AWARENESS OF ARTIFICIAL INTELLIGENCE AMONG DENTAL PRACTITIONERS IN SANGLI, MAHARASTRA – CROSS-SECTIONAL SURVEY

Dr Shridevi Adaki,[1] Dr Amol Karagir,[2] Dr Raghavendra Adaki,[3] Dr Bhagyashree Vanaki,[4] Dr Sheetal Sale,[5] Dr Anupama Bijjal,[6]

[1]Associate Professor, Department of Oral Medicine and Radiology, Bharati Vidyapeeth Deemed to be University, Dental College and Hospital, Sangli, Email: shridevi.adaki@bharatividyapeeth.edu
[2] Assistant Professor, Department of Oral Medicine and Radiology, Bharati Vidyapeeth Deemed to be University, Dental College and Hospital, Sangli, Email: amol.karagir@bharatividyapeeth.edu
[3]Professor and HOD, Department of Prosthodontics,, Bharati Vidyapeeth Deemed to be University, Dental College and Hospital, Sangli, Email: raghavendra.adaki@bharatividyapeeth.edu
[4]Professor, Department of Periodontology, PMNM Dental College and Hospital, Bagalkot
[5]Professor, Department of Pathology, Bharati Vidyapeeth Deemed to be University, Medical College and Hospital, Sangli, Email: sheetal.sale@bharatividyapeeth.edu
[5]Professor, Department of Rasa Shastra, Ayurveda College and Hospital, Ilkal

KEYWORDS
Technology adoption, Knowledge gaps, educational initiatives, Practice management, Technology integration
.

ABSTRACT:
Objective: This cross-sectional survey aims to assess the level of awareness and understanding of artificial intelligence (AI) among dental practitioners in Sangli, Maharashtra. With the rapid advancements in technology, including AI, it is crucial to gauge the extent to which dental professionals are familiar with these technologies, as they play an increasingly prominent role in the field of dentistry.
Methods: A structured questionnaire was designed to collect data on the awareness, knowledge, and perceived relevance of AI among dental practitioners in Sangli. The survey included questions related to the understanding of AI concepts, its current applications, and the willingness of practitioners to integrate AI into their dental practices. A stratified random sampling technique was employed to ensure a representative sample from various dental specialties.The questionnaire was distributed through an online Google forms link. The statistics done using SPSS software, chi square test was done to check the association and a p value of 0.05 was said to be statistically significant.
Results: Preliminary findings reveal varying levels of awareness and knowledge about AI among dental practitioners in Sangli. 63.4% of the participants were aware that artificial intelligence is the analysis of medical data without direct human input. From the survey it was evident that 57% of the participants feel that with the help of AI clinical decision and diagnosis can be revolutionized and also found that both male and female practitioner were equally aware of the importance of application of artificial intelligence in medicine(p-value>0.05). **Conclusion**: This study concludes that about 63.4% of the study participants were aware that Artificial Intelligence technology in medicine is beneficial to doctors and also found that both male and female practitioner were equally aware of artificial intelligence. The findings will contribute to a better understanding of the knowledge gaps that exist in the dental community regarding AI and can guide future educational initiatives to enhance awareness and integration of AI in dental practices. As AI continues to evolve, it is imperative for dental professionals to stay informed and adapt to technological advancements for the improvement of patient care and overall dental practice management.

INTRODUCTION

The human brain is an inimitable structure composed of networks of interlinked neurons which transmit signals throughout the body. This unexampled nature of human brain has always made researchers and scientists inquisitive from time immemorial. The field of science has witnessed various inventions with the advent of technology for creating a model that can simulate the functioning of the human brain.[1]The deed of the constant search has given rise to what is known as artificial intelligence (AI), which is a highly evolved system capable of mimicking functioning of the human brain. AI is defined as a field of science and engineering concerned with the computational

understanding of what is commonly called intelligent behavior and with the creation of artifacts that exhibit such behavior.[2] Computer-based diagnosis is gaining momentum due to its ability to detect and diagnose lesions which may go unnoticed to the human eye, thereby paving way for a holistic practice.

