

Episode 126 – Role of AI in Periodontal Health February 7, 2025

Research
Toward digital periodontal health: Recent advances and future perspectives

Background
Periodontal diseases affect over 50% of the global population, with 14% experiencing severe periodontitis. Periodontal diseases arise from infections and inflammation of the periodontium, extensively impacting oral health. There are significant associations between periodontal disease and systemic conditions, including cardiovascular diseases,[1] diabetes,[2] pregnancy complications, and low birth weight,[3] underscoring the importance of oral health. Early detection and prevention of periodontal diseases is critical to prevent disease progression.

Visual assessments, radiography, periodontal probing, and bleeding on probing, which is a marker of active inflammation, all play an important role in assessing the extent of periodontal destruction.

Staging and grading periodontal disease largely depend on detecting alveolar bone loss clinically through periodontal probing and through analyzing radiographs.[4] However, identifying bone loss clinically is technique sensitive and probing techniques can vary among oral health clinicians. Furthermore, traditional diagnostic tools may fail to capture the full spectrum of periodontal conditions, leading to delayed or suboptimal treatment.

Accordingly, there is a need for effective advanced periodontal diagnostic methods that can provide useful quantitative information on the severity of periodontal disease. These diagnostics may help identify underlying periodontal disease, design treatment plans, and assess the effectiveness of periodontal therapy. Additionally, early and accurate periodontal disease detection is essential to prevent its progression to more severe stages, which are often associated with systemic health issues. Therefore, there is a need for innovative approaches that combine accuracy, non-invasiveness, and comprehensive analysis in periodontal diagnostics. Among these advanced methods are artificial intelligence (AI)-assisted techniques.[5]

---

[1] Refer to Episodes 37, 79, 80, and 81 for discussion on cardiovascular diseases and oral health.
[2] Refer to Episodes 91, 93, and 94 for detailed information on diabetes and oral health.
[3] Refer to Episodes 108, 109, and 110 for additional information on pregnancy and oral health.
[4] Refer to Episodes 49 and 50 for additional information on staging and grading periodontal diseases.
[5] Refer to Episode 85 for additional information on AI in oral healthcare and Episode 102 for discussion on using AI to detect dental caries in oral photographs.

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

Soheili et al. (2024) provided a comprehensive review of the current research on this topic. The authors examined causative factors, disease progression, and the role of AI in enhancing early detection and treatment for periodontal disease. The goals of their study were to emphasize the importance of early intervention to improve client outcomes and inspire further interest among researchers, bioengineers, and AI specialists in the ongoing exploration of AI applications in periodontal disease diagnosis. [1]

Research team

Researcher	Affiliation
Fatemeh Soheili	Biologically Inspired Sensors and Actuators Laboratory (BIOSA), Lassonde School of Engineering, York University, Toronto, ON, Canada Department of Biology, York University, Toronto, ON, Canada
Niloufar Delfan	Biologically Inspired Sensors and Actuators Laboratory (BIOSA), Lassonde School of Engineering, York University, Toronto, ON, Canada School of Electrical and Computer Engineering, College of Engineering, University of Tehran, Tehran, Iran
Negin Masoudifar	Department of Internal Medicine, University Health Network, Toronto, ON, Canada
Shahin Ebrahimni	Biologically Inspired Sensors and Actuators Laboratory (BIOSA), Lassonde School of Engineering, York University, Toronto, ON, Canada
Behzad Moshiri	School of Electrical and Computer Engineering, College of Engineering, University of Tehran, Tehran, Iran Department of Electrical and Computer Engineering, University of Waterloo, Waterloo, ON, Canada
Michael Glogauer	Faculty of Dentistry, University of Toronto, Toronto, ON M5G 1G6, Canada
Ebrahim Ghafar-Zadeh	Biologically Inspired Sensors and Actuators Laboratory (BIOSA), Lassonde School of Engineering, York University, Toronto, ON, Canada Department of Biology, York University, Toronto, ON, Canada Department of Electrical Engineering and Computer Science, York University, Toronto, ON, Canada

References

[1] F. Soheili, N. Delfan, N. Masoudifar, S. Ebrahimni, B. Moshiri, M. Glogauer and E. Ghafar-Zadeh, "Toward digital periodontal health: Recent advances and future perspectives," *Bioengineering,* vol. 11, no. 9, pp. 1-37, 18 September 2024.

Additional Resources

Toward digital periodontal health: Recent advances and future perspectives, Soheili, F; Delfan, N; Masoudifar, N; Ebrahimni, S; Moshiri, B; Glogauer, M; Ghafar-Zadeh, E. *Bioengineering*, Volume 11, Issue 9, September 18, 2024, p 1-37 https://www.mdpi.com/2306-5354/11/9/937

Artificial intelligence in periodontology and implantology—A narrative review, Khan, S; Siddique, A; Khan, A; et al. *Journal of Medical Artificial Intelligence*, Volume 7, March 30, 2024, p 1-13 https://jmai.amegroups.org/article/view/8600/html

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

Artificial intelligence in periodontology: A scoping review, Scott, J; Biancardi, A; Jones, O; Andrew, D. *Dentistry Journal*, Volume 11, Issue 2, February 8, 2023, p 1-15 https://www.mdpi.com/2304-6767/11/2/43

Detecting dental caries on oral photographs using artificial intelligence: A systematic review, Moharrami, M; Farmer, J; Singhal, S; Watson, E; Glogauer, M; et al. *Oral Diseases*, July 1, 2023, p 1-19 https://onlinelibrary.wiley.com/doi/full/10.1111/odi.14659

Current progress and challenges of using artificial intelligence in clinical dentistry—A narrative review, Surlari, Z; Budală, D; Lupu, C; et al. *Journal of Clinical Medicine*, Volume 13, Issue 15, July 27, 2023, p 1-16 https://www.mdpi.com/2077-0383/12/23/7378

Artificial intelligence in dentistry: Past, present, and future, Agrawal, P; Nikhade, P. *Cureus*, Volume 14, Issue 7, July 28, 2022, p 1-10 https://www.cureus.com/articles/104972-artificial-intelligence-in-dentistry-past-present-and-future#!/

Where is the artificial intelligence applied in dentistry? Systematic review and literature analysis, Thurzo, A; Urbanová, W; Novák, B; et al. *Healthcare*, Volume 10, Issue 7, July 8, 2022, p 1-27 https://www.mdpi.com/2227-9032/10/7/1269

Applications of artificial intelligence in dentistry: A comprehensive review, Carrillo-Perez, F; Pecho, O; Morales, J; et al. *Journal of Esthetic and Restorative Dentistry*, Volume 34, Issue 1, November 29, 2021, p 259-280 https://onlinelibrary.wiley.com/doi/full/10.1111/jerd.12844

Use of artificial intelligence in dentistry: Current clinical trends and research advances, Nguyen, T; Larrivée, N; Lee, A; et al. *Journal of the Canadian Dental Association*, Volume 87, May 3, 2021, p 1-7 https://jcda.ca/l7

Developments, application, and performance of artificial intelligence in dentistry – A systematic review, Khanagar, S; Al-ehaideb, A; Maganur, P; et al. *Journal of Dental Sciences*, Volume 16, Issue 1, January 2021, p 508-522 https://www.sciencedirect.com/science/article/pii/S1991790220301434

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA