodontitis is a severe form of periodontal disease that involves the destruction of tooth-supporting tissues. If left untreated, it progresses to deeper

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tissues, disrupting bone homeostasis and ultimately resulting in tooth loss (Petersen & Baehni, 2012). As per the Global Burden of Disease Study in 2016, severe periodontal disease ranked as the 11th most prevalent condition globally (Nazir *et al.*, 2020). According to National Oral Health Survey of Adults in year 2020, 38.2% of Malaysian population suffered from periodontitis, where 23.7% of them having shallow periodontal pocket and 14.5% of them having deep periodontal pocket (NOHSA, 2020).

Previous diagnosis of periodontal diseases was based on American Academy of Periodontology 1999 Classification of Periodontal Diseases. However, this classification was perceived to pose challenges for dental student education and implementation in clinical practice (Das, 2015). For years, periodontitis was classified using outdated methods that overlooked key risk factors, leading to inconsistencies in diagnosis and prevalence estimates. With the introduction of a 2017 Classification of Periodontal and Peri-Implant Diseases and Conditions, it provides a more refined way to diagnose and categorize periodontitis, reshaping our understanding of its true prevalence. The diagnosis of periodontal diseases based on this classification characterized disease in staging and grading that were not defined in previous classification. The current classification is based on the case definition (Tonetti *et al.*, 2018; Eke *et al.*, 2020) that presently being employed globally as the standard guideline in determining the prevalence of periodontitis. The 2017 classification introduced a more accurate approach, focusing on staging and grading to better reflect disease severity and risk.

In Malaysia, there is a lack of local studies reported, applying this new classification to real-world patient populations. This gap hinders a comprehensive understanding of disease patterns and risk profiles. Hence to address this gap, this study was conducted, aimed to determine the prevalence of periodontitis and its associated factors consistent with the current classification systems among local populations.

Materials and Methods

This is a retrospective record review study of patients attending dental clinic Hospital Pakar Universiti Sains Malaysia (HPUSM). The inclusion criteria specified patients aged 18 years old and above, newly diagnosed with periodontal disease within the study period and clearly stated periodontal staging and grading. Meanwhile those presented with gingival enlargement or pregnancy, and incomplete periodontal records were excluded. Based on the sample size calculation using a single proportion formula with anticipated population proportion (P) = 92.7% (Ranganathan *et al.*, 2007) and by anticipating for a potential 10% dropout rate, 138 records required for analysis. The study protocol had been approved by Human Research Ethics Committee USM (*Jawatankuasa Etika Penyelidikan Manusia USM*) (USM/JEPeM/KK/24040309). Utilizing a convenience sampling method, all records of patients from year 2018 until 2024 were screened and reviewed for eligibility.

Data collection involved extracting sociodemographic information such as age, gender, ethnicity, smoking habits, systemic diseases, and medications taken. Oral hygiene status and diagnosis of periodontal disease including its staging and grading was retrieved from the periodontal records. The periodontal examinations were performed by trained undergraduate dental students under the direct supervision and approval of a periodontist. All clinical findings, including staging and grading, were reviewed and verified to ensure consistency and diagnostic accuracy.

The data collected were entered into Statistical Package for Social Science (SPSS Statistics for Windows, Version 27.0, Armonk, NY: IBM Corp) for analysis. Descriptive statistics for categorical variables are presented as frequency and percentage (%) whereas mean and standard deviation (SD) or median and interquartile range (IQR) are presented for continuous variables. Chi-square tests, Fishers exact tests and independent t-test were used to

determine factors associated with periodontitis. Significant level was set at $p < 0.05$ with 95% confidence intervals (CI).

Results

A total of 262 patients out of 300 records has fulfilled the criteria, comprising mostly data of female subjects (56.9%). The remaining 38 cases were excluded due to insufficient clinical data required for accurate diagnosis including probing pocket depth, clinical attachment loss, bleeding on probing, and radiographic assessment of bone loss. The mean (SD) age was 42.5 (14.3) years with Malay ethnicity, accounting for 91.2%, followed by Chinese (7.3%) and Indian (1.5%). The demographic characteristics of

study subjects is summarized in Table 1. Of the total subjects, 32 (12.2%) were diagnosed with diabetes mellitus, 23 (8.8%) had hypertension, and 14 (5.3%) had hyperlipidaemia. A combination of diabetes mellitus and hypertension was present in 26 patients (9.9%). Other systemic diseases, which included conditions such as history of breast cancer, bronchial asthma and allergic rhinitis, were observed in 28 patients (10.7%). Among the total patients, 116 (44.3%) taking medications for their medical problem. About 18% were smokers and most of the patients (85.5%) exhibited poor oral hygiene. The prevalence of periodontitis among patients attending HPUSM was 133 (50.8%) as shown in Table 2.