Artificial intelligence is intelligent computer programs capable of learning and applying knowledge to accomplish complex tasks such as to predict treatment outcomes, recognize objects, and answer questions.[3] Nowadays, AI technologies are widespread and penetrate many applications of our daily life, such as Amazon's online shopping recommendations, Facebook's image recognition, Netflix's streaming videos, and the smartphone's voice assistant.[4] The remarkable success of AI in various fields of our daily life has inspired and is stimulating the development of AI systems in the field of medicine and, also, more specifically, dental medicine.[5,6]

In dentistry, AI is being investigated for a variety of purposes, specifically identification of normal and abnormal structures, diagnosis of diseases and prediction of treatment outcomes.In a study,[7] data from 86 participants were used to construct and train a neural network to predict the factors appearing to be related to the occurrence of recurrent aphthous ulcers. When this was further tested using untrained data of 10 participants the results revealed most accurate predictions to be related to recurrent aphthous ulceration and appropriate for use as input data to construct ANNs (artificial neural network). Internal derangements of the temporomandibular joint are yet another taxing situation where the expert examiners' decision based on clinical and imaging data is considered as gold standard. Hence, when trained ANNs were tested and compared with the diagnosis of a surgeon, the results revealed high sensitivity and specificity of ANN, thereby insisting on the importance of AI in achieving correct interpretations and reducing human errors.[8] The neural network may be of value for the identification of individuals with a high risk of oral cancer or precancer for further clinical examination or health education.[9]In orthodontics, diagnosis forms the crux of the treatment. When a proposed model was trained in this aspect to assess the craniofacial skeletal and dental abnormalities in cephalometry followed by comparison with an expert opinion, the agreement between them was found to be equivalent.[1]It can also be used to provide orthodontic consultations to general practitioners for the alignment of crowded lower teeth.[10]

Artificial intelligence is a breakthrough in the field of technology which is rapidly progressing and has captivated the minds of researchers across the globe.[1] Ever since, its inception dentistry has witnessed some of the exceptional achievements. Hence, this situation demands every dentist to get acquainted with this technology as the future of dentistry is abutting the implementation of its applications. While, in no ways, AI can replace the role of a dentist, it is of prime importance to be aware of the possibilities to integrate this technology in the future for a gratifying and successful practice.[1]

Hence, the present survey is planned to assess the awareness about Artificial intelligence among dental practitioners and to compare the awareness with age groups, gender, level of education and specialty of practice in Sangli district.

MATERIAL & METHODOLOGY

A cross-sectional study was conducted using descriptive survey design with a population of dental practitioners in Sangli, Maharashtra, India. This study proposal got the approved by ethical committee Sangli Unit of Bharati Vidyapeeth Deemed University (approval ref: BV(DU)MC&H/Sangli/IEC/D-83/22). Participants (dental practitioners) who gave informed consent prior to study are included in the study.Self-administered questionnairewas distributed among the participants after testing for validity and reliability. All the measures were taken to prevent any contamination bias. The data for this study was collected using a questionnaire through online google form.

RESULTS

A total of 205 dental practitioners replied to the questionnaire. 52.7% of the study population were females, and 47.3% were males. Among them, 58 have been practicing dentistry for less than 5 years [Graph 1].

Most of our participants 63.4% were aware of the uses of AI in dentistry [Table 1]. When asked about the source of information regarding AI, 29.6 % of participants said that it was through social media followed by the continuing dental education (CDE) program/attending workshops. The majority of participants, 117 (57.07 %), said that AI will lead to major advances in dentistry and medicine. Only 20.5% of dentists accepted that AI can replace dentists/physicians in the future whereas the rest 79.5% disagreed. In addition, when asked about the uses of AI in dentistry, 30.2% (62) said that it would be helpful while 35.1% (72) were not sure [graph 2]. Most of the participants, that is, 132 (64.4%), favoured that AI learning must be included in the dental teaching curriculum.

DISCUSSION

AI applications have gained worldwide popularity and acceptance in academics, clinical practice, and the healthcare sector with no exemption in the field of dental science.It provides a great learning platform promising to transform the healthcare sector more efficiently. AI has been considered to be used in providing precise diagnosis as well as optimizing and anticipating the treatment outcomes.[11]

The findings of this cross-sectional survey highlight several key points regarding the awareness of artificial intelligence (AI) among dental practitioners in Sangli, Maharashtra. The results indicate a diverse range of awareness levels, suggesting the need for targeted educational interventions to bridge knowledge gaps and facilitate the integration of AI into dental practice.

In this study, both genders have almost equally participated (females = 108; males = 97), while in a study conducted by M Zakirulla (2022),[12] males and females had equal participation (male = 150; female = 150). In our study, it was found that 28.3% of practitioners were practicing dentistry for less than 5 years, and among them, 77.6% had remarkably higher knowledge about AI in dentistry than those practicing for more than 5 years.

