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Original Research Paper

Assessment of knowledge for use of Artificial Intelligence in dentistry among post graduate dental students of Gujarat: A Cross-Sectional Study

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ABSTRACT:

Introduction: In this era where Artificial Intelligence (AI) is literally at every corner of our lives, application of these computer-generated simulations in the field of dentistry has become cyberspace. From clinical diagnosis of a particular lesion to their treatment planning, AI has proven to be a boon in dentistry. **Objectives**: To examine mindsets of post graduate dental students of Gujarat on the impact of AI in dentistry. **Methodology:** A cross-sectional study was conducted among the postgraduate dental students of Gujarat, India to evaluate post graduate dental students' mindsets on the impact of AI technologies in dentistry. A structured, self-administered, close-ended questionnaire consisting of 13 questions related to use of AI in dental science was constructed and distributed via Google Forms. Those students who gave consent through google forms were part of this study. Results: 34.3% participants were males and 65.7% were females. It was observed that 7.4% got information about AI from friends and family, 18.1% from newspaper and magazines, 15.3% from lectures in university, 59.2% from social media. The mean rank was high among third year participants on the use of AI as a "definitive diagnostic tool" and "treatment planning tool" in diagnosis and treatment planning in dentistry. **Conclusion:** Majority of students agreed that AI applications should be part of dental training. Follow-up surveys and multicenter studies need to be carried out to further investigate these issues.

Keywords: artificial intelligence, dental students, dental health survey, questionnaire

INTRODUCTION:

Technology has become a fundamental part of human living. The evolution of technology has been advantageous to science development, including dentistry. One of the latest technology that draw many attention is Artificial Intelligence [1]. The concept of AI dates to 1950s, when it was first mentioned by Minsky and McCarthy, who were considered to be pioneering experts in the field. They referred to AI as a task performed by a machine or programme that, if a human were to carry out exactly the same activity, the person would have to use intelligence to succeed in completing the task [2].

According to the World Dental Federation, globally 3.9 billion people are affected by oral diseases and untreated tooth decay impacts nearly half of the world's population; 44% are suffering from the untreated impacts of tooth decay. This makes it the most common disease amongst all the 291 conditions contained within the Global Burden of Disease study [3].

It has been implemented into Dental Education System, creating a virtual reality that enables simulation of the practical procedures in three dimensions. From clinical diagnosis of a particular lesion to their treatment planning, AI has proven to be a boon in dentistry [4&5]. Artificial

Intelligence has been implemented in academic research and in inference tasks throughout the broader economic system with demonstrable success, however much less so for the core functions of public health, specifically protecting and promoting the health of populations [6]. So, the aim of this study to examine the mindsets of post graduate dental students of Gujarat on the impact of AI in various fields of dentistry.

MATERIALS AND METHODS:

A cross-sectional study conducted among post graduate students at all dental colleges of Gujarat. Ethical clearance was obtained from the review board of Narsinhbhai Patel Dental College and Hospital. Those students who gave respond in this google forms were included in the study. First year, second year and third year post graduate students from all dental colleges of Gujarat were included in this study. The students who were not completed the full google form and students from other state were excluded from this study.

A questionnaire was adopted from an existing similar study [7] and modifications were made according to our settings. The link of survey was created using Google Forms and disseminated through various open social media groups among dental post graduate students in Gujarat. The study participants were given a questionnaire, which consisted of two parts: 1st part included demographic details of participants viz. Name, Age, Gender, type of institute, specialization, academic year of study and source of information about AI. 2nd part included the self-administered questionnaire which consisted of 13 questions related to use of AI in dental science. The responses were graded on a 5-point Likert scale from strongly disagree to strongly agree. The study participants allowed for responses in the duration of one month (December 2022). All the responses were collected in the google forms.

The collected data was entered into Microsoft excel 2013 and subjected to statistical analysis using Statistical Package for Social Sciences (SPSS version 20.0). Level of Significance was set ≤ 0.05. Kruskal Wallis test was used to compare the mean among post graduate dental students with the questionnaire.

