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AI in Managing Dental Anxiety: A Meta-Analysis of AI Interventions Aimed at Reducing Anxiety in Dental Patients During Procedures, and Their Impact on Treatment Outcomes

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ADMINISTRATIVE INFORMATION

Support - King Khalid University.

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

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 13 December 2024 and was last updated on 13 December 2024.

INTRODUCTION

Review question / Objective How effective are artificial intelligence (AI) interventions in reducing dental anxiety and improving clinical outcomes in dental care?

Rationale Dental anxiety significantly impacts treatment compliance and oral health. Traditional strategies for managing anxiety face limitations in accessibility, effectiveness, and patient acceptance. AI offers innovative solutions, such as predictive models, real-time monitoring, and personalized treatments, that have the potential to revolutionize anxiety management and enhance patient outcomes in dental care. This meta-analysis aims to systematically evaluate the impact of AI interventions on reducing dental anxiety and improving clinical outcomes.

Condition being studied Dental anxiety and its impact on treatment compliance, oral health, and patient outcomes, focusing on interventions using artificial intelligence (AI) for management and improvement.

METHODS

Search strategy Extensive search across four databases: PubMed, Cochrane, Dimensions.ai, and Google Scholar.

Participant or population Individuals experiencing dental anxiety, including both adults and children, who are undergoing dental care or treatment where AI-based interventions are applied for anxiety management.

Intervention The use of artificial intelligence (AI) interventions, such as predictive models, real-time monitoring, personalized treatment planning, and AI-driven tools, aimed at reducing dental anxiety and improving patient outcomes in dental care.

Comparator Traditional methods of managing dental anxiety, such as behavioral psychotherapy,

pharmacological measures (e.g., sedation), or no specific anxiety management interventions, used as a comparison to AI-based approaches.

Study designs to be included Randomized controlled trials (RCTs), clinical trials.

Eligibility criteria Studies published in English. Studies published as original research articles.

Information sources PubMed, Cochrane, Dimensions.ai, and Google Scholar.

Main outcome(s) AI interventions show potential in reducing dental anxiety, improving patient engagement, and enhancing treatment outcomes through personalized approaches.

Additional outcome(s) AI enables real-time anxiety monitoring, improves doctor-patient communication, and integrates with therapies like VR for tailored, non-invasive anxiety relief.

Data management Microsoft Excel (Excel 365; Microsoft Corp., Redmond, WA, USA). For export and data manipulation, Google Sheets (Alphabet Inc., Mountain View, CA, USA) were also used.

Quality assessment / Risk of bias analysis Two researchers independently assessed the risk of bias of the included articles using —JBI critical appraisal tools. The potential risk of bias was categorized as low if a study provided detailed information pertaining to 70% or more of the applicable parameters.

Strategy of data synthesis Two review authors (RS and MS) used the studies to help select studies and document their decisions. This was done in two stages, with the first stage consisting of a title and abstract screening of all studies against the inclusion criteria, and the second stage being a full text assessment of papers that were deemed potentially relevant based on the initial screening. RS and AK, the review's authors, discussed and settled their differences by consensus after consulting the procedure.

Subgroup analysis The data was compiled from a variety of articles:
• Author(s), year of publication, country, study design.
• Total number of patients/datasets.
• Training/validation datasets.
• Test datasets.
• Aim of the study.

Sensitivity analysis None.

Language restriction Articles only in English were Selected.

Country(ies) involved USA, Saudi Arabia.

Other relevant information NA.

Keywords AI , dental treatment, Anxiety.

Dissemination plans Data will be shared after the publication.

Contributions of each author
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