

Table S1. Main information about data.

	Description	Results
Overview	Timespan	2021:2024
	Sources (Journals, Books, etc.)	32
	Documents	54
	Annual Growth Rate %	50.79
	Document Average Age	0.944
	Average citations per doc	8.037
	References	1379
Document contents	Keywords Plus (ID)	54
	Author's Keywords (DE)	149
Authors	Authors	253
	Authors of single-authored docs	3
Authors collaboration	Single-authored docs	3
	Co-Authors per Doc	4.93
	International co-authorships %	33.33
Document types	article	41
	article; early access	6
	article; proceedings paper	1
	review	6

Table S2. Annual production on the topic, and average citations per article and per year.

Year	MeanTCperArt	n	MeanTCperYear	CitableYears
2021	22.86	7	5.72	4
2022	9.57	7	3.19	3
2023	11.25	16	5.62	2
2024	1.12	24	1.12	1

TC: total citations; n: number of articles.

Table S3. Sources classified according to the h, g, and m indices at the local impact level.

Source	h_index	g_index	m_index	TC	NP	PY_start
JOURNAL OF DENTAL EDUCATION	4	9	1	92	13	2021
CUREUS JOURNAL OF MEDICAL SCIENCE	2	2	1	4	4	2023
EUROPEAN JOURNAL OF DENTAL EDUCATION	2	4	1	21	4	2023
BRITISH DENTAL JOURNAL	1	2	0.5	14	2	2023
CLINICAL AND EXPERIMENTAL HEALTH SCIENCES	1	1	0.25	6	1	2021
DENTISTRY JOURNAL	1	1	0.5	7	1	2023
DENTOMAXILLOFACIAL RADIOLOGY	1	1	0.25	14	1	2021
EDUCATION SCIENCES	1	1	0.5	76	1	2023
FRONTIERS IN PUBLIC HEALTH	1	1	0.25	42	1	2021
HEALTH SCIENCE REPORTS	1	1	0.5	26	1	2023
HEALTHCARE	1	1	0.5	13	1	2023
HELIYON	1	1	0.5	8	1	2023
INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH	1	1	0.333	10	1	2022
JAMIA OPEN	1	1	0.333	5	1	2022
JMIR MEDICAL EDUCATION	1	2	1	4	2	2024
JOURNAL OF DENTISTRY	1	1	0.5	16	1	2023
JOURNAL OF EDUCATIONAL EVALUATION FOR HEALTH PROFESSIONS	1	1	0.5	2	1	2023
JOURNAL OF ENDODONTICS	1	1	1	1	1	2024
JOURNAL OF PHARMACEUTICAL NEGATIVE RESULTS	1	1	0.333	2	1	2022
JOURNAL OF RESEARCH IN MEDICAL AND DENTAL SCIENCE	1	1	0.333	2	1	2022
JOURNAL OF SURGICAL EDUCATION	1	1	0.333	14	1	2022
JOURNAL OF TAIBAH UNIVERSITY MEDICAL SCIENCES	1	1	1	2	1	2024
MEDICAL SCIENCE	1	1	0.25	11	1	2021
ORAL HEALTH & PREVENTIVE DENTISTRY	1	1	0.25	25	1	2021
SEMINARS IN ORTHODONTICS	1	1	0.25	17	1	2021

TC: total citations (at the global level); NP: number of publications; PY: publication year.

Table S4. Top 10 authors classified according to the h, g, and m indices at the local impact level.

Author	h_index	g_index	m_index	TC	NP	PY_start
AFRASHTEHFAR KI	1	1	0.5	76	1	2023
STRUNGA M	1	1	0.5	76	1	2023
SUROVKOVÁ J	1	1	0.5	76	1	2023
THURZO A	1	1	0.5	76	1	2023
URBAN R	1	1	0.5	76	1	2023
YÜZBASIOGLU E	1	1	0.25	45	1	2021
ABU-ISMAIL L	1	1	0.25	42	1	2021
ANDREWS DM	1	1	0.25	42	1	2021
BISDAS S	1	1	0.25	42	1	2021
BOUHUWAISH AM	1	1	0.25	42	1	2021

TC: total citations (at the global level); NP: number of publications; PY: publication year.

Table S5. The top 25 affiliations by the number of times they appear in the documents in this collection.

Affiliation	Frequency
KING SAUD BIN ABDULAZIZ UNIVERSITY FOR HEALTH SCIENCES	9
UNIVERSITY OF LONDON	7
UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER HOUSTON	7
UNIVERSITY OF TEXAS SYSTEM	7
MASHHAD UNIVERSITY MEDICAL SCIENCE	6
UNIVERSITY COLLEGE LONDON	6
UNIVERSITY OF AMSTERDAM	6
VRIJE UNIVERSITEIT AMSTERDAM	6
RIGA STRADINS UNIVERSITY	5
ACADEMIC CENTER FOR DENTISTRY AMSTERDAM	4
UNIVERSITY OF IOWA	4
UNIVERSITY OF MICHIGAN	4
UNIVERSITY OF MICHIGAN SYSTEM	4
UNIVERSITY OF SHARJAH	4
UNIVERSITY OF TORONTO	4
AARHUS UNIVERSITY	3
EUROPEAN UNIVERSITY CYPRUS	3
KING KHALID UNIVERSITY	3
SHAHID BEHESHTI UNIVERSITY MEDICAL SCIENCES	3
UNIVERSITY OF BELGRADE	3
UNIVERSITY OF MANCHESTER	3
UNIVERSITY OF SYDNEY	3
UNIVERSITY OF THE PACIFIC	3
YONSEI UNIVERSITY	3
YONSEI UNIVERSITY HEALTH SYSTEM	3

Table S6. Corresponding author's country together with the international collaboration level.

Country	Articles	Articles %	SCP	MCP	MCP %
USA	9	16.7	7	2	22.2
SAUDI ARABIA	5	9.3	3	2	40
INDIA	4	7.4	3	1	25
AUSTRALIA	3	5.6	3	0	0
GERMANY	3	5.6	2	1	33.3
IRAN	3	5.6	1	2	66.7
KOREA	3	5.6	3	0	0
PAKISTAN	3	5.6	3	0	0
DENMARK	2	3.7	0	2	100
SERBIA	2	3.7	2	0	0
SPAIN	2	3.7	1	1	50
TURKEY	2	3.7	1	1	50
UNITED KINGDOM	2	3.7	1	1	50
CANADA	1	1.9	1	0	0
CYPRUS	1	1.9	0	1	100
LATVIA	1	1.9	0	1	100
MALAYSIA	1	1.9	1	0	0
NETHERLANDS	1	1.9	1	0	0
OMAN	1	1.9	0	1	100
PERU	1	1.9	0	1	100
QATAR	1	1.9	1	0	0
SLOVAKIA	1	1.9	0	1	100
SWEDEN	1	1.9	1	0	0

SCP: single country publications; MCP: multiple country publications.

Table S7. Ranking of countries according to the total number of citations.

Country	TC	Average Article Citations
SLOVAKIA	76	76.00
UNITED KINGDOM	56	28.00
TURKEY	51	25.50
USA	49	5.40
SAUDI ARABIA	48	9.60
IRAN	28	9.30
AUSTRALIA	21	7.00
SPAIN	17	8.50
GERMANY	16	5.30
QATAR	16	16.00
DENMARK	15	7.50
SERBIA	15	7.50
CANADA	14	14.00
CYPRUS	4	4.00
INDIA	4	1.00
SWEDEN	2	2.00
KOREA	1	0.30
LATVIA	0	0.00
MALAYSIA	0	0.00
NETHERLANDS	0	0.00
OMAN	0	0.00
PAKISTAN	0	0.00
PERU	0	0.00

TC: Total citations.

Table S8. Network analysis of authors using various centrality metrics.

Node	Cluster	Betweenness	Closeness	PageRank
chaurasia a	3	0.25	0.2	0.026
fontana m	3	0.25	0.2	0.026
schwendicke f	3	0.25	0.2	0.026
uribe se	3	0.25	0.2	0.026
angelov n	1	0	0.5	0.022
chang j	1	0	0.5	0.022
glick a	1	0	0.5	0.022
han ss	2	0	0.5	0.022
jeon kj	2	0	0.5	0.022
jeong h	2	0	0.5	0.022
alghamdi a	4	0	0.25	0.022
alhamlan r	4	0	0.25	0.022
alhejazi m	4	0	0.25	0.022
alkathiri m	4	0	0.25	0.022
alyami k	4	0	0.25	0.022
rehman a	5	0	1	0.022
aleem a	5	0	1	0.022
adanero a	6	0	1	0.022
algar j	6	0	1	0.022
abdelaziz km	7	0	0.25	0.022
abouzeid hl	7	0	0.25	0.022
algahtani nm	7	0	0.25	0.022
alqarni aas	7	0	0.25	0.022
alzahrani fa	7	0	0.25	0.022
abu-ismail l	8	0	1	0.022
andrews dm	8	0	1	0.022
al ghammari s	9	0	0.5	0.022
al rusheidi a	9	0	0.5	0.022
alarabi a	9	0	0.5	0.022
amiri h	10	0	0.5	0.022
anar ma	10	0	0.5	0.022
anvari mh	10	0	0.5	0.022
crain g	11	0	1	0.022
al sakka y	11	0	1	0.022
albarrak s	12	0	0.167	0.022
aldakhil s	12	0	0.167	0.022
aldalan r	12	0	0.167	0.022
alkhurayji k	12	0	0.167	0.022
almihbash a	12	0	0.167	0.022
alrusaini s	12	0	0.167	0.022
alshehri k	12	0	0.167	0.022
abuzaid mm	13	0	0.5	0.022
al kawas s	13	0	0.5	0.022
aljuaid h	13	0	0.5	0.022

kavadella a	3	0	0.167	0.014
akota i	3	0	0.167	0.014

Table S9. Network analysis of institutions using various centrality metrics.