While considering the awareness about uses of AI in dentistry, 63.4% knew AI applications in dentistry whereas 36.6% did not know. A study conducted by T. Khalid in 2022[13] showed that only 49.4% of their respondents knew the uses of AI. Above all, the majority of the dental practitioners (20.5%) in the study gave the viewpoint that AI cannot replace dentists/physicians in the future. In this study, the knowledge of information related to AI was through social media (29.6%) followed by workshops or CDE programs attended (27%), while in the study conducted by T. Khalid,[13] social media (66%) was found to be the major source of information followed by workshop/lecture attended (38.5%).

Oh S conducted a study in 2019[14] where they found that 43.9% of physicians agreed that the diagnostic ability of AI was superior to that of humans. A similar study was done by Fernandes S in 2022[15] where they concluded that 53.6% of their dental students agreed that AI will be the future of dentistry. The result of the current study showed that 57.7% of dental practitioners consider that AI will lead to major advances in dentistry. Interest and good perception toward AI were found to be better in those with less than 5 years of experience with a statistically significant $P < 0.05$; the study conducted by Fernandes S[15] found that post-graduate students and interns had good perception and knowledge regarding AI.Dental students lack basic knowledge regarding the application of AI technology in dentistry. Usually, a common hindrance while applying AI in dentistry is the lack of courses that teach the topic.[16, 17] In a question that addressed AI as a part of the dental curriculum, 64.4% of participants responded positively that it should be included in the dental teaching programs.

Limitations of the study

The limited sample size underscores the importance of conducting additional studies with larger groups to raise awareness about AI among dental practitioners.

Future prospects of study

The progress of AI in dentistry is highly promising, paving the way for remarkable growth in the integration of AI and dentistry in the near future.

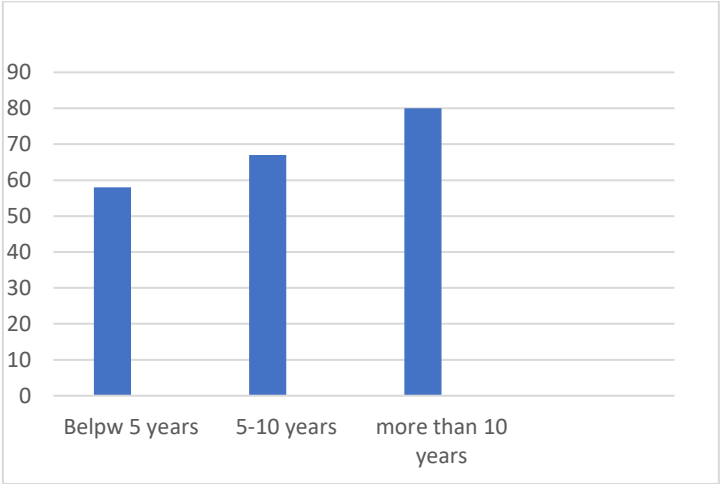
CONCLUSION

To conclude, AI holds significant potential to revolutionize the field of dentistry, transitioning from a conceptual myth to a practical, transformative tool. It can effectively reduce the workload of dentists and clinicians, offering valuable assistance across various areas of dental care. Although studies highlight AI's ability to replicate the accuracy and precision of trained specialists in some cases, it still falls short of consistently matching the expertise and performance of human dentists.

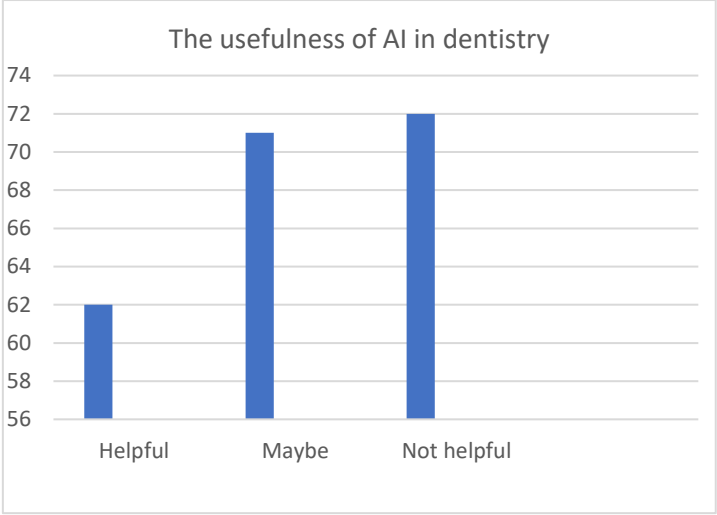
For AI to be successfully integrated into dentistry, it is essential to incorporate focused training programs in dental and continuing education curricula. Ultimately, AI should be seen as a supportive tool to enhance dental practice, while critical decisions will remain the responsibility of dentists, ensuring the multidisciplinary essence of the profession is preserved.