RESULTS:

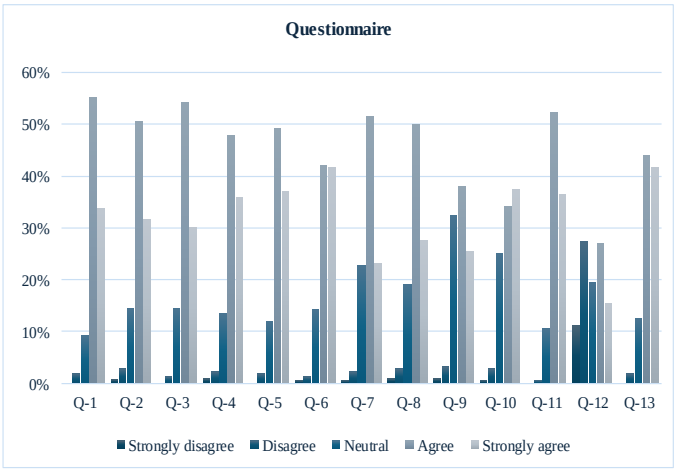
It was observed that out of the total 216 study subjects, 74(34.3%) were males and 142(65.7%) were females. It was observed that 74(34.3%) were from government dental institute and 142(65.7%) were from non-government institute. It was found that 115(53.2%) were studying in first year, 65(30.1%) were studying in second year and 36(16.7%) were studying in third year. It was observed that 37(17.1%) were doing postgraduation in Endodontics, 24(11.1%) were doing postgraduation in Oral and maxillofacial surgery, 38(17.6%) were doing postgraduation in Periodontics, 36(16.7%) were doing postgraduation in Prosthodontics, 30(13.9%) were doing postgraduation in Orthodontics, 7(3.3%) were doing postgraduation in Public health dentistry, 15(6.9%) were doing postgraduation in Pedodontics, 14(6.5%) were doing postgraduation in Oral medicine and radiology and 15(6.9%) were doing postgraduation in Oral pathology. It was observed that 16(7.4%) got the information about AI from friends and family, 39(18.1%) from newspaper and magazines, 33(15.3%) from lectures in university and 128(59.2%) from social media. (Table 1)

Out of 216 study subjects, 119(55.1%) agreed that they find the use of AI in dentistry exciting. 109(50.5%) agreed that AI could be used as a “definitive diagnostic tool” in the diagnosis of disease in dentistry. 117(54.2%) agreed that AI could be used as a “treatment planning tool” in diagnosis and treatment planning in dentistry. 103(47.7%) agreed that AI could be used in the radiographic diagnosis of various diseases in dentistry. 106(49.2%) agreed that AI could be used in forensic dentistry. 91(42.1%) agreed that AI could be used in Implantology. 111(51.4%) agreed that they thought AI removes the necessity for making a patient impression as well as several laboratory steps. 108(50%) agreed that AI could be used in Public Health Dentistry. 82(38%) agreed that AI applications should be part of undergraduate dental training. 81(37.5%) strongly agreed that AI applications should be part of postgraduate dental training. 113(52.3%) agreed that they thought AI would lead to major advances in dentistry. 59(27.3%) disagreed that AI could replace dentists in the future. 95(44%) agreed that they think AI has an advantage in future. (Figure 1)

Table 1: Demographic details of study subjects

DEMOGRAPHIC VARIABLES	CATEGORY	N(%)
Gender	Male	74(34.3)
	Female	142(65.7)
Type of institute	Government	74(34.3)
	Non-government	142(65.7)
Year of study	First year	115(53.2)
	Second year	65(30.1)
	Third year	36(16.7)
Specialization	Endodontics	37(17.1)
	Oral and Maxillofacial surgery	24(11.1)
	Periodontics	38(17.6)
	Prosthodontics	36(16.7)
	Orthodontics	30(13.9)
	Public Health Dentistry	7(3.3)
	Pedodontics	15(6.9)
	Oral Medicine and Radiology	14(6.5)
	Oral Pathology	15(6.9)
Source of information about AI	Friends, Family	16(7.4)
	Newspaper, magazines	39(18.1)
	Lectures in university	33(15.3)
	Social media	128(59.2)

Figure 1: Distribution of study subjects based on the Questionnaire (Individual questions)



The mean rank was high among third year study subjects (115.21) as compared to first year study subjects (115.19) and second year study subjects (92.95) in excitement towards the use of AI in dentistry. A statistically significant difference was observed among various study subjects (p value=0.027). The mean rank was high among third year study subjects (118.18) as compared to first year study subjects (116.35) and second year study subjects (89.25) in use of AI as definitive diagnostic tool in the diagnosis of disease in dentistry. A statistically significant difference was observed among various study subjects (p value=0.005). The mean rank was high among third year study subjects (119.22) as compared to first year study subjects (115.20) and second year study subjects (90.71) in use of AI as a treatment planning tool in diagnosis and treatment planning in dentistry. A statistically significant difference was observed among various study subjects (p value=0.009). The mean rank was high among first year study subjects (119.71) as compared to third year study subjects (115.56) and second year study subjects (84.75) in the use of AI removes the necessity for making a patient impression as well as several laboratory steps. A statistically significant difference was observed among various study subjects (p value<0.001). The mean rank