Node	Cluster	Betweenness	Closeness	PageRank
university of london	2	93	0.028	0.044
university of michigan	6	20	0.024	0.041
university of michigan system	6	20	0.024	0.041
university of sharjah	5	1	0.5	0.036
cardiff university	2	49.5	0.029	0.034
egyptian knowledge bank (ekb)	2	49.5	0.029	0.034
riga stradins university	6	10.5	0.024	0.033
king george's medical university	6	10.5	0.024	0.033
universidade de sao paulo	3	2	0.25	0.032
aarhus university	4	2	0.25	0.032
shahid beheshti university medical sciences	1	38	0.02	0.03
university college london	2	13	0.024	0.03
university of texas health science center houston	7	0	1	0.025
university of texas system	7	0	1	0.025
yonsei university	8	0	1	0.025
yonsei university health system	8	0	1	0.025
saveetha dental college and hospital	9	0	1	0.025
saveetha institute of medical and technical science	9	0	1	0.025
university of toronto	10	0	0.5	0.025
saint michaels hospital toronto	10	0	0.5	0.025
toronto metropolitan university	10	0	0.5	0.025
university of iowa	11	0	1	0.025
a.t. still university of health sciences	11	0	1	0.025
university of amsterdam	6	0	0.018	0.023
vrije universiteit amsterdam	6	0	0.018	0.023
academic center for dentistry amsterdam	6	0	0.018	0.023
ucl medical school	2	0	0.023	0.019
university college london hospitals nhs foundation trust	2	0	0.023	0.019
case western reserve university	5	0	0.333	0.019
princess nourah bint abdulrahman university	5	0	0.333	0.019
king saud bin abdulaziz university for health sciences	2	0	0.019	0.018
king abduallah international medical research center (kaimrc)	2	0	0.019	0.018
universidad peruana cayetano heredia	3	0	0.167	0.018
university of manchester	4	0	0.167	0.018
european university cyprus	6	0	0.022	0.018
ajman university	1	0	0.019	0.017
augusta university	1	0	0.019	0.017

mashhad university medical science	1	0	0.014	0.015
islamic azad university	1	0	0.014	0.015
university of the pacific	6	0	0.017	0.008

Table S10. Network analysis of countries using various centrality metrics.

Node	Cluster	Betweenness	Closeness	PageRank
usa	2	67.276	0.024	0.076
united kingdom	2	74.971	0.026	0.076
germany	2	30.899	0.023	0.063
u arab emirates	2	65.943	0.022	0.047
switzerland	2	14.082	0.02	0.046
egypt	2	11.932	0.022	0.045
pakistan	3	10.769	0.021	0.042
jordan	3	10.769	0.021	0.042
india	2	1.098	0.02	0.041
latvia	2	1.098	0.02	0.039
chile	2	1.098	0.02	0.039
brazil	1	56.333	0.017	0.036
cyprus	2	38.731	0.021	0.036
turkey	5	0	1	0.031
georgia	5	0	1	0.031
iran	3	28	0.019	0.029
saudi arabia	3	0	0.019	0.027
australia	2	0	0.019	0.025
libya	3	0	0.017	0.024
ecuador	3	0	0.017	0.024
indonesia	3	0	0.017	0.024
romania	3	0	0.017	0.024
thailand	3	0	0.019	0.022
peru	4	0	0.011	0.02
netherlands	2	0	0.017	0.018
spain	4	0	0.011	0.015
greece	1	0	0.016	0.014
denmark	1	3	0.017	0.011
slovakia	2	0	0.015	0.01
oman	2	0	0.016	0.009
malaysia	6	0	0.013	0.008
japan	7	0	0.014	0.007
denmark	1	3	0.017	0.011
greece	1	0	0.016	0.014
usa	2	67.276	0.024	0.076
united kingdom	2	74.971	0.026	0.076
germany	2	30.899	0.023	0.063
india	2	1.098	0.02	0.041
netherlands	2	0	0.017	0.018
u arab emirates	2	65.943	0.022	0.047
australia	2	0	0.019	0.025
latvia	2	1.098	0.02	0.039
cyprus	2	38.731	0.021	0.036
switzerland	2	14.082	0.02	0.046

chile	2	1.098	0.02	0.039
egypt	2	11.932	0.022	0.045
oman	2	0	0.016	0.009
slovakia	2	0	0.015	0.01
saudi arabia	3	0	0.019	0.027
iran	3	28	0.019	0.029
pakistan	3	10.769	0.021	0.042
jordan	3	10.769	0.021	0.042
libya	3	0	0.017	0.024
ecuador	3	0	0.017	0.024
indonesia	3	0	0.017	0.024
romania	3	0	0.017	0.024
thailand	3	0	0.019	0.022
peru	4	0	0.011	0.02
spain	4	0	0.011	0.015
turkey	5	0	1	0.031
georgia	5	0	1	0.031
malaysia	6	0	0.013	0.008
japan	7	0	0.014	0.007

Table S11. Summary of articles included in the bibliometric analysis: study design, methodologies, key findings, and conclusions. AI: Artificial intelligence.

Reference	Study design	Methodology	Findings and Conclusions
Amiri et al., 2024 doi.org/10.1186/s12909-024-05406-1	Systematic review and meta-analysis	22 studies were included from Medline/ PubMed, Scopus and Google Scholar: 19 studies were cross-sectional, 3 were mixed. 8491 undergraduate students from dental, nursing, and other health sciences disciplines.	The extent to which healthcare students are prepared for the integration of AI in education remains unclear. Participants demonstrated a moderate level of knowledge regarding AI. Direct experiential learning with AI applications is essential for fostering durable competency acquisition. While participants exhibited a generally positive attitude toward AI, it will be critical to address the ethical and human implications of its use in educational contexts. Significant gaps remain in understanding the long-term effectiveness of optimal pedagogical approaches and ensuring equitable global access to AI-based educational tools. The authors recommend conducting follow-up longitudinal studies to explore the processes of long-term retention, competency acquisition, and equitable Access in order to identifying best practices.
Dashti et al., 2024 doi: 10.1016/j.jtumed.2023.12.010	Systematic review	13 studies were included from PubMed, Web of Science, Embase, Scopus, and Scopus Secondary: 12 among dental students and 1 among dental practitioners	The results highlight an urgent need to incorporate AI instruction into dental school curricula. The average knowledge and usage of AI in dentistry were 58.62% and 54.90%, respectively. While 72.01% of students believed AI would drive significant advancements in dentistry, only 28.45% expressed concerns about AI potentially replacing dentists in the future. Dental students showed lower levels of knowledge about AI applications in dentistry compared to practitioners.
Mousavi Baigi et al., 2023 doi: 10.1002/hsr2.1138	Systematic review	38 studies were included from PubMed, Embase, Scopus and Web of Science. 19378 participants from medicine, dentistry, radiology, medical physics, ophthalmology, dermatology, and others.	A positive attitude towards AI was revealed in the analysis of the included articles. However, the majority of surveyed students acknowledged having limited knowledge and skills in working with AI. To address this gap, direct instruction, training manuals, and detailed instructions are essential for implementing and understanding how AI technology works in order to increase students' knowledge of its advantages.
Kirubarajan et al., 2022 doi: 10.1016/j.jsurg.2021.09.012	Systematic review	49 studies were included from 8 databases: Medline-Ovid, Eric, Embase, CINAHL, Web of Science, Core Collection, Compendex, Scopus and IEEE Xplore. 1185 surgical trainees and dental students among others.	49 relevant studies in surgical education were identified. These studies explored various interventions aimed at assessing surgical competency, personalizing surgical education, and enhancing educational materials across surgical specialties. While these interventions showed promise, most studies did not report outcomes regarding their implementation in medical schools. The authors suggest that these interventions could be used to identify surgical trainees with substandard performance or to effectively evaluate teaching methods.
Aldakhil et al., 2024 doi: 10.7759/cureus.51825	Scoping review	Databases: Medline, Embase, Google Scholar, and Scopus. 21 cross-sectional studies were selected.	7,688 participants were included in the total number of studies. The levels of knowledge and awareness of AI in dentistry are insufficient, especially among dental students. However, most participants expressed their intention to learn more about AI and its applications. The authors suggest that it is crucial to take proactive measures to address this enthusiasm. Less than half of the participants in the included studies felt threatened or believed that AI would replace them.

