



**Received:** 06 Aug 2026  
**Revised:** 26 Aug 2026  
**Accepted:** 06 Sep 2026  
**Published:** 25 Sep 2026

**Volume 12 Issue 09, 2026**  
**Page No - 242-244**  
**DOI - 10.55640/ijmsdh-12-09-29**

**Article Citation:** Kaur, D. N. (2026). Precision Periodontology: Promise, Practicality and Clinical Reality. International Journal of Medical Science and Dental Health, 12(09), 242-244. <https://doi.org/10.55640/ijmsdh-12-09-29>

**Copyright:** © 2026 The Authors. Published by IJMSDH under the Creative Commons CC BY License

## Precision Periodontology: Promise, Practicality and Clinical Reality

**Dr Navneet Kaur, Associate Professor**

Department of Periodontology and Oral Implantology  
National Dental College & Hospital Derabassi, Punjab, India

**Email id:** kaurparneet1963@gmail.com

### Abstract

The concept of precision periodontology is based on treatment strategies from population-based protocols to individualized care. Traditionally periodontal approach guided by standardized mechanical and surgical approach resulting in shifting of paradigm. Precision periodontology proposed preventive, diagnostic, and therapeutic interventions based on individual's genetic profile, microbial flora, systemic health status and behavioural risk factors. While the scientific foundation supporting personalized periodontal care is expanding with significant clinical and logistical barriers remain. This opinion article explores the conceptual basis, clinical relevance, challenges, and future implications of precision periodontology arguing its integration into routine practice must be evidence-driven and pragmatically implemented.

**Keywords:** Precision medicine, Personalized therapy, Periodontal disease, Biomarkers, Microbiome, Risk assessment

### Introduction

Periodontal therapy is based on standardized framework: mechanical debridement, surgical pocket reduction when indicated and supportive periodontal maintenance. Although advancement in regenerative approach (GTR, PRF) and host modulation therapy have refined treatment outcomes. Periodontitis is complex, multifactorial inflammatory disease affected by genetic susceptibility, microbial dysbiosis, systemic conditions, and environmental exposures as risk factors. In this context, the traditional "one-size-fits-all" approach may not fully address inter-individual variability in disease progression and treatment response. Precision periodontology emerged from precision medicine with an aim to customize periodontal care and maintenance based on patient-specific biological and risk profile rather than relying solely on traditional standardized clinical parameters.



## Rationale for Precision Periodontology

Every individual has different genetic makeup with some kind of mutation in the genes. Periodontitis demonstrates marked heterogeneity with genetic predisposition. The tissue distortion is rapid in some individuals despite minimal plaque deposition while in some individual the microbial load is much more comparable but with stability. This variability underscores importance of host response and genetic predisposition.

### Advances in molecular biology and diagnostic technologies have introduced several components central to precision periodontology:

- 1. Genetic Susceptibility:** Polymorphisms in genes associated with inflammatory mediators (e.g., IL-1) have been linked to increased periodontal destruction in susceptible individuals. Genetic screening may help to identify high-risk patients which required close monitoring and early intervention to reach at the step of supportive maintenance.
- 2. Microbiome Profiling:** The understanding of periodontitis has evolved from a specific pathogen model to dysbiotic microbial communities of keystone pathogens. Advanced sequencing technologies such as whole genomic technology, single cell sequencing and RNA sequencing allow detailed analysis of subgingival microbial communities. Personalized antimicrobial strategies are based on microbial composition resulting in positive therapeutic outcomes.
- 3. Biomarkers:** Salivary and GCF biomarkers (MMP, cytokines, inflammatory mediators) are potentially chairside diagnostic tools for the assessment of disease activity (period of remission and exacerbation). Biomarker-driven monitoring could allow earlier detection of active disease phases and detection gives a new direction for interventional timing and their supportive periodontal treatment.
- 4. Systemic and Behavioural Factors:** Diabetes, smoking, obesity, stress, and lifestyle habits significantly influence periodontal inflammation and healing. A precision-based model integrates these modifiers into risk-based treatment planning and maintenance scheduling.

### Clinical Implications:

- **Risk-Based Treatment Planning:** Patients with inflammatory or genetic susceptibility may benefit from adjunctive host modulation therapy as an early intervention.
- **Customized Maintenance Protocols:** Supportive maintenance therapy could be adjusted according to individual risk profile.

- **Targeted Therapeutics:** Microbiome-guided antimicrobial selection could minimize unnecessary antibiotic use and combat resistance.
- **Improved Patient Communication:** Personalized risk assessment enhances patient understanding and compliance, strengthening preventive strategies.

