

Classification of Periodontitis

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ABSTRACT

The concept of classification is often perceived as tedious; however, it remains a critical component in organizing similar disease phenotypes into unified syndromes. Over the years, numerous efforts have been made to refine the classification of periodontal diseases. The evolution of these systems reflects three prominent paradigms that shaped the understanding of periodontal pathologies. Among the various systems developed, the 1999 American Academy of Periodontology (AAP) classification stands out as the most comprehensive and widely accepted. This system was introduced to address the limitations, inconsistencies, and deficiencies identified in the 1989 classification. Additionally, the AAP provided a detailed analysis and justification for the modifications and changes, cementing its relevance in clinical and research settings.

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Introduction

Advancements in research have significantly enhanced the understanding of periodontal diseases over the decades. Despite these strides, debates surrounding the optimal classification system for periodontal diseases persist. Grouping the diverse spectrum of periodontal conditions into a cohesive and universally accepted framework has proven to be a challenging and complex task. Despite these hurdles, continuous efforts have been made over the past century to develop new classification systems or improve existing ones. Such endeavors aim to provide clarity and standardization for both clinical and academic purposes, highlighting the importance of addressing this contentious yet critical topic.

Definition

"An inflammatory disease of the supporting structures of the teeth, caused by microorganisms that invade the gingival tissues, leading to the destruction of the connective tissue and alveolar bone, which may eventually result in tooth mobility and loss [1]".

Significance of Staging

• The Benefits of Periodontal Staging and Grading for Dental Professionals

Periodontal staging and grading offer a range of benefits for dental professionals in managing and treating periodontal disease:

• Accurate Diagnosis and Treatment Planning

Staging and grading allow for a precise diagnosis, which is critical for creating personalized treatment plans. Understanding the severity and extent of the disease enables dental professionals to choose appropriate interventions and track the disease's progression over time.

• Effective Communication

The standardized language provided by periodontal staging and grading ensures clear communication among dental professionals. This consistency is crucial when coordinating care and discussing patient management strategies with colleagues and patients alike.

• Assessment of Treatment Effectiveness

Staging and grading also enable dental professionals to monitor the outcomes of treatment plans. By observing how the disease progresses or regresses over time, adjustments can be made to improve the effectiveness of ongoing therapy, ensuring better patient outcomes and care [2].

Need for Classification System

Classification systems, though often perceived as monotonous, are indispensable in periodontology, providing a structured framework for accurate diagnosis and effective management. These systems facilitate a comprehensive understanding of the diverse manifestations of periodontal diseases. The primary objectives of such systems include:

- Establishing a systematic approach to studying the etiology, susceptibility factors, pathogenesis, and therapeutic modalities of periodontal diseases.
- Enabling clinicians to systematically organize and address the unique healthcare needs of patients.

- Categorizing similar clinical presentations into well-defined syndromes, ensuring consistency and precision in diagnosis and treatment planning [3].

How Classification and Staging are Done

Classification and Staging of Periodontitis

The classification and staging of periodontitis are crucial for understanding its complexity and formulating effective treatment strategies. The 2018 updated classification introduces a multidimensional approach, incorporating staging and grading to provide a comprehensive assessment of the disease's severity, complexity, and prognosis.

Staging: focuses on the severity of periodontitis, tooth loss attributable to the disease, and the complexity of treatment. Determined through a full-mouth diagnosis, staging cannot be subdivided based on localized severity. Key parameters for staging include the extent of bone loss, furcation involvement, tooth mobility, and the number of teeth lost due to periodontitis.

Grading: offers a biological perspective by evaluating the disease's history, progression rate, and associated risk factors such as smoking and diabetes. It also considers the systemic implications of periodontitis. Parameters include the pattern of bone loss, the patient's systemic health, and their response to prior treatments [4].

Significance of Staging and Grading

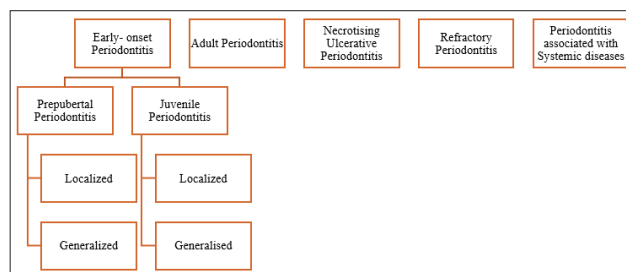
- **Multidimensional View:** Combines severity, progression, and management complexity.
- **Guiding Treatment:** Helps tailor treatment plans, predict responses, and set realistic expectations.
- **Holistic Care:** Accounts for systemic health implications and restorative challenges [5].