Saghiri et al., 2022 doi: 10.1002/jdd.12856	Scoping Review	Databases: Embase, PubMed, Web of Science, and Cochrane Library were searched from 2018 to May 19, 2021. Additionally, a manual search was performed.	31 articles were selected for this review, all directly related to AI and immersive tools in dental education. Few studies specifically identify the applications and efficacy of virtual and AI technologies in this field. A deeper understanding of these domains is essential to help dental students adapt to evolving educational paradigms.
Aminoshariae et al., 2024 doi: 10.1016/j.joen.2024.02.011	Review article	Databases: Medline, Web of Science, Cochrane Library, and a manual search of reference literature until December 2023. ClinicalTrials.gov was used to explore grey literature.	AI tools can be applied in endodontic education to support clinical and didactic teaching by providing individualized feedback, enhanced and augmented training, and virtually generated scenarios, among other applications. The authors consider that the integration of AI will undoubtedly transform the current approach to teaching Endodontics, benefiting dental educators. However, they caution about potential limitations, such as increased reliance on technology leading to a "black box" phenomenon, exposure to liability issues, and the risk of AI generating incorrect treatment recommendations.
Thorat et al., 2024 doi: 10.7759/cureus.54193	Review article	Databases: Google, Medline, and Education Source from 2013 to 2023.	Chatbot GPT offers personalized learning experiences, clinical simulations, continuous accessibility, instant terminology assistance, evidence-based learning resources, and real-time assessment capabilities. Its adaptability addresses diverse learning needs, fostering a learner-centered approach and promoting lifelong learning for both dental students and practitioners. The authors believe that Chatbot GPT has the potential to transform the educational experience. However, collaborative efforts are essential to balance embracing innovation with addressing challenges, ensuring the continuous evolution of dental education.
Dave et al., 2023 doi.org/10.1038/s41415-023-5845-2	Review article	The authors examine the use of AI in healthcare, in medical and dental education, and in publishing.	The incorporation of AI in health degrees can transform the way professionals are trained, offering numerous exciting possibilities. There is a need for research and regulation to maximize the benefits of AI while minimizing its potential risks. It is essential that researchers and educators collaborate closely with medical professionals, data scientists, and regulatory bodies to ensure that the data used to train AI algorithms is accurate and ethically obtained. The authors also discuss the use of AI in publishing.
Thurzo et al., 2023 doi.org/10.3390/educsci13020150	Review article	Databases: Scopus and Web of Science until December 2022.	15 articles covered the required information. The authors concluded that AI needs to be incorporated into dental education curricula, although its implementation in theoretical dental education is more advanced than in practical/clinical education. AI, particularly ChatGPT, can facilitate effective communication between healthcare providers and patients, personalizing interactions. Responsible and ethical use of AI is necessary, alongside efforts to avoid bias and plagiarism.
Spielman, 2024 doi: 10.3389/froh.2024.1368121	Review article	Analysis of current changes and trends in dental education and an attempt to predict the future.	Technological advances, among other factors, are shaping dental education. Dental education will likely include individualized, competency-based, asynchronous, hybrid, face-to-face, and virtual education, with different starting and ending points for students. AI will play a critical role in diagnosis, treatment and practice management.
Bhatia et al., 2024 doi: 10.7759/cureus.60006	Quantitative Study	100 undergraduate dental students were randomly divided into 2 groups. Both groups attended a lecture. Group A was provided with textbooks for reading, while Group B used the Chat Generative Pre-Trained Transformer (ChatGPT) as a resource. An	Group A (conventional method) achieved higher scores compared to Group B (ChatGPT-assisted method).

		online questionnaire was subsequently distributed to all students.	
Qutieshat et al., 2024 doi: 10.1515/dx-2024-0034	Quantitative Study	54 junior students (3rd year) and 55 senior students (5th year) participated in the study. Each student and ChatGPT made pulpal and periapical diagnoses for 7 different scenarios. A team of endodontists established the gold standard diagnosis.	No significant differences in mean accuracy were found between junior students (77%) and senior students (79.7%), but both were significantly lower than ChatGPT's accuracy (99%).
Chang et al., 2024 doi: 10.1002/jdd.13524	Quantitative study	40 third-year dental students were divided into 2 groups (control and test). Both groups were asked to mount a full mouth radiograph series in the correct position. The control group mounted the radiographs manually, while the test group reviewed how an AI application pre-mounted the radiographs and made adjustments. Both groups were later evaluated, and pre- and post-surveys were conducted.	The test group was significantly faster in completing the task than the control group. However, the test group was significantly less accurate in completing the task than the control group. Self-confidence and confidence in AI were consistent between the control and test groups, both before and after the study.
Saravia-Rojas et al., 2024 doi: 10.1002/jdd.13485	Quantitative study	55 fourth-year dental students performed a writing assignment with the help of ChatGPT. One week later, they completed a similar assignment but using conventional methods (with the help of the PubMed database). 3 professors evaluated the tasks. A satisfaction survey was completed by the participants.	39 students completed both tasks. Higher scores were obtained with the traditional method. 64.3% of students considered ChatGPT useful, and 33.3% found it very useful. 61.9% of students believed ChatGPT contributed more than 25% to their productivity.
Ayan et al., 2024 doi: 10.1002/jdd.13437	Quantitative Study	1,200 bitewing radiographs were obtained to train a specific AI system and to test students and the software. 45 radiographs were randomly selected and divided into three subgroups. 40 second-year dental students participated in the study and were divided into two groups. Both groups evaluated 15 bitewing radiographs initially and at the end (pre-test and post-test). Group 2 reviewed 15 bitewings labeled by the AI software. Performances were evaluated by two specialists.	Accuracy, sensitivity, and specificity of both student groups improved significantly. Precision did not improve significantly. The time necessary to complete the task in the post-test was significantly higher in group 2.
Kavadella et al., 2024 doi: 10.2196/51344	Quantitative study	77 second-year dental students were divided into two groups and asked to collaboratively compose an assignment on radiation protection in the dental office in small groups. The "Literature" group used the internet for scientific resources, while the "ChatGPT" group used the AI app for this purpose. Both groups made a presentation on their research and undertook an examination on the topic. The "ChatGPT" group students also completed a survey.	The ChatGPT group students performed significantly better than the Literature group students in the examination. Benefits, limitations, and prospects of the ChatGPT group were obtained from the feedback of the students who used it during the task.
Hultgren et al., 2023	Quantitative study	Questions from 22 dental students were obtained during an online discussion in a microbial pathogenesis course. The questions were aligned with the intended learning outcomes of	ChatGPT-3.5 answered the questions from dental students in a similar or even more elaborate way compared to the answers that had previously been provided by a professor. ChatGPT-3.5 was also

<p>doi: 10.3352/jeehp.2023.20.32</p>		<p>the course. The same questions were answered by ChatGPT-3.5 months later.</p>	<p>asked to elaborate concrete intended learning outcomes for a similar course, and they were found to be, to a large degree, irrelevant. The authors consider it a useful tool to assist dental education.</p>
<p>Schropp et al., 2024 doi: 10.1111/eje.12973</p>	<p>Quantitative Study</p>	<p>74 third-year dental students were divided into 2 groups (test and control) and tasked with evaluating proximal enamel caries in bitewing radiographs. In the first session, the test group evaluated enamel caries in 25 radiographs using AI software (AssistDent®), while the control group evaluated the same without AI assistance. One month later, both groups repeated the evaluation with another set of 25 radiographs, this time without using the AI tool.</p>	<p>During the first session, no significant differences in positive agreement were observed between the groups; however, negative agreement was higher in the test group. In the second session, no significant differences were observed between the groups. Both groups showed performance improvement: the test group in positive agreement and the control group in negative agreement.</p>
<p>Kim et al., 2023 doi: 10.3390/bioengineering10050615</p>	<p>Quantitative study</p>	<p>The Conformer model was utilized to implement an AI dental patient, designed to replace actors for training students. The authors developed a Korean standardized patient scenario data generator to collect responses to diagnostic questions based on provided patient information. This system used pre-prepared questions for training. To evaluate the model's performance, the Bilingual Evaluation Understudy (BLEU) score and Word Error Rate (WER) were used to compare it with the Transformer model.</p>	<p>The Conformer-based model demonstrated improvements of 3.92% in BLEU and 6.74% in WER compared to the Transformer model. The authors suggest that this AI dental patient simulation has potential applications in other medical and nursing fields, if additional data collection processes are conducted.</p>
<p>Mahrous et al., 2023 doi: 10.1002/jdd.13225</p>	<p>Quantitative study</p>	<p>In phase one, 2 groups of randomly divided second-year dental students participated. One group had access to the AiDental software for designing a removable partial denture (RPD), while the other group did not. Both groups received conventional RPD instruction and practice, with the AiDental group having supplementary access to the software. After 2 weeks, both groups took a mock practical test. In phase two, all students were granted access to the AiDental software for the remainder of the course. All participants completed a survey evaluating their perceptions of the AI software.</p>	<p>In phase one, students with access to the AI software were more likely to achieve grades A or B compared to the other group. Survey results indicated favorable perceptions towards the software.</p>
<p>Glick et al., 2022 doi: 10.1093/jamiaopen/ooac031</p>	<p>Quantitative study</p>	<p>22 third-year dental students and 19 fourth-year dental students were divided into two groups (test and control) and asked to identify furcal lesions on dental radiographs. The test group had AI assistance while the control group did not. All participants completed a questionnaire.</p>	<p>There was no difference in performance between the test and control groups. Both test and control groups believed that the use of AI would improve clinical decision making.</p>