These types of approaches usually aligned with minimally invasive and biologically driven therapy potentially improving long-term tooth retention and systemic health outcomes.

### Challenges and Practical Limitations

- 1. Limited Chairside Accessibility:** Many genetic and microbiome analysis remains expensive and laboratory-dependent may limit the routine clinical application.
- 2. Inconsistent Evidence:** While having associations between biomarkers and disease activity, standardized diagnostic thresholds and validated clinical protocols are not yet universally established.
- 3. Cost-Effectiveness Concerns:** The financial expense of advanced diagnostic tools into routine periodontal practice may restrict accessibility particularly in resource-limited settings.
- 4. Ethical and Data Considerations:** Genetic testing introduces ethical concerns related to data privacy, patient consent, and potential misuse of information.

### Is the Profession Ready?

The transition toward precision periodontology requires integration of research, technology, and clinical pragmatism. Dental education must adapt to incorporate molecular diagnostics tools and risk-based frameworks. Clinicians must remain incorporated with emerging technologies, distinguishing between evidence-based advancement and commercial enthusiasm. Importantly, precision periodontology should complement and not to replace fundamental/standard principles of periodontal therapeutic measures. Mechanical biofilm control, patient education, and supportive care remain indispensable. Personalized approaches should refine and enhance these principles rather than overshadow them.

### Future Directions

The future of precision periodontology lies in the development of affordable chairside diagnostic kits, validated biomarker panels, artificial intelligence-assisted risk prediction models, and longitudinal clinical trials confirming outcome benefits. Integration with digital dentistry and electronic health



records may further streamline individualized care. As systemic health connections become more evident, collaboration between dental and medical professionals will be essential in implementing truly personalized care models.

## Conclusion

Precision periodontology represents a promising evolution in periodontal care reflecting a broader shift toward individualized medicine. By integrating genetic, microbial, systemic and behavioural factors into diagnosis and treatment planning, the aim is to move beyond standardized protocols toward patient-centred therapy. However, substantial clinical, economical and ethical challenges must be addressed before widespread implementation becomes feasible. The future of periodontal therapy may indeed be personalized, but its success will depend on balancing scientific advancement with clinical realism.

## References

1. Gundelly M, Pusuluri SV, Koduganti RR, Ambati M, Chiluveru S, Chandaka M. Precision Medicine in Periodontics: A Literature Review. *Cureus*. 2024;16(9):e68952.
2. Dong A, Proctor G, Zaric S. Diagnostic Accuracy of Microbiome-Derived Biomarkers in Periodontitis: Systematic Review and Meta-Analysis. *J Periodontal Res*. 2025;60(8):748–761.
3. Radu CM, Radu CC, Zaha DC. Salivary and Microbiome Biomarkers in Periodontitis: Advances in Diagnosis and Therapy—A Narrative Review. *Medicina (Kaunas)*. 2025;61(10):1818.
4. Dommisch H, Hoedke D, Lu EM-C, Schäfer A, Richter G, Kang J, et al. Genetic Biomarkers for Periodontal Diseases: A Systematic Review. *J Clin Periodontol*. 2025;52 Suppl 29(Suppl 29):182–210.
5. Bostanci N, Manoil D, Van Holm W, Belibasakis GN, Teughels W. Microbial Markers for Diagnosis and Risk Assessment for Periodontal Diseases: A Systematic Literature Search and Narrative Synthesis. *J Clin Periodontol*. 2025;52 Suppl 29(Suppl 29):125–154.
6. Pitchika V, Büttner M, Schwendicke F. Artificial intelligence and personalized diagnostics in periodontology: A narrative review. *Periodontol 2000*. 2024;95(1):220–231.
7. Dipalma G, Inchingolo AM, Inchingolo F, Palumbo I, Riccaldo L, Guglielmo M, et al. The Precision Paradigm in Periodontology: A Multilevel Framework for Tailored Diagnosis, Treatment, and Prevention. *J Pers Med*. 2025;15(9):440.
8. Selvaraj S, Kumar SM. Customized Periodontics: A Blueprint for Accurate Periodontal Treatment – A Narrative Review. *IJRDO J Appl Sci*. 2025;11(5):11–17.
9. Chew RJ, Goh CE, Sriram G, Preshaw PM, Tan KS. Microbial biomarkers as a predictor of periodontal treatment response: A systematic review. *J Periodontal Res*. 2023;58(6):1113–1127.
10. Anil A, Balakrishnan KVAB, Peter MR, Suresh R. Precision Periodontics – A Review. *J Transl Med Transplant Res*. 2024; 3:112.