Table 1. Sociodemographic profile of study subjects (n=262).

Variables	n (%)	Mean (SD)
Age		42.5 (14.3)
Gender		
Male	115 (43.9)	
Female	147 (56.1)	
Ethnic		
Malay	239 (91.2)	
Chinese	19 (7.3)	
Indian	4 (1.5)	
Systemic diseases		
Diabetes Mellitus	32 (12.2)	
Hypertension	23 (8.8)	
Hyperlipidaemia	14 (5.3)	
Combined DM + HPT	26 (9.9)	
Others	28 (10.7)	
None	139 (53.1)	
Medication taken		
Yes	116 (44.3)	
No	146 (55.7)	
Smoking habits		
Yes	47 (17.9)	
No	215 (82.1)	
Oral hygiene		
Good	38 (14.5)	
Poor	224 (85.5)	

Table 2. Prevalence of periodontitis based on the 2017 Classification of Periodontal Diseases and Conditions 2017 (n=262).

Variables	n(%)
Gingivitis	129 (49.2)
Periodontitis	133 (50.8)

Regarding the severity and extent of periodontitis based on staging and grading (Table 3), the most common diagnosis was generalized periodontitis stage III grade C, identified in 33 patients (31.4%). This was

followed by generalized periodontitis stage III grade B (24.8%), generalized periodontitis stage II grade B (13.3%) and generalized periodontitis stage IV grade C (11.4%).

Table 3. Severity and extent of periodontitis based on staging and grading (n=133).

Variables	n(%)		
	Grade A	Grade B	Grade C
Localised Periodontitis			
Stage I	4 (14.3)	6 (21.4)	0 (0)
Stage II	3 (10.7)	5 (17.9)	1 (3.6)
Stage III	0 (0)	6 (21.4)	0 (0)
Stage IV	1 (3.6)	1 (3.6)	1 (3.6)
Generalised Periodontitis			
Stage I	2 (1.9)	2 (1.9)	1 (1.0)
Stage II	4 (3.8)	14 (13.3)	2 (1.9)
Stage III	5 (4.8)	26 (24.8)	33 (31.4)
Stage IV	1 (1.0)	3 (2.9)	12 (11.4)

Age was significantly associated with periodontitis ($p<0.01$), with a mean age of 49.2 years (SD11.3). Similarly, systemic diseases were also found to be significantly associated with periodontitis ($p<0.01$), with 77 (57.9%) patients having systemic conditions such as hypertension, hyperlipidaemia, diabetes mellitus, or a

combination of diabetes mellitus and hypertension. Additionally, a significant association was also observed between periodontitis and medication, as well as smoking habits ($p<0.01$). There was no significant association between periodontitis and gender, ethnicity and oral hygiene status (Table 4).

Table 4. Factors associated with the periodontitis (n=262).

Variables	Gingivitis n (%)	Periodontitis n (%)	χ^2 (df)	P-value
Age (mean, SD)	35.53 (13.8)	49.2 (11.3)	-8.8 (246.9)	< 0.01 ^a
Gender				
Male	54 (41.9)	61 (45.9)	0.4 (1)	0.51 ^b
Female	75 (58.1)	72 (54.1)		
Ethnic				
Malay	115 (89.1)	124 (93.2)	1.7	0.42 ^c
Chinese	11 (8.5)	8 (6.0)		
Indian	3 (2.3)	1 (0.8)		
Systemic diseases				
Yes	44 (34.1)	77 (57.9)	14.9 (1)	< 0.01 ^b
No	85 (65.9)	56 (42.1)		
Medication				
Yes	44 (34.1)	72 (54.1)	10.6 (1)	0.00 ^b
No	85 (65.9)	61 (45.9)		
Smoking habits				
Yes	9 (7.0)	38 (28.6)	20.7 (1)	< 0.01 ^b
No	120 (93.0)	95 (71.4)		
Oral hygiene				
Good	19 (14.7)	19 (14.3)	0.0 (1)	0.92 ^b
Poor	110 (85.3)	114 (85.7)		

^aIndependent T-test, ^bPearson Chi-square Test, ^cFisher's Exact Test; Significant at p<0.05

Discussion

Periodontitis is a significant public health concern, with a notable impact on oral health and overall well-being. Considering the current classification system of periodontal disease 2017 (Tonetti *et al.*, 2018), this study aims to determine the prevalence of periodontitis and its associated factors among patients attending HPUSM since the

application of this new classification scheme in our setting in 2018.