<p>de Vries et al., 2024 doi: 10.3389/froh.2024.1386904</p>	<p>Qualitative study</p>	<p>Redesign of a 4-week course on the basics of immunology and pathology for dental students (144 participants). The course incorporated various active-learning activities, including team-based learning, lectures and tutorials with interactive elements, seminars, and the use of ChatGPT. Student feedback was collected through two evaluations: mid-course and final-course surveys (77 respondents). Control group: None.</p>	<p>77 students completed a survey consisting of 17 five-point Likert scale questions to evaluate the course. All questions related to the active educational methods received high scores. Both students and teachers found ChatGPT to be a useful tool.</p>
<p>Qamar et al., 2024 doi: 10.1186/s12903-024-04305-7</p>	<p>Qualitative study</p>	<p>Exploration of the perspectives of postgraduate trainees, lecturers, assistants, associates, and professors at a dental institution in Pakistan. 23 randomly selected participants anonymously completed a questionnaire addressing various topics related to AI's importance in dentistry.</p>	<p>Knowledge of AI concepts and applications in dentistry varied among faculty positions. Associate professors demonstrated a higher level of familiarity with AI concepts. 100% of respondents indicated the need for faculty-oriented AI programs, and 83% recognized the importance of AI applications in enhancing patient outcomes.</p>
<p>Jeong et al., 2024 doi: 10.1186/s12909-024-05441-y</p>	<p>Qualitative study</p>	<p>A 17-item online questionnaire regarding perceptions, confidence, predictions, and perceived future prospects related to AI was conducted at 2 dental colleges and on 2 dental websites.</p>	<p>Responses were collected from 120 dental students (55.6%) and 96 dentists (44.4%). 63.3% of students and 58.3% of dentists expressed interest in AI. 42.5% of students and 49.0% of dentists indicated that dental schools should offer educational programs on AI. Regarding diagnostic superiority, 25.0% of students and dentists agreed or strongly agreed that AI could outperform a skilled dentist. 75.0% of students and 70.8% of dentists recognized AI's potential use in dentistry. Students showed a more active intention to use AI, while dentists indicated they would use it more selectively.</p>
<p>Uribe et al., 2024 doi: 10.1111/eje.13009</p>	<p>Qualitative study</p>	<p>A 31-item online questionnaire was developed to assess dental educators' perceptions of AI chatbots, such as ChatGPT, and their influence on dental education. The questionnaire was distributed via email and social media. The questions were divided into eight domains: 1. Background information; 2. The current use of AI in education; 3. Perceived impact of AI on dental education; 4. Barriers to using chatbots in dental education; 5. Future of AI chatbots in dental education; 6. Impact of AI tools on assessment methods in dental education; 7. Impact of AI tools on student engagement, critical thinking, grading, and interaction in dental education; and 8. Additional feedback.</p>	<p>A total of 428 dental educators from 66 countries completed the survey. Respondents reported having a moderate level of knowledge about AI-powered tools in education, such as ChatGPT, and showed high agreement that AI chatbots could enhance dental education, particularly in areas such as knowledge acquisition, research, and clinical decision-making. 59.3% of participants indicated a lack of support or training when using AI, 50.2% were skeptical about AI chatbots replacing traditional teaching, and 39.5% questioned chatbots' ability to assess students' skills. 41% believed the benefits of using AI tools outweighed the disadvantages, with 43.9% remaining neutral.</p>
<p>Lin et al., 2024 doi: 10.1038/s41415-024-7184-3</p>	<p>Qualitative study</p>	<p>A 21-item close-ended online survey was sent to 225 clinical-year dental students. All questions were rated by students using a 5-point Likert scale. The questions were divided into 3 domains: 1) Patient's rights and privacy; 2) Patient-centered care and safety; and 3) Regulatory governance.</p>	<p>165 students responded to the survey. Respondents showed positive perceptions across all three domains, with uniform and comparable perceptions observed across various academic years and genders. Female respondents expressed stronger agreement regarding the prioritization of patient consent and privacy. Item 13 – “Clinical decisions made by AI algorithms may result in unnecessary treatment” – scored lower among all clinical-year dental students, suggesting some skepticism towards the possibility of AI algorithms leading to unwarranted interventions.</p>

<p>Kröplin et al., 2024 doi: 10.2196/51389</p>	<p>Qualitative study</p>	<p>A course in digital health with a curriculum divided into 4 topics was offered: 1) Digital communication, 2) Digital didactics, 3) Management and digital leadership, and 4) Robotics and digital intelligence. A 12-question pre-test was developed to assess students' prior knowledge of the course content. 20 health science students: 15 from human medicine, 3 from dentistry, and 2 from medical biotechnology completed the test and the course.</p>	<p>Digital didactics, economics, virtual or augmented reality, and open educational resources were the least known topics included in the curriculum. 9 out of the 20 students chose the "Robotics and AI" topic for their term papers. The authors suggest that the content of digital health curricula should be integrated into standard teaching for all health science students.</p>
<p>Zia et al., 2024 http://ojs.lumhs.edu.pk/index.php/jlumhs/article/view/1261</p>	<p>Qualitative study</p>	<p>A 26-question online survey with yes/no/I don't know responses was delivered to 550 general dentists, dental undergraduates, and postgraduate consultants and specialists regarding robotics and AI. The questions were divided into 3 domains: 1) Knowledge of AI, 2) Perception towards AI and robotics, and 3) Attitudes towards AI and robotics.</p>	<p>55.2% of respondents had prior knowledge of AI and robotics, while only 42.5% were able to distinguish between AI and robotics. 58% of dentists considered AI and robotics helpful tools for future dental procedures, while 16% believed AI will eventually replace dentists. The authors suggest that more education and training programs for dental professionals are necessary and recognize the need for further research to establish the best way to integrate robotics and AI to improve patient outcomes.</p>
<p>Kalaimani et al., 2023 doi: 10.7759/cureus.44656</p>	<p>Qualitative study</p>	<p>A self-structured, 25-question close-ended online survey was distributed among dentists and dental students to evaluate their knowledge, attitudes, and practices related to AI. A total of 595 dental surgeons and 405 dental students participated in the study.</p>	<p>63.5% of respondents were aware of AI. Among students, 43.2% believed that AI could assist them in preparing theoretical answers, practical assignments, and preclinical work. Additionally, 63.9% of respondents indicated that AI training should be included in medical/dental education programs, while 59.7% suggested that these programs should be updated with AI content. There were no significant differences observed when comparing the responses of dental surgeons and dental students.</p>
<p>Hamd et al., 2023 doi: 10.1016/j.heliyon.2023.e17089</p>	<p>Qualitative study</p>	<p>The authors adapted a previously validated survey to assess dentists', academic faculty's, and students' knowledge and perceptions regarding the integration of AI into dental practice. The survey was distributed online, and participants completed it anonymously.</p>	<p>134 responses were collected, including 72 from dental students, 19 from academic staff, and 44 from practicing dentists. More than 80% of participants stated that AI would play a significant role in dental practice, could be used in various applications, and expressed a readiness to learn about AI applications. The results also showed that respondents had a medium to high level of knowledge about AI, a lack of training programs, and a high level of enthusiasm for implementing AI in practice.</p>
<p>Roganović et al., 2023 doi: 10.3390/healthcare11101480</p>	<p>Qualitative study</p>	<p>An online 25-item closed-ended survey was sent to 130 final-year undergraduate dental students and 151 practicing dentists to investigate their current perspectives and readiness to accept AI into dental practice.</p>	<p>193 responses were obtained, with 76 from students and 117 from experienced dentists. Only 7.9% of respondents reported familiarity with AI use, while 34% believed that AI should be implemented in dental practice. Regression analysis revealed several barriers, including a lack of knowledge about AI technology, fear of being replaced by AI, and concerns about the absence of regulatory policies.</p>
<p>Karan-Romero et al., 2023 doi.org/10.3390/dj11050125</p>	<p>Qualitative study</p>	<p>A 22-question survey was sent to 260 dental students. The survey consisted of three sections: 1) sociodemographic characteristics, 2) knowledge about AI and its applications in dentistry, and 3) level of agreement (agree/do not know/disagree) with 15 statements.</p>	<p>200 responses were evaluated. 86% expressed confidence that AI will lead to significant advancements in dentistry. 45% of students disagreed with the idea that dentists could be replaced by AI in the future. Support for integrating AI into undergraduate dental programs was indicated by 67% of respondents, and 72% agreed with its inclusion in postgraduate curricula.</p>
<p>Jeong et al., 2023 doi: 10.1002/jdd.13189</p>	<p>Qualitative study</p>	<p>A 24-question online survey was distributed to 1,310 dental hygiene students from four different dental schools. The questionnaire included 7 sociodemographic questions and 17 questions, answered using a 5-point Likert scale, focusing on</p>	<p>Responses from 753 participants were analyzed. Among the respondents, 83.9% reported moderate to high interest in AI, and 93.1% accessed AI-related information through the internet. The primary perceived advantages of AI in dentistry were its speed and objectivity (25.4%), ability to integrate vast amounts of data (25.4%), and its capacity to reduce misdiagnosis rates (26.3%). Conversely, the</p>

