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Assessing the Knowledge, Attitudes, and Practices of Dental Students Regarding Artificial Intelligence (AI): A Survey Based on Questionnaire Responses

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Abstract

This study conducted a questionnaire-based survey to evaluate the Knowledge, Attitudes, and Practices (KAP) concerning Artificial Intelligence (AI) among undergraduate dental students in North Gujarat, India. The survey involved 558 participants from various stages of dental education, including II BDS, III BDS, IV BDS, and interns. An online questionnaire, comprising 19 close-ended questions, was pretested and distributed through social media platforms (WhatsApp groups). A concise note explaining the study's purpose accompanied the questionnaire, and informed consent was obtained from the participants. The questions aimed to gauge respondents' awareness and fundamental KAP towards AI in the context of dentistry.

The findings indicated that 64.1% of the students possessed basic knowledge of AI. In terms of diagnostic abilities, 33.3% of respondents believed that AI surpassed the clinical experience of a human doctor, while 53.6% expressed optimism regarding the future of AI in India.

The present survey demonstrated satisfactory awareness among dental students concerning the concept of AI-enabled dentistry. However, their understanding of limitations, disadvantages, and practical perspectives related to AI was deemed insufficient. Consequently, the study underscores the necessity of prioritizing the integration of AI-enabled technology knowledge and practical applications into the undergraduate dental curriculum. This emphasis is crucial for enhancing students' comprehension and proficiency in this evolving field.

Keywords: Artificial Intelligence, Dentistry, Undergraduate dental students, North Gujarat, India.

Introduction

The human brain is the most fascinating, the most evolved and intellectual of all species on the planet, making it pre-eminent. The endeavour to use technology to imitate human intelligence dates back to the 1950s.[1] One of the newest areas of science and technology is artificial intelligence (AI), which isdubbed as "The Stethoscope of the 21st Century", that implies it is an essential tool for the medical/dental fraternity.[2]

Virtual assistants like Alexa and Siri, face recognition, healthcare systems, self-driving cars, robots, and other areas of our daily life are just a few examples of how AI has permeated nearly every aspect of our lives. India is a technologically progressive nation that has yet to achieve its full potential. Many people, including medical professionals and researchers, are still unfamiliar with the ideas behind artificial intelligence (AI), as well as its potential effects on both our personal and professional life.[3]

The clinical use of AI programs have gained popularity in dentistry, especially in diagnostic radiology which is helpful to new dental graduates. The auto-segmentation of the inferior alveolar nerve, the study of facial growth, the tracing of cephalometric landmarks, the identification of caries, alveolar bone loss, and periapical pathosis, among other comparable tasks, are all made possible by AI systems. According to studies, AI is increasingly being used in the early detection of cervical lymph node metastases and mouth cancer, as well as in the diagnosis and planning of therapy for a number of orofacial disorders.[4]

In educational dentistry, it can be helpful for pre clinical tasks like teeth arrangement and tooth preparation,for behaviour management of anxious children, direct treatment by surgical robots.[7]In future, artificial- based intelligence reduces the burden of educator and cost of education.[5]

Understanding AI technology and adapting to the redefined roles of the dentist is a prerequisite for future clinical practice.[6] In order to gain further insight, we performed an online survey to assess the Knowledge Attitude and Practice (KAP) about AI among Under graduate Dental students of North Gujarat, India.

Materials and Method

This cross sectional descriptive study was approved by the Institutional Ethical Board. Permissions of dental institutional authorities of teaching hospitals across North Gujarat, India were obtained. A total of558 Dental students,(including II BDS, III BDS, IV BDS, INTERNS) responded to the validated, pretested (Crohnback Alpha Value -0.83) online questionnaire link sent via social media websites (WhatsApp groups), along with a short note explaining the purpose of the study and informed consent.

The questionnaire consisted of 19 close ended items, broadly divided into 4 sections. The first part consisted of respondents' recognition and then about fundamental KAP towards AI. Participants were asked to select one option from the answers provided against each question.

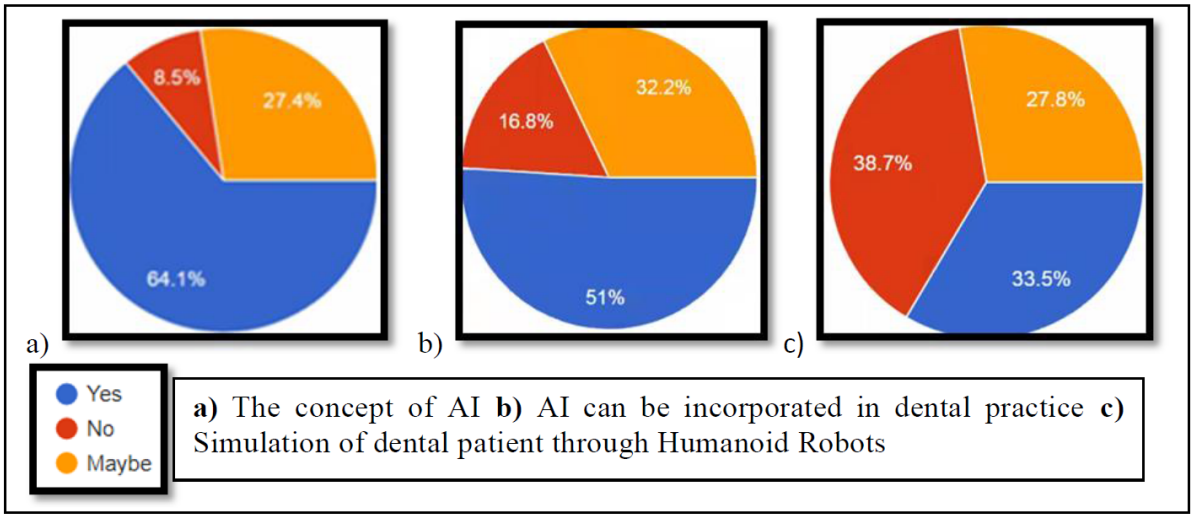
The questionnaire was sent to every student of II BDS, III BDS, IV BDS, INTERNS, considering low response rate in online survey.

Collected data were compiled in a master Excel sheet 2007®. Statistical analysis was done by using the software SPSS 20(IBM) version®. Chi square test was done to check the association and a 'p' value was set at <0.05 as significant. The survey was completed in the month of November 2021.

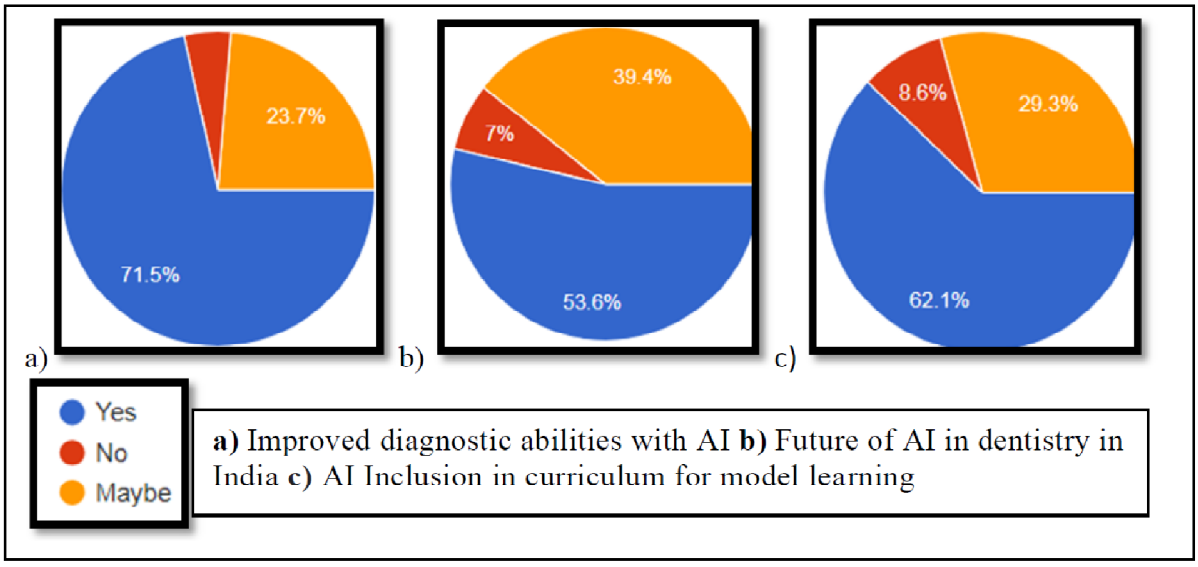
Results

Table 1.Demographic data of study participants

Name of the College	Narsinhbhai Patel Dental College &Hospital, Visnagar	237(42.5%)
	Siddhpur Dental College& Hospital, Siddhpur	321(57.5%)
Year of Study	Second Year	175(31.4%)
	Third Year	169(30.3%)
	Fourth Year	179(32.1%)
	Intern	35(6.3%)



a) The concept of AI **b)** AI can be incorporated in dental practice **c)** Simulation of dental patient through Humanoid Robots



a) Improved diagnostic abilities with AI **b)** Future of AI in dentistry in India **c)** AI Inclusion in curriculum for model learning

