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Knowledge, attitudes, and perceptions regarding the future of artificial intelligence in oral radiology in Jazan, Saudi Arabia

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***Abstract*---**Context: Applications of AI in dentistry are interesting, especially in radiology, and can be a boon for novice practitioners. AI can help in the tracing of cephalometric landmarks; in the detection of caries, alveolar bone loss, and periapical pathosis; the auto-segmentation of the inferior alveolar nerve; the analysis of facial growth, and other similar tasks. Methods and Materials: An online survey was prepared using Google Forms and the link was distributed among dentists in Jazan. The questionnaire was divided into 3 sections (knowledge, attitudes, and future). The first part consisted of 4 questions about fundamental knowledge of AI. The second part consisted of 4 questions regarding the dentist's attitudes towards AI. The final section consisted of 7 questions about the possible future of AI in dental radiology among dentists in Jazan. Statistical analysis used: The data was statistically analysed using PASW Statistics for Windows, version 18 (SPSS Inc., Chicago, USA). The chi-squared test

was used, with a level of significance $p<0.05$. Results: Of the 93 participants, 61% were familiar with the concept of AI, 77% expected to utilise AI for making diagnoses, 27% agreed that the major role of AI would be to interpret complicated radiographs, and 67% agreed that AI would have a future in Saudi Arabia. Conclusions:This survey concluded that practitioners were well aware about the potential uses of AI, that AI could be used as an adjunct to increase diagnostic precision during radiographic interpretation, and that AI has a promising role in radiological diagnosis.

***Keywords*---**Artificial Intelligence, Radiology, Dental Radiology, Knowledge, Attitude, Survey.

Introduction

Artificial intelligence (AI) simply put is the acquisition of knowledge or data by computers or machines to perform tasks requiring human intelligence.[1,2] AI programs have been developed to analyse data collected from a diverse range of sources, and have been widely used in the manufacturing sector, the stock market, the medical field, and meteorology, among other domains.[1,2] Despite this, many healthcare professionals are not yet familiar with the concepts and true potential of AI, and the impact it can have. Over the last few years, AI has gained popularity in the field of healthcare and research. Its possible applications in dentistry need due attention. Application of AI in the dental sciences, especially in dental radiology, can be a boon for dental practitioners. Today, AI is capable in accurately tracing cephalometric landmarks; detection of caries, alveolar bone loss, and periapical pathosis; auto-segmentation of the inferior alveolar nerve; analysis of facial growth, and other similar tasks.[3] The use of AI has been reported in previous studies for the screening of oral cancer, metastasis, along with the diagnosis and treatment planning of diseases.[3–6] Nevertheless, opinions regarding the scope of AI are varied. On one hand, many believe in the opportunities in the field of healthcare that AI may create, while others still believe AI to be unreliable.[7] This study investigates the knowledge, attitudes, and perceptions regarding the future of AI for radiological diagnosis among dental specialists in Jazan, southern part of Saudi Arabia.

Subjects and Methods

This study was approved by the institutional ethical board of College of Dentistry, Jazan University. A questionnaire consisting of 15 close-ended questions based on a previous study was formulated.[8] A pilot questionnaire was used to verify the content validity of the survey. The final survey questionnaire was formulated as a Google Form. The link for the same was distributed among various dental practitioners, post-graduate researchers, and oral radiologists in Jazan (via WhatsApp groups/emails) from September to November 2021. A brief description of AI and the goals of the survey were provided to the participants in the preface of the survey questionnaire. The survey consisted of a questionnaire regarding respondents' recognition and attitudes towards AI and the possible future of AI in radiological diagnosis (Table 1). Apart from the demographic details, the

questionnaire was broadly divided into 3 sections (knowledge, attitudes, and future). The first part consisted of 4 questions about respondents' fundamental knowledge of AI. The second part consisted of 4 questions regarding their current attitudes towards AI. The final section consisted of 7 questions about the possible future of AI in dental radiology among dentists in Jazan. The data collected were statistically analysed using PASW Statistics for Windows, version 18 (SPSS Inc., Chicago, USA). The level of significance was set at $p<0.05$. The Chi-squared test was applied and frequency distributions of responses (i.e., the percentage of respondents who agreed) were presented graphically.