		students' attitudes toward AI, confidence in AI, predictions about AI, and its future prospects.	main perceived disadvantages were its inflexibility in application to individual patients (33.6%), difficulty in handling unexpected situations (29.8%), and limited ability to empathize with patients' feelings (25.2%). Participants from schools with existing AI-related education expressed significantly higher demands for AI-related content compared to those without such knowledge ($p < 0.05$).
Choi et al., 2023 doi: 10.1111/eje.12895	Qualitative study	A 3D feedback technology was used to interactively analyze endodontic access cavities in molars. A total of 79 third-year dental students practiced access cavity preparation during a preclinical course, utilizing the technology to receive feedback. Traditional feedback methods were also provided. Before and after this process, students completed a survey with 6 (pre-exposure) or 7 (post-exposure) statements, which were evaluated on a 5-point Likert scale.	44 students completed the surveys. All participants agreed or strongly agreed that the software effectively supported their learning in access cavity preparation. Additionally, 86% of respondents indicated that using the software improved their skills in performing the task, and 89% reported feeling more confident after utilizing the software.
Suárez et al., 2022 doi: 10.3390/ijerph19148735	Qualitative study	An AI chatbot was utilized to simulate a conversation with a virtual patient presenting with reversible pulpitis, aiming to train students in achieving accurate diagnoses. A total of 457 fourth- and fifth-year dental students were invited to interact with the AI chatbot and subsequently complete an 11-question feedback survey.	Higher agreement scores were recorded for statements reflecting high satisfaction with the tool, its ability to instill confidence and security, and the belief that it should be integrated into the curriculum. Fifth-year students provided more favorable ratings for the interaction and expressed higher satisfaction compared to fourth-year students. The authors suggest that incorporating AI tools into dental curricula would be well-received by students and would enhance their preparation for and adaptation to emerging technological developments.
AlAhmari, 2022 https://www.jrmds.in/articles/perspectives-of-saudi-dental-student-on-the-impact-of-artificial-intelligence-in-dentistry-a-crosssectional-study-89948.html	Qualitative study	A 22-question online survey was developed to assess dental students' perspectives on the impact of AI technologies in dentistry. The survey covered the following topics: 1) Sources of information about AI technologies, 2) Knowledge of AI's working principles, and 3) Applications of AI in dentistry. Students were asked to express their level of agreement with various statements using a 5-point Likert scale.	218 students completed the survey. Among them, 22% reported having basic knowledge of AI technologies, while 37% were aware of AI applications in dentistry, with social media being the primary source of information (61%). 74% of respondents agreed that AI will contribute significantly to the field of dentistry. Support for integrating AI in undergraduate curricula and 77% advocating for its incorporation into postgraduate programs.
Ram et al., 2022 doi: 10.47750/pnr.2022.13.S04.155	Qualitative study	A 15-question multiple-choice survey was distributed to 100 dental students to assess their knowledge and perceptions of AI and its applications in dentistry.	84% of respondents were aware of AI-based devices in healthcare. 81% believed that AI could assist clinicians in decision-making processes. Regarding specific applications, 86% considered AI suitable for diagnosing soft tissue lesions, 73% supported its use in interpreting radiographs, and 52% believed it was appropriate for interpreting 3D scans.
Bisdas et al., 2021 doi: 10.3389/fpubh.2021.795284	Qualitative study	An anonymous electronic survey on AI was designed and distributed to medical and dental students. Topics included in the survey were: 1) Sources of information about AI, 2) Applications and concerns regarding AI, 3) The	3,133 responses were collected from students across 63 countries. The majority of respondents reported having at least a moderate understanding of AI technologies and their current applications. Furthermore, 85.6% of students believed that AI should be integrated into medical and dental training, and 99% expressed their intention to incorporate AI into their future practice.

		status of AI as a topic in medical and dental education, 4) Students' feelings and attitudes toward AI.	
Keser et al., 2021 doi:10.33808/clinexphealhtsci.928246	Qualitative study	An 11-question online survey was conducted with 140 dental students in their 4th (n=75) and 5th (n=65) years, focusing on their knowledge, attitudes, and perceptions regarding AI in Oral Radiology.	60% of respondents were familiar with AI, and 79.3% recognized it as a useful tool in medical practice. However, only 39.3% reported a basic understanding of how to integrate AI into their work. Most participants (91.4%) believed AI will assist dentists in diagnosis and decision-making, yet 66.4% indicated they would rely on their own judgment in cases of differing opinions.
Khanagar et al., 2021 https://discoveryjournals.org/medicalscience/current_issue/v25/n114/A8.htm	Qualitative study	A 22-question survey was distributed to dental students from seven universities in Saudi Arabia. The survey comprised three sections: 1) Sources of information about recent AI applications used in daily life, 2) Basic knowledge of AI working principles, and 3) Awareness of AI applications in dentistry.	423 responses were collected. Among them, 50.1% reported no basic knowledge of AI principles, and 55.8% were unaware of AI applications in dentistry. Those who had information about AI cited social media (40.9%) and friends or family (26%) as primary sources. Most respondents (86.5%) agreed or strongly agreed that AI could lead to significant advances in medicine and dentistry, and 81.3% found AI exciting. Regarding education, 67.1% supported including AI in undergraduate dental training, a percentage that rose to 82.2% when considering postgraduate training.
Abouzeid et al., 2021 doi: 10.3290/j.ohpd.b1693873	Qualitative study	A 26-question closed-ended survey (yes/no/don't know) was distributed to dental students, graduates/interns, and postgraduate dentists to assess their knowledge, perceptions, and attitudes regarding robotics and AI.	570 participants completed the survey, including 330 dental students, 104 interns/graduates, and 131 postgraduate dentists. Most respondents provided affirmative answers concerning their knowledge, attitudes, and perceptions of robotics and AI. Participants believed that robotics and AI are beneficial in dentistry and could improve outcomes. A significant majority (83.3%) expressed willingness to be treated using robotics or AI, and 84.5% indicated they would recommend its use. Furthermore, 87.7% affirmed their interest in learning more about AI and robotics in the future.
Pauwels et al., 2021 doi: 10.1259/dmfr.20200461	Qualitative study	A 1-hour lecture was given across 6 different locations, focusing on the basic principles of AI and providing an overview of AI research in medicine and dentistry. Participants completed a questionnaire both before and after the lecture.	293 questionnaires were collected. Of the respondents, 57% were undergraduate dental students, 20.2% were postgraduate/PhD students, and 14.7% were professors. Before the lecture: 60.3% of participants were unfamiliar with the application of AI in radiology, with most of their prior knowledge coming from social media. Participants strongly agreed on the potential and anticipated impact of AI in oral radiology. After the lecture: Positive attitudes towards various applications of AI in oral radiology increased significantly across all respondent categories.
Yüzbaşıoğlu, 2021 doi: 10.1002/jdd.12385	Qualitative study	A 22-question online survey was conducted to assess the knowledge, attitudes, and applications of AI in dentistry among students from 9 dental schools. The questionnaire comprised three sections: 1) Sociodemographic information, 2) Knowledge about AI and its use in dentistry, and 3) 15 statements for participants to express their level of agreement using a Likert scale.	1,103 dental students completed the survey. Of the respondents, 48.4% reported having basic knowledge of AI technologies. The majority (85.7%) agreed that AI would bring significant changes to dentistry, though only 28.6% considered it feasible that AI could replace dentists in the future. In terms of education, 74.6% supported the inclusion of AI in undergraduate dental programs, and 79.8% agreed it should also be part of postgraduate curricula.
Mladenovic et al., 2023 doi: 10.1002/jdd.13060	Qualitative study	Fifth-year dental students received training on AI-assisted CBCT image analysis software. Following the training, they completed a feedback survey.	All respondents agreed that the software was easy to use and found it helpful. Specifically, 63.6% highlighted its utility in detecting dental anomalies.