Table 2: Distribution of study subjects based on the use of AI in dentistry

QUESTIONS	MEAN RANK OF POSTGRADUATES			p-VALUE
	1st year	2nd year	3rd year	
I find the use of AI in dentistry exciting.	115.19	92.95	115.21	0.027*
AI can be used as a “definitive diagnostic tool” in the diagnosis of disease in dentistry.	116.35	89.25	118.18	0.005*
AI can be used as a “treatment planning tool” in diagnosis and treatment planning in dentistry.	115.20	90.71	119.22	0.009*
I think that AI removes the necessity for making a patient impression as well as several laboratory steps.	119.71	84.75	115.56	<0.001*
AI can replace dentists in the future.	141.40	73.17	67.18	<0.001*

Level of significance p≤0.05, *Significant, **Non-significant was high among first year study subjects (141.40) as compared to second year study subjects (73.17) and third year study subjects (67.18). A statistically significant difference was observed among various study subjects (p value<0.001). (Table 2)

DISCUSSION:

Over the last several years, AI applications in medicine have expanded exponentially, which will have an impact on the future of the practice in the medical field, and it is increasingly evident that AI education for medical and dental students is necessary [7]. In the era where technical assistance has a pivotal role, it is very important to not only have knowledge but also, we should explore possible uses of technology in the field of dentistry. Utilization of artificial intelligence in combination with the skills of dentists may improve the diagnosis, prognosis and outcome of the treatment [8]. The current a descriptive cross-sectional study including 216 study participants was carried out to examine the mindsets of post graduate dental students of Gujarat on the impact of AI in dentistry.

In our study, 59.2% of study subjects used social media as their sources of information about AI. This finding is in accordance with recent studies [7&9]. Similar findings were also reported in the study concerning attitudes of Turkish dental students with respect to AI in which participants noted that their information was provided more by social media sources than academic ones [10]. It indicates that there is a need to teach the basics of AI to undergraduate and postgraduate students, so that students may get adequate pertinent and evidence-based information in the coming years. The use of Bolman and Deal's Reframing Organizations as an infrastructural model to implement AI curriculum in dental colleges [11].

In our study majority of participants found the use of AI is exciting and considered as a 'definitive diagnostic, prognostic as well as treatment planning tool'. Similar results were obtained in these studies [8,10,12-14]. Majority of the respondents agreed that AI remove the necessity of several laboratory steps and ease the treatment procedures. Similar observation was reported in this study [12]. The diagnostic precision of deep learning algorithms at a quicker rate has transformed aided diagnostics into a more interactive practice. These observations indicate that AI was preferred for its ability to obtain quick, high-quality real-time data and ease practices in health care services with minimal errors [15].

Considering the potential influence of AI technology on the future of the medical field, the need to include AI related topics in the curriculum exists. It is interesting to note that majority of post graduate dental students in the present study agreed that AI should be part of undergraduate and/or postgraduate dental training. The results demonstrate a need to incorporate AI into dental curricula. Our findings support other studies demonstrating that students recognize the importance of AI technologies in their field and their interest to learn new technologies [9,10,16].

Majority of the participants did not agree that AI will replace human dentists in the future. This finding corresponds with those from other study in which the students indicated that AI would not replace doctors because of its limitations, such as lack of conversations with patients to earn their trust, reassure them, and/or show empathy [17-19]. Moreover, in some cases the doctors need to perform examinations or interpret histories and promote further discussion [20]. Contradictory studies were done by Yüzbasıoğlu [10], Sur J et al [12], Ranjana et al [21] conducted among dental students and professionals. This could be attributed to the fact that many study participants feel that physical examination, patient trust, empathy, and comfort play an important role apart from artificial sensors that gather accurate, relevant information to aid in diagnosis and treatment planning.

There is not much literature available regarding the subject and there was less sample size. A social desirability bias can occur in response. Since both the investigator and respondents are dental professionals. Only post graduate students' perspectives were included in this study.

CONCLUSION:

AI is an upcoming technological tool in medical and dental sciences. According to the findings of this study, most post graduate dental students are enthusiastic about AI application in dentistry. They believe that AI can be used effectively for diagnoses of several diseases and as a treatment planning tool in diagnosis and treatment planning in dentistry. Half of students agreed that AI removes the necessity for making a patient impression as well as several laboratory steps. Majority of students agreed that AI applications should be part of dental training. Follow-up surveys and multicenter studies need to be carried out to further investigate these issues.

Awareness about AI must be achieved through dental associations, research institutions, and technology companies by promoting discussions and educational resources related to AI. Research papers, publications, and presentations on AI in dentistry could contribute to spreading awareness among dental students. The field of AI is rapidly evolving, and new applications and tools are being developed regularly. Thus, staying updated on advancements in AI is essential for dentists interested in incorporating AI into their work. To improve the future of dentistry in this revolutionary AI period, the curriculum must be updated.

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