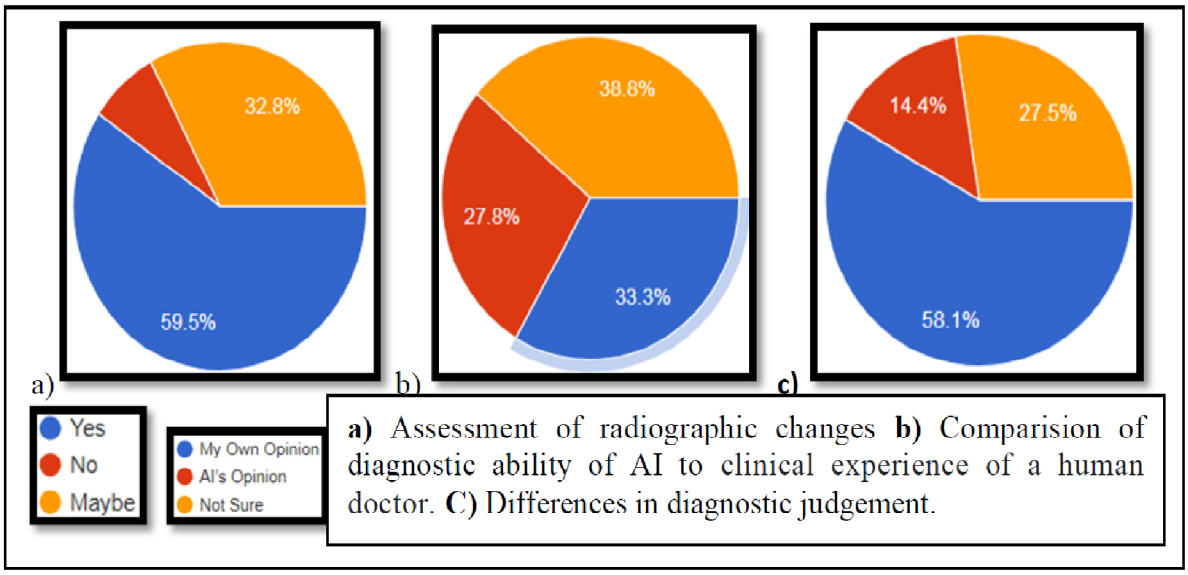


Table 2: Year wise KAP of the undergraduate students of North Gujarat

QUESTIONS	Year of study				
	II	III	IV	Interns	'P'value
Knowledge:					
The concept of AI	98	95	126	33	0.000
	(56%)	(56.5%)	(71.6%)	(94.3%)	
AI can be incorporated in dental practice	86	72	92	31	0.000
	(50%)	(42.9%)	(52.3%)	(88.6%)	
Simulation of dental patient through Humanoid Robots	65	37	55	25	0.000
	(37.7%)	(22%)	(31.3%)	(71.4%)	
Attitude:					
Improved diagnostic abilities with AI	118	106	132	32	0.008
	(68.6%)	(63%)	(75%)	(91.4%)	
Future of AI in dentistry in India	92	65	105	27	0.000
	(53.5%)	(38.7%)	(59.7%)	(77.1%)	
AI Inclusion in curriculum for model learning	94	90	121	27	0.000
	(54.6%)	(53.6%)	(68.75%)	(77.1%)	
Practice :					
Assessment of radiographic changes	85	83	124 (70.5%)	33	0.000
	(49.4%)	(49.4%)		(94.3%)	
Comparision of diagnostic ability of AI to clinical experience of a human doctor.	29	15	23 (13%)	5	0.001
	(16.9%)	(8.9%)		(14.3%)	
Differences in diagnostic judgement.	70	44	48 (27.3%)	19	0.003
	(40.7%)	(26.2%)		(54.3%)	

KAP towards AI was better to interns as compared to 2nd, 3rd and final year undergraduates which is statistically significant. ('p' value < 0.05)

Discussion

The field of AI has experienced brilliant advances and growth over the past two decades. Recent progress in digitized data acquisition, machine learning and computing infrastructure, AI applications are expanding towards medicine and dentistry, AI is under scrutiny for a various purposes, specifically identification of normal and abnormal structures, diagnosis of diseases and prediction of treatment outcomes. This Google questionnaire based survey, assessing KAP regarding future of AI among the dental students (558) in North Gujarat, India.

The knowledge about AI among dental students was low and 64.1% of them were familiar with the subject. Comparisons with studies in various parts of India, like in Chennai about 59% of the study participants were aware which was similar to present study[7] and in Telangana study conducted by Asmatahasin M et al (2021)[1] revealed 89.63% of students were aware of the term AI which was higher.