Shamim et al., 2024 doi: 10.29271/jcpsp.2024.05.595	Qualitative Study	10 short essays from final-year students were manually assessed and graded. These essays were also assessed by ChatGPT-3.5, and the scores were compared.	To grade the summative essays and train the AI system, four specific prompts were provided to ChatGPT. AI and machine learning technologies hold significant potential to supplement human grading in essay assessments, though they should not replace human evaluators. The authors recommend that educators integrate these technologies to enhance the standards and quality of healthcare education.
Ali et al., 2024 doi: 10.1111/eje.12937	Qualitative study	50 independent items, each corresponding to a unique learning outcome, were developed using 5 assessment formats (n=10 per item): multiple-choice questions (MCQs), short-answer questions (SAQs), short essay questions (SEQs), true/false questions, and fill-in-the-blank items. ChatGPT answered all 50 items and generated a reflective response.	ChatGPT performed accurately on most text-based assessments but was unable to process image-based questions. A key limitation identified was the word count of its responses.
Islam et al., 2022 doi: 10.1002/jdd.13010	Position paper	Bolman and Deal's Four Frames model was used to present the implementation of AI in dental education. The four perspectives, or frames, include Structural, Human Resource, Political, and Symbolic.	AI is a tool that can enhance and improve certain tasks, significantly impacting education by enhancing teaching and learning experiences, and healthcare by supporting various functions. The authors propose a framework (the Four Frames model) that, while tailored to AI, is adaptable for a wide range of innovations and organizational objectives within institutions of dental education.
Schwendicke et al., 2023 doi: 10.1016/j.jdent.2022.104363	Position paper	Curricula and other documents focused on AI and medical professions were evaluated. Relevant items were extracted. The items were adapted in consultation with members of the IADR e-oral health group, the ITU/WHO Focus Group on AI for Health, and the Association for Dental Education in Europe. Intended learning outcomes were defined. The resulting curriculum was agreed through an online Delphi process.	Four domains of learning outcomes emerged: (1) Basic definitions and terms, the rationale behind AI and the principle of machine learning, the idea of training, validating, and testing models, the definition of reference tests, the contrast between dynamic and static AI, and the problem of AI being a black box and requiring explainability should be known. (2) Use cases, the types of AI required to address them, and the typical setup of AI software for dental purposes should be taught. (3) Evaluation metrics, their interpretation, the relevant impact of AI on patient or societal health outcomes, and related examples should be considered. (4) Issues about generalizability and representativeness, explainability, autonomy and accountability, and the need for governance should be highlighted.
Or et al., 2024 doi: 10.1002/jdd.13591	Pilot study	A history-taking chatbot was developed in which the student assumes the role of a clinician, while the chatbot responds as a patient. Guided by an ideal script for patient-practitioner dialogue, the chatbot employs the GPT-3.5 Instruct model with structured prompts. 13 students actively used the chatbot.	Students found the chatbot useful, with improved perceived competence after using the AI tool. The chatbot encouraged active participation and provided additional opportunities for practice. Researchers concluded that educational chatbots hold clear potential in dental education and were well-received by both staff and senior students.
Prinz et al., 2024 doi: 10.1002/jdd.13479	Pilot study	An e-learning tool utilizing the Generative Pre-trained Transformer 4 (GPT-4) Model (OpenAI) was implemented. Students were introduced to the tool and engaged in diagnosing virtual patients presenting various cases of dental pain. Each scenario included a detailed patient history and essential diagnostic parameters. At the end, students received the correct	The method yielded promising results, suggesting it as a viable approach for practicing diagnostic skills. However, the significant effort required to construct cases was noted. The authors plan a future pilot study with a larger cohort of undergraduate students to evaluate the effectiveness of this program.

		diagnosis alongside an annotated chat protocol conducted by an experienced clinician.	
Kim et al., 2023 doi: 10.1002/jdd.13337	Perspective paper	Authors explored: 1) Considerations when adopting AI, 2) Integration of AI into the dental curriculum, 3) Proposed curriculum model, 4) Guidance for dental organizations, 5) Other uses of AI in dental education.	AI is driving significant changes in healthcare by offering easy accessibility and a high-quality standard. Dental education must take a proactive and visionary approach to safely and ethically integrate AI, ensuring the benefit of both students and patients, as well as future providers.
Tadinada et al., 2023 doi: 10.1002/jdd.13131	Perspective paper	The authors provide a description of how to incorporate technology into the dental curriculum.	New technologies, such as artificial intelligence, offer innovative platforms and strategies for dental education. This is particularly relevant given the shift to online learning during the COVID-19 pandemic, highlighting the need for agile and efficient hybrid courses in dental curricula. The paper presents examples of technology integration into curricula and provides a detailed roadmap for incorporating these tools effectively. It also discusses challenges, potential solutions, and strategies to create a more flexible and responsive educational framework.
Gandedkar et al., 2021 doi.org/10.1053/j.sodo.2021.05.003	Narrative review	Narrative review in orthodontics	AI is a modern phenomenon capable of driving significant changes in education and research. This review examines the current and potential applications of AI in orthodontic teaching and research, emphasizing its transformative role. AI enhances the capabilities of both students and professors in educational activities, fostering a collaborative and mutually beneficial relationship. AI is modern days phenomenon that can led major changes education and research.

Table S12. The top 15 high-impact articles published between 2021 and 2024.

Paper	DOI	Total Citations	TC per Year
THURZO A. 2023. EDUC SCI	10.3390/educsci13020150	76	38.00
YÜZBASIOGLU E. 2021. J DENT EDUC	10.1002/jdd.12385	45	11.25
BISDAS S. 2021. FRONT PUBLIC HEALTH	10.3389/fpubh.2021.795284	42	10.50
BAIGI SFM. 2023. HEALTH SCI REP-US	10.1002/hsr2.1138	26	13.00
ABOUZEID HL. 2021. ORAL HLTH PREV DENT	10.3290/j.ohpd.b1693873	25	6.25
SAGHIRI MA. 2022. J DENT EDUC	10.1002/jdd.12856	19	6.33
GANDEDKAR NH. 2021. SEMIN ORTHOD	10.1053/j.sodo.2021.05.003	17	4.25
ALI K. 2024. EUR J DENT EDUC	10.1111/eje.12937	16	16.00
SCHWENDICKE F. 2023. J DENT	10.1016/j.jdent.2022.104363	16	8.00
ISLAM NM. 2022. J DENT EDUC	10.1002/jdd.13010	15	5.00
DAVE M. 2023. BRIT DENT J	10.1038/s41415-023-5845-2	14	7.00
KIRUBARAJAN A. 2022. J SURG EDUC	10.1016/j.jsurg.2021.09.012	14	4.67
PAUWELS R. 2021. DENTOMAXILLOFAC RAD	10.1259/dmfr.20200461	14	3.50
ROGANOVIC J. 2023. HEALTHCARE-BASEL	10.3390/healthcare11101480	13	6.50
KHANAGAR S. 2021. MED SCI	NA	11	2.75

TC: total citations (at the global level); NA: not available.

Table S13. Co-citation network based on papers and using various centrality metrics.

Node	Cluster	Betweenness	Closeness	PageRank
yüzbasioglu e 2021	2	841.758	0.008	0.067
dos santos 2019	5	277.864	0.007	0.038
thurzo a 2023	3	203.597	0.007	0.029
khanagar sb 2021	4	95.598	0.006	0.036
lee jh 2018-1	5	74.399	0.006	0.029
sit c 2020	2	73.131	0.006	0.025
schwendicke f 2023	3	57.843	0.006	0.026
hung kf 2020	4	53.745	0.006	0.03
saghiri ma 2022	4	50.559	0.006	0.016
karan-romero m 2023	2	49.494	0.005	0.025
boreak nezar 2020	1	49.389	0.005	0.015
islam nm 2022	3	33.711	0.006	0.024
khanagar s 2021	2	25.399	0.006	0.04
johnston sc 2018	5	23.224	0.006	0.021
oh s 2019	5	19.273	0.006	0.024
davenport thomas 2019	2	14.023	0.006	0.012
gong b 2019	5	14.016	0.006	0.026
schwendicke f 2020	2	11.958	0.006	0.014
agrawal p 2022	3	11.617	0.006	0.01
sajjad i 2021	2	11.064	0.005	0.022
sur j 2020	2	9.998	0.006	0.029
shan t 2021	4	6.273	0.006	0.017
abouzeid hl 2021	2	6.216	0.005	0.022
hosny a 2018	2	4.927	0.005	0.008
pauwels r 2021	2	3.154	0.005	0.026
hiraiwa t 2019	5	2.768	0.006	0.024
miotto r 2018	5	2.428	0.006	0.02
lee jh 2018-2	5	2.428	0.006	0.016
khanagar sb 2022	2	2.111	0.005	0.007
chen qx 2016	5	1.845	0.006	0.022
hammond p 1993	5	1.845	0.006	0.022
lee h 2017	5	1.845	0.006	0.018
thulasi ms. 2022	2	1.494	0.005	0.024
paranjape ketan 2019	2	0.538	0.005	0.009
singh nishi 2023	2	0.465	0.005	0.014
keser g 2021	2	0	0.003	0.028
aboalshamat kt 2022	2	0	0.003	0.022
bas b 2012	5	0	0.006	0.018
asmatahasin m. 2021	2	0	0.003	0.016
ekert t 2019	5	0	0.003	0.015
roganovic j 2023	3	0	0.004	0.014
ezhov m 2021	1	0	0.002	0.012
ahmed n 2021	4	0	0.006	0.011

orhan k 2020	4	0	0.003	0.01
pournelle g. 1953	4	0	0.003	0.01
beregi jp 2018	5	0	0.004	0.01
bisdas s 2021	2	0	0.003	0.008
nguyen tt 2021	2	0	0.003	0.007
gilson aidan 2023	3	0	0.003	0.006
suárez a 2022	3	0	0.003	0.006