The prevalence of periodontal disease in Malaysia is notably high, affecting 94% of adults aged 15 years and older. Among these, 48.5% have been diagnosed with periodontitis, with 18.2% suffering from its severe form—a rate significantly higher than the global average (Anuwar *et al.*, 2024). This present study shows a similar pattern

emerges in which 50.8% of cases were diagnosed with periodontitis, among all subjects with the rest were having gingivitis. This distribution reflects a balanced yet concerning trend, as gingivitis, if left untreated, can progress to periodontitis, increasing the risk of tooth loss. In comparison, the NOHSA 2020 reported a national prevalence of 38.2%, with 14.5% of the population having deep periodontal pockets (NOHSA, 2020). Globally, pooled data from 2011 to 2020 showed a 62% prevalence among dentate adults (Trindade *et al.*, 2023), while high-income countries reported a prevalence of 43.7% (Nazir *et al.*, 2020). The higher prevalence of periodontitis at HPUSM compared to national and global figures may reflect regional risk factors, patient demographics, or differences in healthcare-seeking behaviour.

Generalized periodontitis stage III grade C was the most prevalent in this study, accounting for 31.4% of cases. According to the 2017 classification system for periodontal diseases, in which stage III is characterized by interdental clinical attachment loss greater than 5 mm and radiographic bone loss extending to the middle third of the root and beyond, and grade C denotes a rapid rate of disease progression. In a study conducted by Carmen & Hong (2024), reported among their study subjects, stage IV periodontitis was more common (54.2%) than stage III periodontitis (45.8%). Furthermore, a large proportion of patients showed rapid periodontitis progression and were categorized under grade C (78.9%). Generalized periodontitis was predominant in their study, accounting for 85.9% of cases (Carmen & Hong, 2024). Our study observed a slightly lower prevalence of generalized periodontitis stage III grade C, with a difference of 14.4%. Periodontitis affects a significant portion of the global population, and the current classification system provides a universal framework for assessing its prevalence. This aligns with other studies reporting high proportions of advanced stages (17.6%–54%) (Germen *et al.*, 2021; Stødle *et al.*, 2021) and rapid progression under grade C, reaching up to

78.9% (Carmen & Hong, 2024). Variations in the prevalence of periodontitis classifications can occur due to differences in study populations and clinical settings. The slightly lower prevalence observed in our study may reflect differences in the severity of cases presenting at our clinic or regional disparities in oral health practices and risk factors. Additionally, demographic characteristics such as age distribution, socioeconomic status, and access to dental care may also contribute to these findings. While dental biofilm and calculus accumulation are the main causes of periodontal diseases, other risk factors such as age, gender, ethnicity, systemic conditions, medication, smoking habits and oral hygiene play a significant role in influencing the development and progression of periodontitis. Understanding this complex interplay is essential for the effective prevention, diagnosis, and management of the disease.

The mean age of patients diagnosed with periodontitis in this study was 49.2 years, with an age range of 18–75 years. Similarly, another study reported a mean age of 43.4 years for their periodontitis patients, within the same age range of 18–75 years (Carmen & Hong, 2024). In this study, we found that there was a significant association between mean age and periodontitis ($p < 0.01$). A study conducted by Arshad *et al.* (2024), found that individuals aged 45–64 and those of Malay ethnicity have a significantly higher risk of severe periodontitis compared to other age groups and ethnicities, respectively (Arshad *et al.*, 2024). Huang *et al.* (2024) reported that higher biological age was associated with an increased risk of periodontitis ($p = 0.03$) (Huang *et al.*, 2024). Similarly, Germen *et al.* found a significant association between periodontitis and individuals aged 45–64 years ($p = 0.001$) (Germen *et al.*, 2021). Additionally, Huang *et al.* (2024) also identified age as a risk factor for the development of periodontitis, particularly among middle-aged and elderly patients ($p < 0.05$) (Huang & Dong, 2022). This current study found a significant association between age and periodontitis, with older individuals more likely to experience severe forms of the disease. This

finding aligns with other studies, which also report increased prevalence and severity among middle-aged and elderly adults. The association may be attributed to the cumulative effects of plaque accumulation and age-related changes in immune function and tissue regeneration, reinforcing age as a key factor in the progression of periodontitis.

