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Tashkhis Dental AI: A Tawhidic Approach to Smart Web-Based Diagnostics for Oral Health and Ihsan-Centred Care

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ABSTRACT

Introduction: Oral diseases such as dental caries and periodontal bone loss remain among the most prevalent global health challenges, often detected late, leading to costly and invasive treatment. Limited access to specialised diagnostic tools further widens the disparity in oral health care. Guided by IIUM's Tawhidic Epistemology and the value of *Ihsan*, this project introduces Tashkhis Dental AI, a web-based diagnostic platform designed to integrate technology with ethical responsibility. **Methods:** A dataset of over 5,000 anonymised intraoral and panoramic radiographs was ethically curated, de-identified, and reviewed for quality before use. Convolutional neural networks (CNNs) were developed to detect dental caries, periodontal bone loss, and related pathologies, with data split into training (70%), validation (15%), and testing (15%) sets. Pre-processing included normalisation and standardisation, while augmentation techniques enhanced robustness. Model performance was evaluated using accuracy, sensitivity, specificity, precision, and F1-score, benchmarked against board-certified oral radiologists, with reliability measured via Cohen's kappa. The validated model was deployed as a cloud-based web application for real-time diagnostic support. **Results:** When tested against expert evaluations, the system achieved a diagnostic accuracy above 97%, showing strong reliability and agreement with board-certified oral radiologists. The integration of AI within a user-friendly web interface provided clinicians with robust diagnostic support, enabled large-scale community screenings, and reduced diagnostic errors. The tool also demonstrated scalability in underserved settings, highlighting its potential to strengthen clinical practice, enhance preventive care, and expand public health outreach through accessible AI-driven diagnostics. **Conclusion:** Tashkhis Dental AI exemplifies IIUM's mission of uniting technological advancement with Tawhidic values, ensuring innovation serves humanity ethically and compassionately. By fostering early detection, preventive care, and equitable access, this initiative not only aligns with IIUM's vision but also supports global priorities such as SDG 3 (Good Health & Well-Being) and SDG 9 (Industry, Innovation & Infrastructure).

Keywords: Artificial Intelligence; dental diagnostics; early detection; oral health