Table S14. Thematic map of the author's keywords. using various centrality metrics.

Words	Cluster	Cluster_Label	btw_centrality	clos_centrality	pagerank_centrality
artificial intelligence	1	artificial intelligence	3,650.967	0.005	0.106
dental education	1	artificial intelligence	2,064.964	0.004	0.08
dentistry	1	artificial intelligence	1,291.748	0.004	0.047
large language models	1	artificial intelligence	6.792	0.003	0.009
machine learning	2	machine learning	366.843	0.003	0.027
dental curriculum	2	machine learning	19.912	0.003	0.01
chatbots	3	chatbots	206.51	0.003	0.03
attitude	4	attitude	90.448	0.003	0.018
knowledge	4	attitude	27.832	0.003	0.014
awareness	4	attitude	3.998	0.003	0.011
perception	4	attitude	48.317	0.003	0.01
dental	5	dental	132.948	0.003	0.013
dentists	5	dental	36.575	0.003	0.009
clinical decision support systems	5	dental	44.025	0.003	0.007
oral health	5	dental	254.392	0.004	0.008
practice	5	dental	86.546	0.004	0.007
robotics	6	robotics	1,102.351	0.003	0.013
diagnosis	7	diagnosis	153.484	0.004	0.006
endodontics	8	endodontics	153.484	0.004	0.006
survey	9	survey	105.121	0.003	0.006
teaching methods	10	teaching methods	62.603	0.004	0.007

btw: betweenness; clos: closeness.

Table S15. Centrality measures for the themes (authors' keywords) for each subperiod.

Year 2021					
Words	Cluster	Cluster_Label	btw_centrality	clos_centrality	pagerank_centrality
artificial intelligence	1	artificial intelligence	58.5	0.056	0.203
survey	1	artificial intelligence	6	0.036	0.086
dental education	2	dental education	4.5	0.034	0.102
attitude	2	dental education	0	0.027	0.073
awareness	2	dental education	0	0.027	0.073
Year 2022					
artificial intelligence	1	artificial intelligence	157	0.03	0.109
dental education	2	dental education	87	0.023	0.085
dentistry	2	dental education	2	0.018	0.045
Year 2023					
artificial intelligence	1	artificial intelligence	566.608	0.016	0.123
dentistry	1	artificial intelligence	95.623	0.011	0.049
dental education	2	dental education	247.963	0.011	0.071
machine learning	3	machine learning	12.841	0.01	0.031
dental curriculum	3	machine learning	3.857	0.008	0.029
dental	3	machine learning	7.316	0.009	0.023
attitude	4	attitude	65.336	0.012	0.03
knowledge	4	attitude	5.143	0.01	0.02
Year 2024					
dental education	1	artificial intelligence	639.23	0.008	0.09
artificial intelligence	1	artificial intelligence	970.538	0.009	0.09
chatbots	1	artificial intelligence	105.509	0.006	0.051
dentistry	1	artificial intelligence	477.59	0.007	0.058
large language models	1	artificial intelligence	4.833	0.006	0.019
teaching methods	1	artificial intelligence	17.865	0.006	0.015
machine learning	2	machine learning	55.478	0.005	0.028
attitude	3	attitude	76.258	0.007	0.015
perception	3	attitude	76.258	0.007	0.015

dentists	4	dentists	121.388	0.006	0.015
endodontics	5	endodontics	86.059	0.007	0.013
robotics	6	robotics	572.201	0.007	0.019

btw: betweenness; clos: closeness.

Figure S1. According to Bradford's Law, Journal of Dental Education, Cureus Journal of Medical Science, and European Journal of Dental Education contained the majority of the published documents (shaded area).

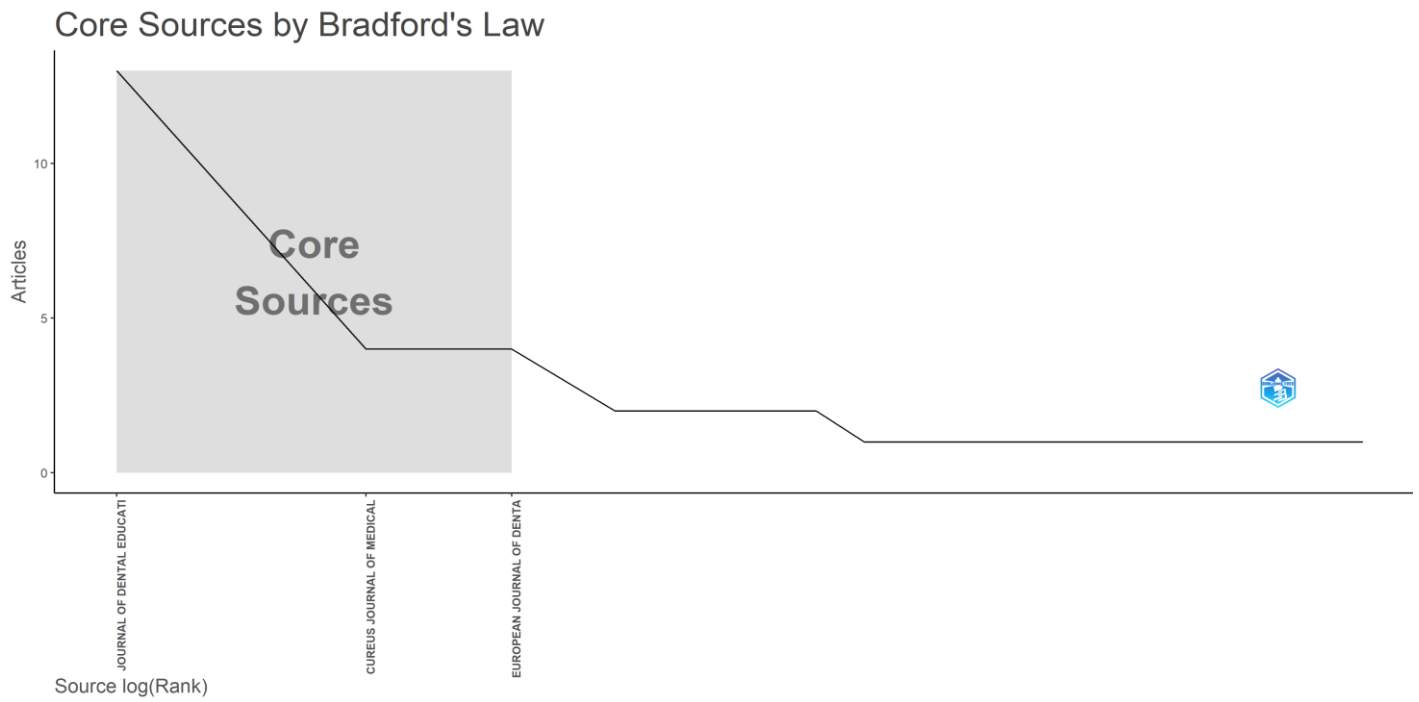


Figure S2. Map of collaboration networks among authors. The nodes represent authors and are proportional to the frequency of occurrence of the author in question. The edges represent the connections between authors, with the thickness of the edges indicating the frequency of occurrence between two of them. The relative positions of the nodes indicate the interrelation between them. The colors represent the clusters to which each author belongs.