Results

Of the 93 practitioners who answered the questionnaire, 47 were male and 46 were female. Table 2 depicts the demographic characteristics of the survey participants.

Knowledge

There was a remarkable knowledge of AI among dentists. Of the 93 respondents, 57 (61%) were already familiar with the AI framework (Fig. 1). Although 68 dentists (73%) accepted that AI has useful medical applications, only 33 (36%) had a basic understanding of how to integrate AI into their dental practice. Moreover, 62 dentists (67%) accepted that AI can speed up the healthcare system and minimize errors and can provide a large quantity of high-quality data without emotional or physical fatigue in a timely manner (Fig. 1).

Attitude

Most dentists (81%) would like to use software that would be useful for radiological diagnosis (Fig. 2). Although 25% of dentists fully agreed that AI can make better diagnoses than a human doctor, 35% were not sure. In the event of a difference of opinion in diagnosis, only 13% of participating dentists stated that they would follow the AI's prediction, while 48% of the participating dentists would rely on their ability to diagnose and 33 were not sure. Furthermore, 63 of the participating dentists (68%) stated that they would recommend AI to their fellow practitioners (Fig. 2).

Future

Sixty-five dentists (70%) believed that AI will come to the rescue to evaluate minute details on X-rays that they sometimes miss (Fig. 3). A total of 71 dentists (77%) agreed that they would use AI for dental diagnosis and treatment planning and 68 (73%) stated that they would utilise AI algorithms for medical diagnosis in the near future. Twenty-five (27%) dentists agreed that the key function of AI is to interpret complicated radiographic scans, and 44 (48%) indicated that AI would be valuable for diagnostic purposes, while 15 (16%) and 9 (10%) of the participating dentists agreed that AI would be used for making treatment decisions and direct treatment, respectively (Fig. 3). Forty-nine (53%) favoured the use of AI in specialised dental clinics (centres for radiology, prosthodontic clinics, and orthodontic clinics), 18 (19%) approved of the use of AI at university

hospitals, 15 (16%) at public health centres and 11 (12%) for primary care at private clinics. A total of 62 (67%) dentists believed that AI has a future in Saudi Arabia, while 52 dentists (56%) agreed that AI will help budding dentists in their diagnosis and decision-making.

Discussion

The results of this survey showed that a good percentage of dental practitioners understood the concept and potential applications of AI. Most agreed on the benefits of its use in dentistry and 27% felt that it would help in speeding up the interpretation of complicated scans. In a survey[1] among Korean medical practitioners, only 6% were acquainted with the idea of AI, 83.4% approved of the use of AI in the medical field, and 43.9% opined that the diagnostic capacity of AI was superior. The respondents stated that the benefits of using AI are its ability to obtain large amounts of relevant, high-quality data, speed up healthcare processes, and decrease medical errors. Another survey[8] carried out among Indian dentists revealed that 68% of dentists were familiar with the concept of AI, while 69% were of the opinion that AI had potential uses in diagnosis and treatment planning and 63% affirmed that AI has a future in Indian dental practice. A large proportion (68%) of practitioners opined that AI could be used in assessing minute radiographic details that may be missed out and 64% stated that AI would help beginner practitioners make diagnoses. The current study done in the Jazan region of Saudi Arabia revealed that 57% of dentists were acquainted with the concept of AI, while 77% believed AI had latent uses in diagnosis and treatment planning and 67% acknowledged that AI has a future in Saudi Arabian dental practice. Sixty-five (70%) respondents believed AI could be used in evaluating minute radiographic details missed by practitioners and 56% stated that AI would help novice practitioners make diagnoses. Ground-breaking research in AI has been a source of great innovation and a prominent topic of discussion within radiological societies. Despite its risks and need for quality assurance, it has a promising future in the field of healthcare and changes in the delivery of radiological services are bound to occur.[9] This study revealed that 67% of dentists were sure of AI having a future in Saudi Arabia and 27% of dentists agreed that the major beneficial task of AI is interpretation of complicated radiographic scans. With advances in the diagnostic accuracy of deep learning algorithms, aided diagnostics are becoming an interactive process than a mere “second opinion”.[3] AI excels at recognising and learning complex patterns in imaging data and proving quantitative assessments rather than qualitative assessments of radiographic characteristics.[10] The higher efficiency provided by AI will allow radiologists to perform more value-added tasks and play a vital role in multidisciplinary clinical teams.[11] The luxury of having a second opinion at a practitioners finger tips using AI could bolster diagnosis and treatment planning and help patients.[12] The main limitation of the present study is the limited number of participants, who were practicing in Jazan, Saudi Arabia. Future studies should be carried out with larger samples to validate the accuracy and usefulness of AI programs in various dental specialties.