REFERENCES:

1. Kalappanavar A, Sneha S, Annigeri RG. Artificial intelligence: A dentist's perspective. J Med RadiolPatholSurg2018;5:2-4
2. Khanna SS, Dhaimade PA. Artificial Intelligence: Transforming dentistry today. Indian J Basic Appl Med Res 2017;6:161-7.
3. Hung K, Andy WKY, Tanaka R and Bornstein MM. Current Applications, Opportunities, and Limitations of AI for 3D Imaging in Dental Research and Practice. Int. J. Environ. Res. Public Health 2020; 17: 4424
4. 4. Gandomi, A.; Haider, M. Beyond the hype: Big data concepts, methods, and analytics. Int. J. Inf. Manag.2015;35:137–144
5. Jiang, F, Jiang, Y, Zhi, H, Dong, Y, Li H, Ma S, Wang Y, Dong Q, Shen, H, Wang Y. Artificial intelligence in healthcare: Past, present and future. Stroke Vasc. Neurol. 2017;2:230–243.
6. Hamet P, Tremblay J. Artificial intelligence in medicine. Metabolism 2017;69:S36–S40
7. Dar-Odeh NS, Alsmadi OM, Bakri F, Abu-Hammour Z, Shehabi AA, Al-Omiri MK, *et al*. Predicting recurrent aphthous ulceration using genetic algorithms-optimized neural networks. AdvApplBioinformChem2010;3:7-13.
8. Bas B, Ozgonenel O, Ozden B, Bekcioglu B, Bulut E, Kurt M. Use of artificial Neural network in differentiation of subgroups of temporomandibular internal derangements: A preliminary study. J Oral MaxillofacSurg2012;70:51-9
9. Speight PM, Elliott AE, Jullien JA, Downer MC, Zakzrewska JM. The use of artificial intelligence to identify people at risk of oral cancer and precancer. Br Dent J 1995;179:382-7.
10. Williams JS, Matthewman A, Brown D. An orthodontic expert system. Fuzzy Sets Syst 1989;30:121-33.
11. Hada P, Sharma S, Singh V, Dubey S, Jain S, Goswami D. Evaluation of attitude and awareness of dental practitioners regarding artificial intelligence: A cross-sectional study. J Indian Acad Oral Med Radiol2024;36:22-5.
12. Zakirulla M, Rayed A, Shehre A. Study on dentist's awareness towards use of artificial intelligence and robotics in oral health dentistry. J Res Med Dent Sci 2022;10:114-7.
13. Khalid T. Perception and utilization of artificial intelligence among dental professionals in Saudi Arabia. Open Dent J 2022;16:1-7. doi: 10.2174/18742106-v16-e2208110.
14. Oh S, Kim JH, Choi SW. Physician confidence in artificial intelligence: An online mobile survey. J Med Internet Res 2019;21:e12422.
15. Fernandes S, Parmar D, Bafna Y. Knowledge, attitude and practice of dental students towards artificial intelligence: A Questionnaire-based survey. J Xid Uni 2022;1:284-91.
16. Javed S, Zakirulla M, Baig RU. Development of artificial neural network model for prediction of poststreptococcus mutans in dental caries. Comp Biomed 2019;186:105-98.
17. Gross D, Gross K, Wilhelmy S. Digitalization in dentistry: Ethical challenges and implications. Quintessence Int 2019;50:830-8.



Graph 1: Graph depicting years of professional practice



Graph 2: Graph showing the usefulness of AI in dentistry

Table 1: Response of participants to various questions regarding AI

Sl no	Questions	Response	
		Yes	No
1	Awareness regarding AI?	130 (63.4%)	75 (36.6%)
2	Will AI lead to major advances in dentistry?	117 (57.07%)	88 (42.93%)
3	Will AI replace dentists in the future?	42 (20.5%)	163 (79.5%)
4	Should AI be a part of dental curriculum?	132 (64.4%)	73 (35.6%)