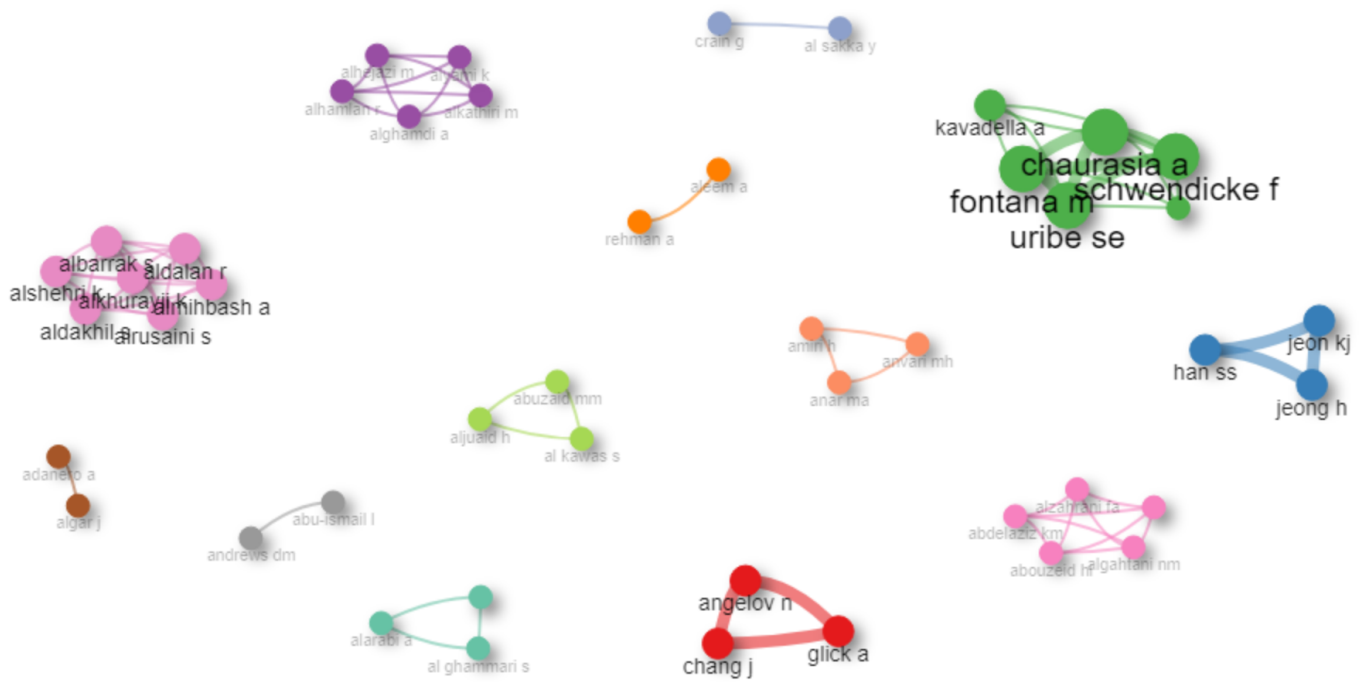


Figure S3. Map of collaboration networks among countries. The nodes represent countries and are proportional to the frequency of occurrence. The edges represent the connections between them, with the thickness of the edges indicating the frequency of occurrence between two countries. The relative positions of the nodes indicate the interrelation between them. The colors represent the clusters to which each country belongs.

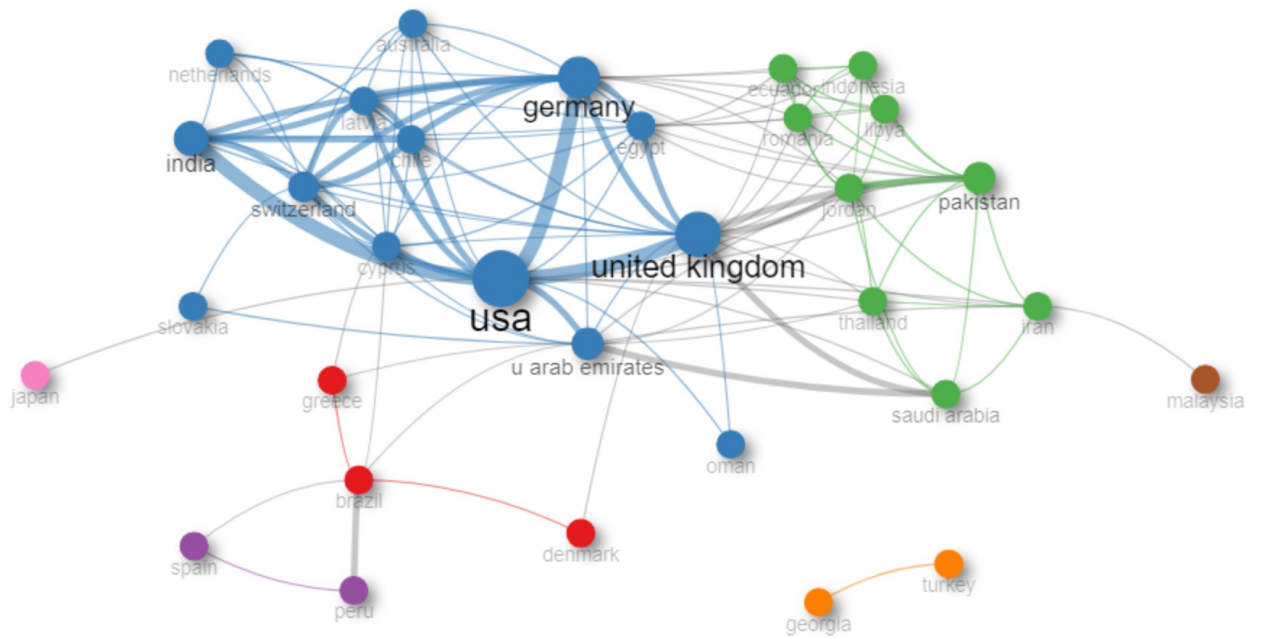


Figure S4. Country collaboration map. The color intensity is proportional to the number of publications. The thickness of the edges indicating the frequency of occurrence between two countries.

Country Collaboration Map

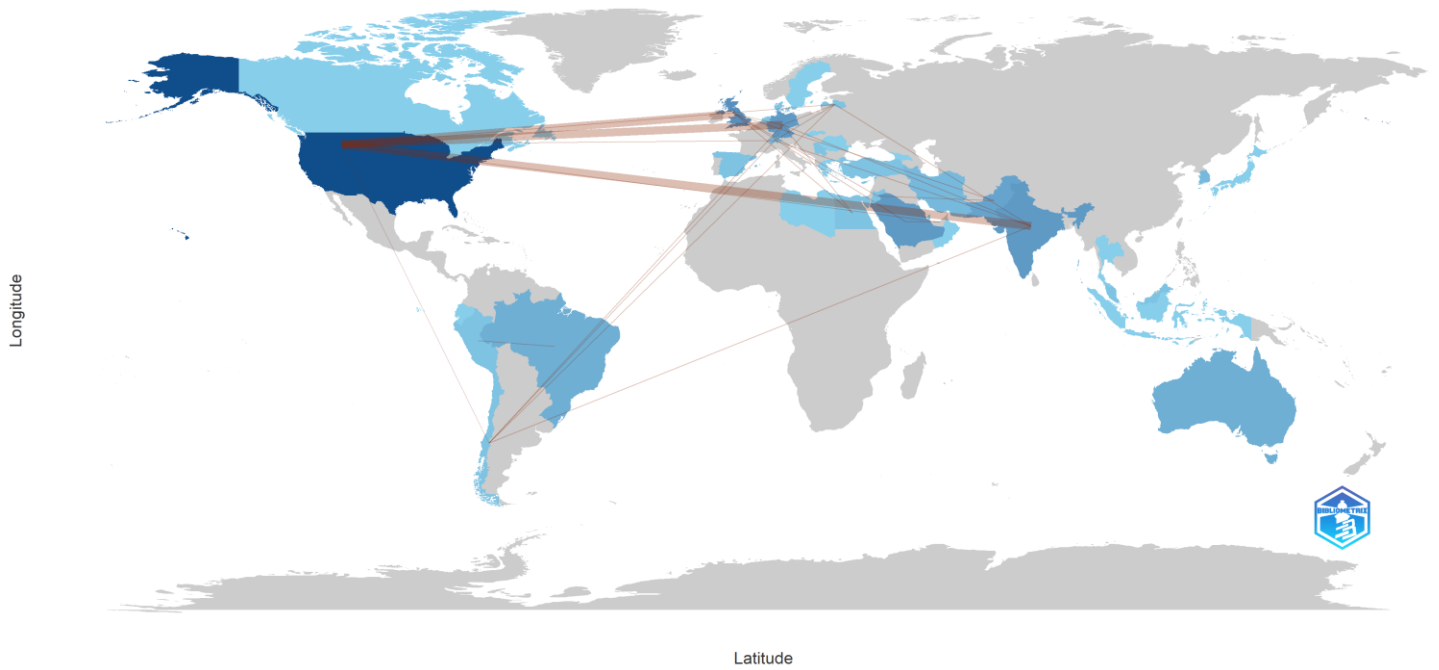


Figure S6. Thematic evolution of the author's keywords from 2021 to 2024. The circle size is proportional to the word occurrences in the cluster.

