

**A QUESTIONNAIRE STUDY FOR DENTAL STUDENTS' SATISFACTION WITH
"THE USE OF ARTIFICIAL INTELLIGENCE IN DENTISTRY"**

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Abstract: Background/purpose: Using artificial intelligence to "detect cephalometric landmarks" can effectively improve dentist's effectiveness. This study evaluated dental students' satisfaction with the use of artificial intelligence to detect cephalometric landmarks in 2023 and 2024 at Tashkent State Dental Institute, Uzbekistan.

Keywords: Artificial intelligence; Cephalometrics; machine learning.

Materials and methods: For the use of detecting cephalometric landmarks artificial intelligence-based applications have been very common in recent years. In Tashkent State Dental Institute fifth-year dental students have been asked to complete an online-based questionnaire with three survey questions regarding their satisfaction with the use of AI to detect cephalometric landmarks using 5-point Likert scale ratings.

Results: Seventy-six (89%) of 118 and 72 (96%) of 134 students answered the questions in 2023 and 2024 respectively. The satisfaction rates improved from 64% in 2023 to 81% in 2024. The satisfaction rate is 81% in 2024 for the use of AI to detect cephalometric landmarks.

Conclusion: The results of this study suggest that the inclusion of the using artificial intelligence to detect cephalometric landmarks in 2024 marked an increase in satisfaction rates than 2023.

Introduction. A range of studies have explored the use of artificial intelligence in detecting cephalometric landmarks, with promising results. Kafieh (2007) introduced a method combining active shape models and a neural network, achieving high accuracy in landmark detection.¹ Chen (2011) proposed a deformable template approach, demonstrating both accurate and efficient landmark identification.² More recently, Junaid (2022) conducted a systematic review of AI systems, highlighting the potential of deep learning-based convolutional neural networks in achieving clinically acceptable diagnostic performance.³ These studies collectively suggest that AI can significantly improve the accuracy and efficiency of cephalometric landmark detection. Artificial intelligence (AI) is increasingly being integrated into dentistry, with a focus on enhancing precision, efficiency, and patient care.⁴ AI applications, such as CAD/CAM engineering and neural networks, are being used to improve diagnosis, treatment planning, and surgical procedures.⁵ The use of AI in dentistry is particularly beneficial in preventive healthcare, where it can aid in early diagnosis and treatment optimization, leading to improved clinical outcomes and patient experience⁶. In orthodontics, AI has emerged as a particularly valuable tool, demonstrating superior accuracy, precision, and time-efficiency in cephalometric landmark detection. The study focused on assessing dental students' satisfaction with the use of artificial intelligence

(AI) in detecting cephalometric landmarks during 2023 and 2024. Surveys were utilized to collect data on students' perceptions and satisfaction rates regarding AI applications. This approach facilitated the analysis of prevailing trends and themes, providing insights into the effectiveness of AI in dental education. By comparing students' perspectives, the study aimed to enhance the development and improvement of AI technologies within dental institutions. The findings could potentially lead to more accurate and efficient diagnostic tools, ultimately benefiting both dental education and clinical practice.

Materials and methods. This study evaluated dental students' satisfaction with the use of AI applications for detecting cephalometric landmarks at Tashkent State Dental Institute in two successive years of 2023 and 2024. The fifth-year dentistry students in the Orthodontics course were granted access to AI applications as a component of their normal curriculum.

The use of AI in orthodontics course consisted of detecting cephalometric landmarks and doing various types of analyses like Downs, Kim's as well as Steiner's analysis instead of manual analysing. Students used AI applications like WebCeph or CephX.

Following their courses, the students were promptly instructed to fill out an online questionnaire consisting of three survey questions [4]. These questions aimed to gauge their satisfaction with the utilization of AI applications, with scores provided on a 5-point Likert scale. In addition, students have the option to submit unstructured textual feedback, expressing either good or negative comments and suggestions regarding the utilization of AI. This study was conducted in accordance with the principles outlined in the Declaration of Helsinki. The participation in the survey study was voluntary and anonymous. The Likert scale scores and free text comments underwent statistical analysis [7]. A comparison was made between the responses of two cohorts of fifth-year dental students from the years 2023 and 2024. Descriptive statistics were used to describe the findings, and the main themes in the qualitative comments were highlighted.

Results. In this survey study, Seventy-six (89%) of 118 and 72 (96%) of 134 students answered the questions in 2023 and 2024 respectively. The satisfaction rates improved from 64% in 2023 to 81% in 2024. The satisfaction rate is 81% in 2024 for the use of AI to detect cephalometric landmarks. In general, the dental students reported relatively higher satisfaction rates than 2023.

More qualitative comments were given by the dental students with a response rate of 42% in 2024 versus a response rate of 36% in 2023. In 2024, positive feedback of 'very good' was given by 68% of the dental students. Moreover, 12% of dental students asked to improve providing AI application quality while 9% of the dental students commented negatively about the applications' complexity.

Discussion. The main results of this survey study were the relatively higher overall students' satisfaction rates with the use of artificial intelligence to detecting cephalometric landmarks in 2024. This also means that an adequate explanation of the frameworks and mechanisms of AI use in dentistry especially in orthodontics is important to promote an understanding of cephalometrics. Recent studies have demonstrated the potential of artificial intelligence and machine learning in cephalometrics. Nishimoto and Hwang both developed automated landmark prediction systems using deep learning, with Nishimoto achieving

accurate predictions and Hwang's latest AI showing superior performance compared to previous methods.^{7,8} Alshamrani proposed the use of machine learning models for cephalometric location recognition, which could significantly speed up the process.⁹ Schwendicke conducted a systematic review and meta-analysis, concluding that DL models consistently show high accuracy in detecting cephalometric landmarks, particularly in 2-D imagery.¹⁰ However, the studies highlighted the need for further research to demonstrate the generalizability and clinical usefulness of these AI and ML applications in cephalometrics.

Using artificial intelligence is becoming more convenient in Tashkent State Dental Institute, department of orthodontics. Promoting students' suggestions may influence to improve effective learning as well as diagnosing more precisely with better therapy in the future.

Declaration of competing interest. The authors have no conflicts of interests relevant to this article.

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