The comparison with international outlook, was in concordance to our study, in Turkey reported by Yuzbasıoglu E et al (2021)[8] among dental students, only 48.40% were familiar; and in Saudi Arabia author concluded that 49.9% had basic knowledge about the AI.[9]

The present study queries about medical usefulness and dental application of AI, found 69.5% students in agreement, however only 52% had a basic understanding of how to integrate AI into their dental practice. Similar study conducted by Sur J et al (2020)[3] revealed 72% students accepted that AI hasuseful medical applications, only 42% had a basic understanding about integration of AI in their dental practice.

Super-realistic dental training robots are widely used for training undergraduates in countries like Japan, Mexico, USA[10,11,12]. A study conducted by Abe S et al[10] considered physical pain, treatment safety, elapsed time and a clean area for tooth preparation through robotic simulation was significantly better than practical clinical trial. The present study demonstrated 33.5% students know about humanoid Robots that can simulate a dental patient and 27.8% were totally unaware of such technology existing which shows lack of knowledge of dynamic technologies not prevalent in India but widely available in technologically advanced countries like Japan, USA, etc.

The proficiency of AI techniques in diagnosis has been explored in almost every field of medicine. In the present study 71.5 % students agreed that the diagnostic ability by AI can improve the treatment plan of a dentist which is comparable to studies conducted by various authors like Yuzbasıoglu et al (2020)[8] where 57.2% students and Sur et al (2020)[3] observed 69% students agreed about the improved diagnostic ability of AI. According to Mupparapu et al. (2018)[13], the goal of AI may not have been to replace medical professionals, but dentists could profit from the extra luxury of a second opinion in nanoseconds thanks to AI technologies that could support the diagnosis and ultimately help patients.

A question which addressed about AI future in India, among current study participants a total of 53.6% students answered affirmatively. These results were less compared to study

performed by Sur J et al[3] in which 63% dental students affirmed the same. This suggests comparatively lower levels of knowledge and awareness among students of North Gujarat population. Since both the studies are among Indian populations in the similar time frame, results demonstrate lack of practical experience among study participants.

Availability of online learning courses, social media other broadcasting media and growth in communication technologies can be considered the factors responsible for better knowledge and implementation of AI. When incorporation of Model Learning into University curriculum was concerned, 62.1% students had affirmative responses, 29.3% of students were not clear and 8.6% with negative response which may be because of post pandemic period, there is increase in use of digital learning.

AI will aid in the radiological diagnostics of aspiring dentists.[3] In the current study 59.5 % of students were optimistic that AI will assess radiographic changes that may be missed by clinicians which is less than studies previously performed by Sur J et al (2020)[3] and Yuzbaşıoglu et al(2020)[8] where the same question had more positive responses 68% and 61.7% respectively. These results indicate lack ofawareness in radiographic aids of north Gujarat dental students. That might be because they are still using the conventional radiographic aids or lack of accessibility to the recent AI enabled radiographic diagnostic aids.

As the technology advances, AI has resulted in extensive application of clinical practice. A Korean study done by Oh S et al (2019)[14] in which 43.9% physicians agreed that the diagnostic ability of AI was superior to that of humans, however result of current study demonstrated 33.3% AI Practice related perception.

AI with deep learning algorithms, identify lesions and carryout measurements for diagnosis of the condition.[1] Only 14.4% of the students who participated said they would follow the AI's prognosis in the event of a disagreement over the diagnosis, while 58.1% said they would depend on their own diagnostic judgement. This might be because of the difference trainees involved in study in learning phase with less experience and exposure to clinical work.

According to our findings, around 64.1% of survey participants were aware about AI concept, 50.9% of the respondents agreed about application in dentistry. Hence there is a need for organising seminars, lectures and workshops for dental students to gain more understanding towards AI and its applications.

Dental students lack basic knowledge about AI hence a need to evoke their interest towards learning about AI and its potential future applications as a new technology is necessary. Participants emphasized that the basic working principles of AI should be taught in dental school curriculum.

Conclusions

Current study arrived at following conclusions,

- Among all the students Interns had better Knowledge Attitude And Practice towards the concept of AI.
- All the undergraduate students had positive attitude towards AI with keen interest to further pursue study of this topic.
- When perception of practice was concerned, students were not confident to implement AI technology clinically.

To subsist with the momentum at which technology is been advancing, there is high need to organise seminars, lectures and workshops on AI systems that dentists could incorporate and employ as an auxiliary tool in their practises.

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