Dr Mohammed H. Elnagar DDS, MS, PhD
University of Illinois, Chicago
Biomedical Research Award (BRA) 2026

Dr. Mohammed Elnagar is an Associate Professor in the Department of Orthodontics at the University of Illinois Chicago (UIC). He received his DDS, graduating with honors on top of his class, followed by a General Practice Residency and a Master of Dental Science. Dr. Elnagar completed a Residency \Certificate of Specialty in Orthodontics and a PhD program in oral health sciences at the University of Illinois, Chicago. He is a Diplomate of the American Board of Orthodontics.

Dr. Elnagar practices orthodontics in Chicago, focusing on Digital orthodontics, dentofacial orthopedics with skeletal anchorage, and surgical orthodontics. Furthermore, he is the Director of the digital and AI Laboratory at UIC Orthodontics; his Research Interests are 3D Imaging, 3D printing TADs, Artificial intelligence applications in Health Care, and Clinical and Transitional research.

Dr. Elnagar received many Awards from the American Association of Orthodontists Foundation (AAOF). More recently, in 2023, for his work on emerging technologies, he received the Burstone-Indiana Biomechanics Award and was designated as a Burstone Fellow in Biomechanics.

The American Association of Orthodontists (AAO) also appointed him to be the recipient of the AAO Academy of Academic Leadership Sponsorship Program Award. In addition, Dr\Elnagar was elected as secretary for the American Association for Dental Research Chicago section in 2020. And the Society of Educators of the American Association of Orthodontists editor in 2021. In 2026 elected to be on the National Committee on Technology (CTECH) for the American Association of Orthodontists (AAO). Dr Elnagar has published more than 55 articles and 6 book chapters; he has given more than 70 invited talks/lectures at national and international meetings.

Project Synopsis

Orthodontic treatment outcomes are influenced by oral hygiene, appliance reliability, patient compliance, and treatment efficiency. Poor oral hygiene during treatment may lead to complications such as gingivitis, white spot lesions, and caries, while appliance failures such as bracket debonding, attachment loss, and aligner unseating may prolong treatment and increase clinical burden. Current evidence regarding these complications is limited by small sample sizes, subjective clinical evaluations, and lack of large-scale longitudinal data.

This project aims to leverage artificial intelligence (AI) and Big Data analytics to evaluate oral hygiene patterns, appliance failures, and aligner wear protocols in a large global cohort of orthodontic patients. The study will analyze more than 40,000 de-identified patient records from individuals treated with clear aligners and fixed appliances. The project will investigate correlations between oral hygiene and factors such as age, geographic location, tooth type, treatment stage, appliance type, treatment duration, and patient compliance. In addition, the study will compare appliance failure frequencies between clear aligners and fixed bracket systems, including analyses by bracket type, tooth location, and stage of treatment. The project will also evaluate aligner unseating and treatment progression across different aligner change protocols.

The study will combine traditional statistical analyses with advanced machine learning methods to identify treatment patterns, predict risk factors, and evaluate longitudinal trends. This project is expected to provide one of the most comprehensive assessments of oral hygiene and appliance reliability in orthodontics to date. The findings will support more personalized and evidence-based treatment strategies, improve treatment efficiency, reduce complications, and further advance the integration of AI and Big Data into orthodontic care.

The funding from the AAOF is crucial for our project, to support our team, and to obtain primary data for external grant. Furthermore, it will assist in the development of my career as an Educator, Clinician, and Scientist.