Classification of Periodontitis

- **1870-1920: Clinical Characteristic Paradigms**
Between 1870 and 1920, understanding the etiopathogenesis of periodontal diseases was limited, leading to debates on whether the diseases were caused by local or systemic factors. Some researchers believed both played a role, acknowledging cases where local and systemic factors contributed. Classification relied heavily on case descriptions and subjective clinical interpretations [6].
- **1920-1970: Classical Pathology Paradigm**
During this period, periodontal diseases were categorized as either inflammatory or non-inflammatory ("degenerative" or "dystrophic"), based on the belief that certain conditions, such as cementopathia, arose from degenerative changes in the periodontium. Terms like "dystrophic," "atrophic," and "degenerative" were commonly utilized in these classification systems. However, by the 1970s, there was a paradigm shift in understanding. A notable case involving a patient with hypophosphatasia—characterized by premature loss of anterior deciduous teeth and the presence of Porphyromonas gingivalis in the subgingival flora—highlighted that factors beyond cementum hypoplasia could contribute to periodontal destruction [7].
- **1970: Infection/ Host Response Paradigm**
Building on Robert Koch's postulates (1876), the infectious nature of periodontal diseases became a focal point. W.D. Miller identified three key factors in pyorrhea alveolaris: (1) predisposing conditions, (2) local irritation, and (3) bacteria. He also noted that systemic conditions like diabetes and pregnancy could impact disease progression. Between 1976 and 1979, studies revealed microbial specificity in periodontosis sites and demonstrated impaired chemotactic and

phagocytic functions of neutrophils in juvenile periodontitis. These findings helped establish the Infection/Host Response paradigm. Modern classification systems incorporate elements from all these paradigms, acknowledging historical insights while embracing updates based on current knowledge [8].

- **1989: World Workshop in Clinical Periodontics**
The 1989 classification was rooted in the Infection/Host Response paradigm. It placed significant emphasis on the patient's age and the disease's rate of progression, highlighting the relationship between microbial infection and the host's immune response [9].

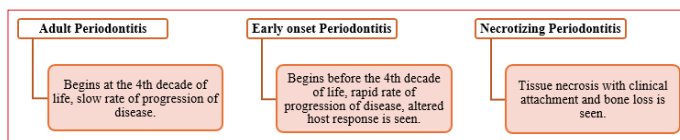


Drawbacks

- The gingival disease category was not included.
- Age-dependent criteria in other periodontitis categories lacked validation.
- Significant overlap in progression rates across different periodontal disease categories.
- Categories like "Rapidly Progressive Periodontitis," "Refractory Periodontitis," and "Prepubertal Periodontitis" were heterogeneous.
- Clinical characteristics of various periodontitis categories showed extensive overlap.

These limitations led to criticism of the 1989 classification soon after its release, prompting others to propose alternative systems [10].

- **1993: European Workshop in Periodontology**
This classification, being simple, was agreed upon by most clinicians and research scientists throughout the world.



The 1993 European classification lacked a detailed spectrum of periodontal diseases seen in clinical practice. This led the 1996 World Workshop in Periodontics to highlight the need for a revised classification system. In response, the American Academy of Periodontology formed a committee in 1997 to organize an international workshop. This effort culminated in the 1999 classification system for periodontal diseases and conditions [11].

- **1999: American Academy of Periodontology**
The 1999 classification by the American Academy of Periodontology was developed to address the limitations, inconsistencies, and deficiencies of the 1989 classification. It included detailed analysis and justification for each modification and change [12].

I. Gingival diseases (G)

II. Gingival diseases (G)

- A. Gingival diseases caused by plaque
 1. Gingivitis exclusively caused by plaque

- C. Changed mucous membrane on an edentulous ridge
 1. Loss of vertical or horizontal bone dimension
 2. Loss of gingiva, i.e. keratinized tissue
 3. Gingival growths, i.e. of soft tissue
 4. Abnormal localisation of the tongue or lip frenum
 5. Reduced vestibule depth
- 6. Abnormal staining
- D. Occlusal trauma
 1. Primary occlusal trauma
 2. Secondary occlusal trauma

Changes in the 1999 Classification of Periodontal Diseases

The 1999 classification of periodontal diseases brought significant updates to address the limitations of the previous 1989 system. These changes aimed to improve clarity, refine diagnostic criteria, and incorporate new insights into the etiology and progression of periodontal conditions. Below are the key changes introduced in the updated classification system

Addition of a Section on Gingival Diseases

- Gingival diseases were categorized into plaque-induced and non-plaque-induced.
- Plaque-Induced Gingival Diseases: Could be modified by systemic factors, medications, or malnutrition.
- Non-Plaque-Induced Gingival Diseases: Stem from infections (bacterial, viral, fungal), genetic origins, trauma, or foreign body reactions.

Renaming “Adult Periodontitis” as “Chronic Periodontitis”

- The term "Adult Periodontitis" was replaced to avoid confusion since it can also occur in adolescents.

Key Features:

- Classified as localized (<30%) or generalized (>30%).
- Severity based on clinical attachment loss (CAL):
- Mild (1–2 mm), Moderate (3–4 mm), Severe (>5 mm).
- Progression rates vary but do not exclude diagnosis.

Replacement of “Early-Onset Periodontitis” with “Aggressive Periodontitis”

- Age-dependent terms like “Juvenile Periodontitis” were replaced to prevent diagnostic dilemmas.
- New terms: **Localized Aggressive Periodontitis (LAP) and Generalized Aggressive Periodontitis (GAP)**.
- Rapidly Progressive Periodontitis" was removed as a separate category.

Elimination of “Refractory Periodontitis” as a Standalone Category

- The term “refractory” was expanded to include all forms of periodontitis, such as refractory chronic or aggressive periodontitis.

Clarifications on Systemic Diseases and Periodontitis

- "Periodontitis as a manifestation of systemic diseases" was retained.
- **Exclusions:**
- **Diabetes mellitus:** Alters periodontitis progression but isn't classified as a primary cause.
- **Smoking:** Considered a modifier rather than a separate disease category.

Introduction of “Necrotizing Periodontal Diseases”

- Necrotizing ulcerative gingivitis (NUG) and necrotizing ulcerative periodontitis (NUP) were grouped under this single category.
- These conditions may result from systemic factors (e.g., HIV) or local triggers (stress, smoking).

Inclusion of New Categories

- **Periodontal Abscess and Periodontic-Endodontic Lesions** were added for their clinical significance.
- **Developmental or Acquired Deformities:** Highlighted their impact on periodontal treatment outcomes [12].

2017: Classification of Periodontal and Peri-Implant Diseases and Conditions.

The 2017 classification of periodontal and peri-implant diseases marked a significant milestone in periodontal research and clinical practice. Spearheaded by the *World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions*, this update was driven by advancements in knowledge, emerging technologies, and the need for better patient care. Unlike previous systems, the 2017 classification emphasized a more comprehensive, evidence-based approach, integrating aspects such as disease progression, prognostic factors, and patient-centered outcomes [13].

This new system introduced major changes, including redefining periodontitis based on stages and grades, incorporating peri-implant diseases as a distinct category, and refining diagnostic criteria to align with modern research. However, while the new classification aimed to address limitations of earlier systems, it faced criticism for not fully evaluating potential impacts, such as changes in disease prevalence estimates, resource usage, and patient-centered benefits. This underscores the importance of balanced assessments in creating classification systems that are both clinically relevant and ethically justified [14].

CLASSIFICATION OF PERIODONTAL AND PERI-IMPLANT DISEASE AND CONDITION 2017										
<i>Periodontal Diseases and condition</i>										
<i>Periodontal health, Gingival Disease and conditions</i>			<i>Periodontitis</i>			<i>Other conditions affecting the periodontium</i>				
Periodontal health and Gingival health	Gingivitis: Dental Biofilm-Induced	Gingival disease: Non-Dental Biofilm-induced	Necrotizing Periodontal Diseases	Periodontitis	Periodontitis as a Manifestation of Systemic disease	Systemic diseases or conditions affecting the periodontal supporting tissue	Periodontal abscesses and endodontic-periodontal lesions	Mucogingival deformities and conditions	Traumatic occlusal forces	
						Tooth and prosthesis related factors				
<i>Peri-implant Diseases and Conditions</i>										
Peri-implant Health		Peri-implant mucositis			Peri-implantitis		Peri-implant Soft and hard tissue deficiencies			

2018: Periodontal Manifestation of Systemic Disease and Developmental and Acquired Conditions

Periodontitis, a progressive inflammatory disease caused by bacterial biofilms, is one of the leading causes of tooth loss due to irreversible damage to periodontal tissues. Active periodontal therapy (APT), which includes non-surgical and surgical interventions, combined with supportive periodontal therapy (SPT), allows for long-term preservation of teeth when guided by an accurate diagnosis. This highlights the need for diagnostic and predictive models that provide insights into prognosis and aid in tailored periodontal treatment [15].