Key Messages

This survey emphasised on the awareness of practitioners about the potential uses of AI, its uses as an adjunct to increase diagnostic precision during radiographic interpretation, and its future in radiological diagnosis.

References

1. Oh S, Kim JH, Choi SW, et al. Physician Confidence in Artificial Intelligence: An Online Mobile Survey. J Med Internet Res. 2019;21.
2. Dreyer KJ, Raymond Geis J. When Machines Think: Radiology's Next Frontier. Radiology. 2017;285:713–718.
3. Hwang JJ, Jung YH, Cho BH, et al. An overview of deep learning in the field of dentistry. Imaging Sci Dent. 2019;49:1–7.
4. Bychkov D, Linder N, Turkki R, et al. Deep learning based tissue analysis predicts outcome in colorectal cancer. Sci Rep. 2018;8.
5. Bas B, Ozgonenel O, Ozden B, et al. Use of artificial neural network in differentiation of subgroups of temporomandibular internal derangements: a preliminary study. J Oral Maxillofac Surg. 2012;70:51–59.
6. Shaban M, Khurram SA, Fraz MM, et al. A Novel Digital Score for Abundance of Tumour Infiltrating Lymphocytes Predicts Disease Free Survival in Oral Squamous Cell Carcinoma. Sci Rep. 2019;9:1–13.
7. Johnston SC. Anticipating and Training the Physician of the Future: The Importance of Caring in an Age of Artificial Intelligence. Acad Med. 2018;93:1105–1106.
8. Sur J, Dewangan D, Sawriya E, et al. Knowledge , attitudes , and perceptions regarding the future of artificial intelligence in oral radiology in India : A survey. 2020;193–198.
9. Pakdemirli E. Artificial intelligence in radiology: friend or foe? Where are we now and where are we heading? Acta Radiol Open. 2019;8:205846011983022.
10. Hosny A, Parmar C, Quackenbush J, et al. Artificial intelligence in radiology. Nat Rev Cancer. 2018;18:500–510.
11. Pesapane F, Codari M, Sardanelli F. Artificial intelligence in medical imaging: threat or opportunity? Radiologists again at the forefront of innovation in medicine. Eur Radiol Exp. 2018;2:1–10.
12. Mupparapu M, Wu CW, Chen YC. Artificial intelligence, machine learning, neural networks, and deep learning: Futuristic concepts for new dental diagnosis. Quintessence Int. 2018;49:687–688.

Table 1. Survey questionnaire

KNOWLEDGE
1) Are you familiar with the concept of artificial intelligence (AI) and its uses? a) Yes b) Not sure 2) Do you agree that AI has useful applications in the medical field? a) Yes b) Not sure c) Maybe 3) Do you have any idea of how AI can be incorporated in dental practice? a) Yes b) No c) Maybe

4) What according to you are the advantages of using AI? a) AI can speed up processes in health care & reduce medical errors. b) AI can deliver vast amounts of clinically relevant high-quality data in real time c) AI has no emotional exhaustion nor physical limitation d) All of the above
ATTITUDE
5) Would you like to use a software/program that can be helpful in radiological diagnosis? a) Yes b) No c) Maybe 6) Do you agree that the diagnostic ability of AI is better than the clinical experience of a human doctor? a) Yes b) No c) Maybe 7) If your medical judgment and AI's judgments differ, which will you follow? a) My own opinion b) AI's opinion c) Not Sure 8) Will you recommend fellow practitioners to implement AI in their clinical practice? a) Yes b) No c) Maybe
FUTURE
9) Do you agree AI will help to evaluate minute details in radiographs which sometimes are missed by practitioners? a) Yes b) No c) Maybe 10) Do you agree that you may use AI while doing medical diagnosis in the future? a) Yes b) No c) Maybe 11) Do you agree that you may use AI while making dental diagnosis and treatment planning in the future? a) Yes b) No c) Maybe 12) In which field of dentistry do you think AI will be most useful? a) Making a diagnosis b) Making treatment decisions c) Direct treatment (including surgical robots) d) Interpreting complicated radiographic scans 13) Which sector of health care do you think will be the first to commercialize AI? a) Public health centres b) Primary care in private clinics c) Specialized clinics d) University hospitals 14) Do you think AI has a future in dentistry in Saudi Arabia ? a) Yes b) No c) Maybe 15) Do you think AI will help budding dentists in diagnosis and decision-making? a) Yes b) No c) Maybe

