

INPLASY

AI-Assisted Periodontal Prevention: Utopia or Emerging Reality? A Systematic Review

INPLASY202650049

doi: 10.37766/inplasy2026.5.0049

Received: 8 May 2026

Published: 8 May 2026

Boudraa, I; el Machrouhi, M; Kissa, J.

Corresponding author:

Imane Boudraa

imane8bdr@gmail.com

Author Affiliation:

university of hassan 2 casablanca.

ADMINISTRATIVE INFORMATION

Support - This systematic review received no specific funding.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202650049

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 8 May 2026 and was last updated on 8 May 2026.

INTRODUCTION

Review question / Objective The objective of this systematic review is to evaluate the efficacy of artificial intelligence-based technologies in the prevention of periodontal diseases, with particular emphasis on the improvement of oral hygiene — including toothbrushing, dental plaque control, and adherence to oral hygiene recommendations.

Condition being studied Periodontal diseases are chronic inflammatory conditions affecting the supporting tissues of the teeth, including the gingiva, periodontal ligament, cementum, and alveolar bone. They range from gingivitis — a reversible gingival inflammation caused by bacterial biofilm — to periodontitis, a more severe form involving progressive destruction of tooth-supporting structures, leading to bone loss and tooth loss if untreated. Associated with systemic conditions such as diabetes and cardiovascular disease, severe periodontitis affects approximately 11% of the global population, making it a major public health concern.

Their prevention relies primarily on rigorous oral hygiene practices; however, patient adherence to these measures often remains insufficient. Artificial intelligence (AI) offers promising prospects in this regard, through tools such as connected toothbrushes, mHealth applications, and automated reminder systems that enable personalized, real-time patient support and feedback.

Early results suggest improvements in biofilm control and reduced gingival inflammation. A systematic review is therefore necessary to rigorously evaluate the actual efficacy of these technologies in periodontal prevention.

METHODS

Participant or population Patients at risk of periodontal diseases or the general population.

Intervention Artificial intelligence-based tools (mobile applications, connected toothbrushes, intelligent self-monitoring systems).

Comparator Standard preventive care (conventional education, conventional follow-up) or absence of AI-based intervention.

Study designs to be included Randomized Controlled Trials (RCTs), as they represent the highest level of evidence for evaluating the efficacy of interventions and minimizing selection bias. Controlled clinical trials (non-randomized), which may provide relevant comparative data where randomization was not feasible. Prospective cohort studies, which allow for the longitudinal assessment of behavioral and clinical outcomes associated with AI-based interventions. Comparative observational studies, included to broaden the evidence base, particularly in contexts where experimental designs are limited. Case series, considered o.

Eligibility criteria Studies including patients under 18 years of age, as behavioral patterns, oral hygiene compliance, and periodontal risk profiles differ significantly from those of the adult population, warranting a separate review, Studies conducted exclusively among patients undergoing orthodontic treatment, Studies evaluating interventions based solely on phone call reminders or messaging tools (SMS, WhatsApp, or equivalent platforms), without integration of any artificial intelligence component – such as machine learning algorithms, intelligent feedback systems, or automated data-driven personalization – as these do not meet the definition of AI-based intervention as specified in the PICO framework of this review.

Information sources MEDLINE via PubMed
Scopus
ScienceDirect
Cochrane Library.

Main outcome(s) 1. Plaque Control : Measure Plaque Index (PI) Effect measure, Timing/ Gingival Inflammation : Measure: Gingival Index (GI)/ 3. Periodontal Clinical Parameters/ Oral Hygiene Compliance and Behavioral Adherence/ 5. Patient-Reported Outcomes.

Quality assessment / Risk of bias analysis Non-randomized studies will be assessed using the ROBINS-I tool (Risk Of Bias In Non-randomized Studies of Interventions), which evaluates bias across seven domains. Studies evaluating the diagnostic or predictive accuracy of AI-based tools will be assessed using QUADAS-2 (Quality Assessment of Diagnostic Accuracy Studies), which covers four domains. Case series and

descriptive studies will be appraised using the JBI Critical Appraisal Checklist for Case Series.

Strategy of data synthesis All included studies will be synthesized narratively and presented in structured summary tables covering study design, population characteristics, type of AI-based intervention, outcomes reported, and main results. Given the anticipated clinical and methodological heterogeneity across studies, no quantitative pooling will be performed; sources of variability will be explored and discussed narratively. The overall certainty of evidence for each outcome will be evaluated using the GRADE approach, and a Summary of Findings (SoF) table will be produced accordingly.

Subgroup analysis Although no meta-analysis is planned, subgroup analyses will be conducted narratively to explore potential sources of heterogeneity and to assess whether the effects of AI-based interventions differ across specific population subgroups or intervention characteristics. The following pre-specified subgroups will be examined.

Sensitivity analysis None.

Country(ies) involved Morocco.

Keywords ("dental plaque" OR "plaque index" OR "gingival index" OR "oral hygiene") AND ("artificial intelligence" OR "machine learning" OR "digital health").

Contributions of each author

Author 1 - Imane Boudraa.
Email: imane8bdr@gmail.com
Author 2 - Marouane el Machrouhi.
Author 3 - Jamila Kissa.