With regard to gender, periodontitis was more common in female (54.1%) than in male (45.9%). Similar observations were noted in a local study where 63.8% of periodontitis patients were female (Taib *et al.*, 2013). This could be attributed to several factors, including greater health-seeking behaviour and awareness of oral health issues among women compared to men. Additionally, hormonal changes associated with pregnancy, menopause, and the menstrual cycle may increase females' susceptibility to periodontal diseases (Reeves, 2025). These highlight the need for targeted prevention and education efforts that address gender-specific risk factors and behaviours. However, we found that there was no significant association between gender and periodontitis ($p = 0.51$). Another local study by Singh *et al.* (2019), reported that sex was not significantly associated with periodontitis in the adjusted analysis. This finding is consistent with our study even though few studies reported the prevalence of periodontitis is greater in males than females (Desvarieux *et al.*, 2004; Ababneh *et al.*, 2012).

We found that ethnicity was not statistically significant with periodontitis ($p = 0.42$), with the highest prevalence observed among Malay patients (93.2%), followed by Chinese (6.0%) and Indian (0.8%). However, a study conducted by Arshad *et al.* (2024) found that ethnicity was significantly associated with periodontitis severity ($p = 0.003$). Malay individuals exhibited a higher prevalence of both mild (36.0%) and severe (4.7%) periodontitis compared to other ethnic groups, which reported rates of 4.8% and 0%, respectively (Arshad *et al.*, 2024). Majority of patients attending HPUSM were Malay, which may have skewed the ethnic distribution and limited the ability to detect

statistical differences between groups. Moreover, ethnicity itself does not inherently determine susceptibility to periodontitis; rather, the development and progression of the disease result from a complex interplay of modifiable and non-modifiable risk factors. When differences are observed across ethnic groups, they are more likely to reflect underlying socio-economic conditions, disparities in access to care, and health-related behaviours, rather than ethnicity as an independent determinant.

In the present study, 57.9% of patients with periodontitis also had systemic diseases, and was significantly associated ($p < 0.01$). This finding is consistent with previous local study that reported a significant association between periodontitis and systemic conditions such as diabetes mellitus ($p = 0.01$), hypertension ($p < 0.01$), and the combination of both ($p = 0.004$) (Taib *et al.*, 2013). Similarly, Gatarayiha *et al.* in 2024 found that systemic conditions significantly influence the development and progression of periodontitis (Gatarayiha *et al.*, 2024). Larvin *et al.* (2023) further reported that individuals with moderate-to-severe periodontitis have a higher risk of developing diabetes (Larvin *et al.*, 2023). These findings are consistent with growing evidence that highlights the bidirectional relationship between systemic diseases and periodontal health (Preshaw *et al.*, 2012). Conditions like diabetes mellitus and hypertension are known to exacerbate periodontal disease due to their effects on immune function, inflammatory pathways, and tissue repair. For instance, diabetes impairs the body's ability to fight infections and promotes a chronic inflammatory state, while hypertension can compromise blood flow and hinder tissue regeneration within the periodontium (Genco and Borgnakke, 2013). Collectively, these studies reinforce the importance of considering systemic health in the management and prevention of periodontitis.

Our findings demonstrated a strong association between medication use and periodontitis ($p = 0.00$), with more than half of the participants (54.1%) reporting

current medication use. This aligns with previous evidence indicating that several drug categories, including bisphosphonates, proton pump inhibitors, antidepressants, anticoagulants, statins, and ACE inhibitors, may adversely influence periodontal health (Chatzopoulos *et al.*, 2023). Other study also found that systemic medications used to manage diabetes mellitus were significantly associated with the severity and progression rate of periodontal disease ($p < 0.05$) (Batista-Cárdenas *et al.*, 2024). This aligns with our findings, as many of these medications are known to influence oral and periodontal health. For instance, bisphosphonates and proton pump inhibitors can affect bone metabolism and healing, while anticoagulants may exacerbate gum bleeding, a hallmark of periodontitis. Additionally, medications like antidepressants and statins can alter inflammatory pathways, potentially impacting periodontal disease progression (Wang *et al.*, 2020).

We also found that periodontitis is significantly associated with smoking habit ($p < 0.001$). The role of smoking as a risk factor for periodontal disease is well-documented in the literatures (Baharuddin, 2008). They found that 71.8% of the participants were current smokers, with periodontitis affecting 21.8% of their examined sextants. In another study, conducted by Razali *et al.* in 2005, confirmed that smokers exhibited more severe periodontal disease compared to non-smokers (Razali *et al.*, 2005). Smoking raises the incidence of periodontitis by 85% (Alwithanani, 2023). Tobacco smoking may lead to an increase in both local and systemic levels of pro-inflammatory cytokines, reactive oxygen species, collagenase, and serine proteases, which contribute to the accelerated destruction of periodontal tissues (Johannsen *et al.*, 2014). Long-term smoking is strongly associated with poor periodontal health, as it influences the progression of periodontitis by impairing both immune response and vascular function (Batista-Cárdenas *et al.*, 2024).

Our study revealed that the majority of periodontitis patients (85.7%) had poor oral

hygiene. However, there was no significant association between oral hygiene status and periodontitis ($p = 0.92$). A meta-analysis by Lertpimonchai *et al.* (2017), observed a dose-response relationship between oral hygiene and periodontal disease, showing that fair to poor oral hygiene increases the risk of developing periodontitis by 2 to 5 times (Lertpimonchai *et al.*, 2017). This is inconsistent with our result could be due to differences in study design, population characteristics, or sample size. For instance, our study population may have included other confounding factors, such as systemic health conditions, or medication used, which could mask the impact of oral hygiene. Additionally, variations in the assessment methods for oral hygiene and periodontitis severity may have contributed to the inconsistency. Oral hygiene practices vary worldwide and are often shaped by factors such as socioeconomic status, level of education, and home environment (Vano *et al.*, 2015).

This study has several limitations. First, its retrospective design posed challenges, including incomplete records and variability in the quality of documented information. As with most record review studies, the lack of control over data quality may affect the reliability of the findings. Furthermore, information bias could arise if diagnoses or exposures were inaccurately recorded, potentially leading to misclassification. Nevertheless, the insights gained from this review can serve as a foundation for designing cross-sectional or prospective studies with more rigorous control over data collection and variable measurement.

Second, the use of convenience sampling for participant recruitment limits the generalizability of our findings, as the sample may not accurately represent the broader population and is subject to selection bias. Next, lack of standardized diagnostic criteria due to variations in the definition and classification of periodontitis among different studies can pose challenges when comparing findings. For instance, while some studies may use the 2017 classification system (staging and grading) for periodontitis, others might follow older

or alternative diagnostic criteria. These differences can lead to inconsistencies in prevalence rates, severity assessment, or disease progression metrics. As a result, drawing direct comparisons or integrating findings with other research may become difficult, potentially affecting the study's ability to contribute to a broader understanding of periodontitis.

Lastly, the reliance on self-reported data for systemic conditions and smoking habits introduces the potential for reporting bias, which may affect the accuracy of the results. Patients may underreport or overreport their health conditions or smoking behaviours due to forgetfulness, social desirability bias, or a lack of awareness about their actual health status. This reliance on subjective accounts could lead to misclassification, resulting in an underestimation or overestimation of the associations between these factors and periodontitis.

Despite its limitations, our study had several notable strengths. The periodontitis was diagnosed based on the 2017 classification system for periodontal and peri-implant diseases and conditions. This ensures that the data from our study can be directly compared with other studies employing this updated classification system. Additionally, as this classification is now widely adopted by periodontal specialists, our findings align with current clinical standards, enhancing their relevance and applicability in local clinical practice. Other than that, our study highlighted significant findings on few risk factors associated with periodontitis such as age, systemic diseases, medication used, and smoking. The study identifies potential gaps and inconsistencies, paving the way for future research to explore these areas further.

Conclusion

Within the study's limitations, it was found that severe periodontitis (stage III grade C) was prevalent among patients attending HPUSM, based on 2017 classification of periodontal disease, indicating a rising

incidence in local region. Age, systemic diseases, medication used, and smoking habits, all of which may influence the development and progression of periodontitis. These findings underscore the critical role of risk factors in determining the rate of periodontal disease progression, emphasizing the need for targeted prevention and management strategies for periodontitis.

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