Table 2 Demographic characteristics

Demographics		**N**	**%**
Gender	**Male**	47	50.5
	Female	46	49.5
Current Work	**Dental intern**	35	37.6
	General dental practitioner	53	57.0

	Specialist	5	5.4

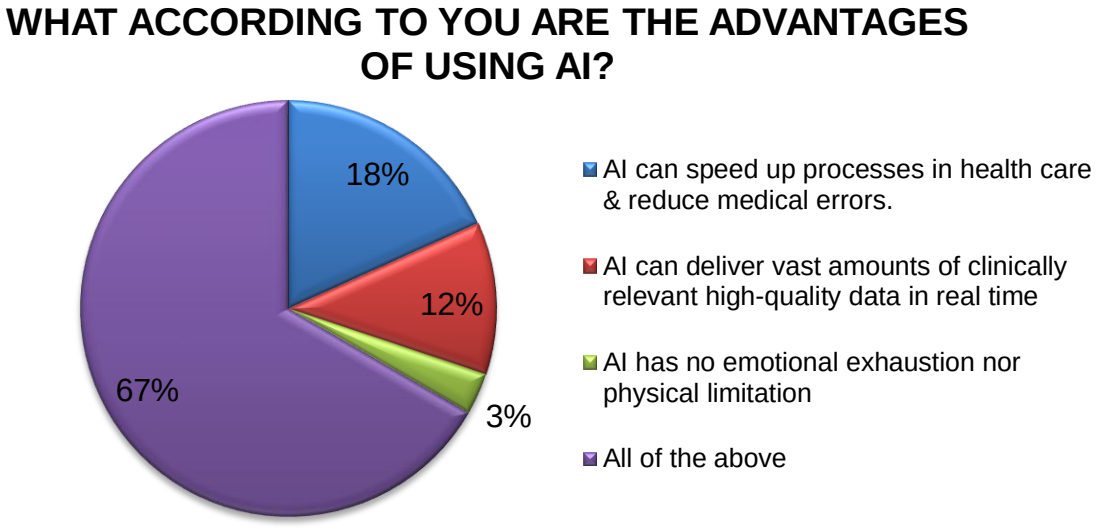

Figure 1. Knowledge about advantages of using AI

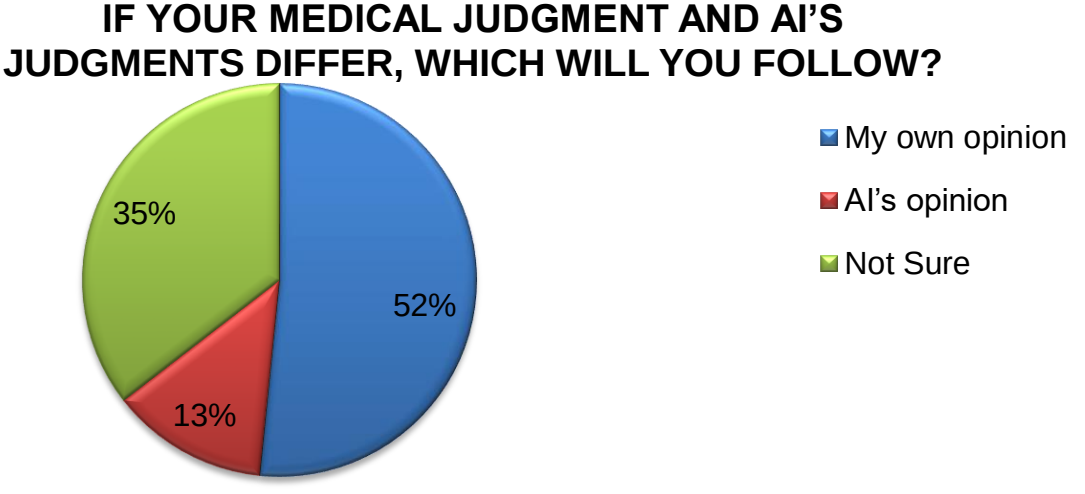

Figure 2. Attitude towards differences in radiographic interpretation

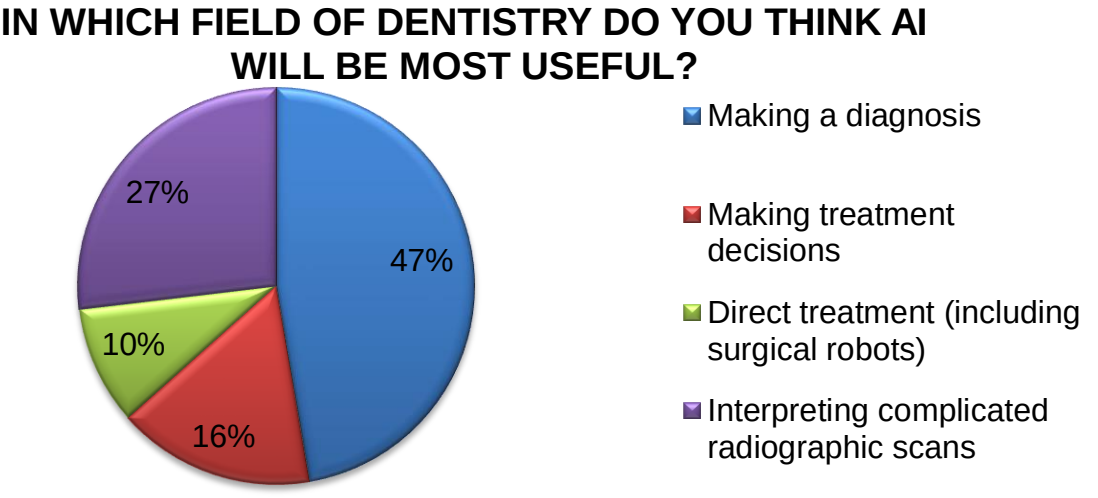

Figure 3. Perception regarding utility of AI in dentistry

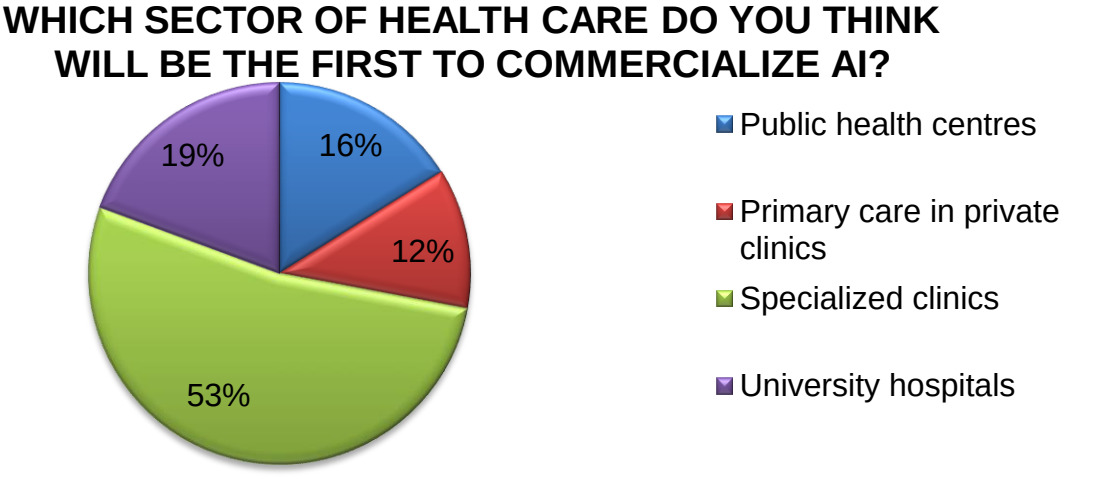

Figure 4. Perception regarding commercialisation of AI