The 1999 American Academy of Periodontology (AAP) classification categorized periodontitis into chronic and aggressive forms. However, this system faced limitations, prompting the development of the 2018 classification, introduced after a 2017 workshop by the AAP and the European Federation of Periodontology [16].

CLASSIFICATION OF PERIODONTAL AND PERI-IMPLANT DISEASE AND CONDITION 2018			
Periodontal Diseases and condition			
Periodontal health, Gingival Disease and conditions Chapple, Mealey, et al. 2018 Consensus Rept Trombelli et al. 2018 Case Definitions		Periodontitis Papapanou, Sanz et al 2018 Consensus Rept Jepsen, Caton et al 2018 Consensus Rept Tonetti, Greenwell, Kornman. 2018 Case definition	
		Other conditions affecting the periodontium Jepsen, Caton et al. 2018 Consensus Rept Papapanou, Sanz et al. 2018 Consensus Rept	
Periodontal health and Gingival health	Gingivitis: Dental Biofilm- Induced	Gingival disease: Non-Dental Biofilm- induced	Necrotizing Periodontal Diseases Periodontitis Periodontitis as a Manifestation of Systemic disease
			Systemic diseases or conditions affecting the periodontal supporting tissue Periodontal abscesses and endodontic-periodontal lesions Mucogingival deformities and conditions Traumatic occlusal forces Tooth and prosthesis related factors
Peri-implant Diseases and Conditions			
Berglundh, Armitage et al. 2018 Consensus Rept			
Peri-implant Health	Peri-implant mucositis	Peri-implantitis	Peri-implant Soft and hard tissue deficiencies
Staging of Periodontitis			
Stage	Severity (Interdental CAL)	Bone Loss	Complexity
I	1-2 mm	Coronal third (<15%)	- No tooth loss- Probing depth ≤4 mm
II	3-4 mm	Coronal third (15%-33%)	- No tooth loss- Probing depth ≤5 mm
III	≥5 mm	Extending to middle third or beyond	- ≤4 teeth lost- Complex management required
IV	≥5 mm	Extending to middle third or beyond	- ≥5 teeth lost- Severe damage requiring complex rehabilitation
Grading of Periodontitis			
Grade	Progression Rate	Risk Factors	Key Features
A	Slow progression	Non-smoker, no diabetes	- No bone loss or CAL over 5 years
B	Moderate progression	<10 cigarettes/day, controlled diabetes	- Bone loss or CAL consistent with age
C	Rapid progression	≥10 cigarettes/day, uncontrolled diabetes	- Bone loss exceeds expected levels for patient age

Multidimensional Staging and Grading System

- Stages (I–IV): Based on disease severity and complexity of management.
- Grades (A–C): Reflect risk of disease progression, influenced by clinical attachment loss, radiographic bone loss, and risk factors (e.g., smoking, diabetes).
- Extent classified as localized or generalized.

Integration into Clinical Practice

- The system has been widely adopted in research, education, and treatment protocols.
- It serves as a basis for assessing disease prognosis, including tooth loss due to periodontal disease (TLPD).

Prognostic Value in Treatment Phases

- Active Periodontal Therapy (APT): Teeth with poor prognoses may be extracted during APT, often influenced by functional restorative needs or insufficient response to therapy.
- Supportive Periodontal Therapy (SPT): After stabilization of periodontal tissues, SPT ensures long-term

maintenance, with TLPD as an important measure of success.

While studies in Western populations suggest that the 2018 classification aids in risk assessment and prognosis, data on its utility in other populations and treatment periods (APT and SPT) remain limited [17].

Role of Periodontitis Grading in Determining Severity of Disease
 The staging and grading system for periodontitis treatment allows dental professionals to better evaluate the condition of a patient’s mouth and develop treatment plans accordingly, taking into account such factors as inflammation, bone loss, and tooth mobility. This helps ensure the most effective treatments are administered. Treatment based on periodontitis staging and grading.[18]

The grading system introduced in the 2018 classification of periodontitis plays a crucial role in assessing the severity of the disease and the risk of progression. Unlike the earlier classifications, which focused primarily on clinical and radiographic findings, the grading system incorporates additional factors such as the

patient's systemic health and lifestyle behaviors, offering a more comprehensive approach to diagnosis and treatment planning.[18]

Three Grading Levels (A, B, C)

- **Grade A:** Represents a slow progression of the disease.
- **Grade B:** Indicates a moderate risk of progression.
- **Grade C:** Suggests a rapid progression with high risk of future tissue damage.

Assessment Parameters:

- **Radiographic Bone Loss:** Examined over a set timeframe to gauge disease activity.
- **Clinical Attachment Loss:** Used to measure current disease severity.
- **Risk Factors:** Includes systemic conditions such as diabetes and lifestyle factors like smoking that exacerbate disease progression.

Integration of Risk Assessment

Grading integrates patient-specific data to predict outcomes, allowing clinicians to design tailored treatment protocols and prioritize high-risk patients.

Benefits of the Grading System

- **Personalized Care:** Enables clinicians to identify patients with more aggressive forms of periodontitis and provide intensified treatment.
- **Prognostic Value:** Helps forecast the potential for future periodontal damage, guiding both preventive and therapeutic measures.
- **Enhanced Monitoring:** Allows tracking of disease progression over time, making it easier to evaluate treatment efficacy.[19]

Impact on Treatment and Management of Disease

Impact of Periodontitis Classification on Treatment and Management

The classification of periodontitis plays a pivotal role in determining the appropriate treatment and management protocols. Historically, the classification has evolved to better define the severity, progression, and prognosis of the disease, allowing clinicians to tailor treatment strategies accordingly.[20]

In the **1999 classification** (AAP), periodontitis was categorized into **chronic periodontitis** and **aggressive periodontitis**, with the treatment approach varying based on these broad categories. **Chronic periodontitis** was associated with moderate to severe destruction and was commonly treated with scaling and root planing (non-surgical therapy) and possibly surgical interventions for more advanced cases [21]. **Aggressive periodontitis**, on the other hand, was recognized for its rapid progression and typically required more aggressive treatments, often involving surgical approaches and adjunctive therapies.

The **2017 classification** introduced by the World Workshop, which was further detailed in 2018, refined this system by introducing **staging and grading** to better reflect disease progression and prognosis. The **staging** provided a clearer understanding of the **severity** (from stage I for mild cases to stage IV for advanced cases), while the **grading** system assessed the **rate of progression** based on risk factors like smoking, diabetes, and genetic predispositions. This allowed for more individualized treatment plans, where patients at higher grades (e.g., grade C for rapid progression) might need more intensive and frequent interventions, such as surgical therapy, regenerative procedures, or the use of

adjunctive antimicrobial treatments.[22]

The **classification's impact on treatment** is profound, as it guides the decision on **the intensity of therapy**, from **non-surgical debridement** in early stages to **complex surgical interventions** in advanced stages. It also plays a significant role in determining the **maintenance** frequency, as patients with more severe disease may require **more frequent follow-up visits** and supportive periodontal therapy (SPT). The classification system also aids in predicting the **long-term outcomes**, such as the likelihood of **tooth loss** and the need for **restorative interventions**, which further informs **patient education and counselling**.

In summary, a comprehensive periodontitis classification system not only helps in providing an accurate diagnosis but also enhances the ability to predict disease outcomes, tailor treatments, and manage patient expectations throughout their periodontal care journey.

Conclusion

The classification of periodontitis plays a critical role in accurately diagnosing the disease, assessing its severity, and determining the most appropriate treatment plan. Over the years, the evolution from the 1999 classification to the 2017/2018 staging and grading system has allowed for a more precise categorization of the disease, improving clinicians' ability to predict disease progression and outcomes. By incorporating factors such as disease severity, rate of progression, and risk factors like smoking and diabetes, the new classification enables a more tailored, patient-centered approach to treatment.

The impact of the classification is particularly significant in guiding treatment intensity, frequency of maintenance, and long-term management. For instance, patients with advanced periodontitis or high-risk factors may require more aggressive therapies and frequent follow-ups to manage disease progression effectively. Additionally, it helps clinicians identify patients at higher risk for tooth loss and plan for possible restorative care.

In conclusion, the accurate and updated classification system for periodontitis ensures that periodontal treatment is personalized, evidence-based, and outcome-driven, ultimately improving patient care and the long-term success of periodontal interventions. The shift towards a more multidimensional approach in categorizing the disease represents a significant advancement in periodontal practice, fostering better clinical decision-making and enhancing patient outcomes.

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