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# ARTIFICIAL INTELLIGENCE'S EMERGING ROLE IN ORAL ONCOLOGY

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## ABSTRACT

Artificial Intelligence (AI) and its application is providing new horizons in research and applied science. The goal of this study was to determine the level of awareness, attitudes, and future perspectives about AI among dental students and professionals and its application in digital pathology. A questionnaire survey was conducted among Undergraduate and Postgraduate dental students and Faculty/Clinicians through Google Forms. It was categorised into sections with the objective of determining knowledge, attitudes, and future perspectives of AI and its potential applications in pathology. The responders' identities were kept anonymous. A total of 200 people responded to the poll, with 136 females and 64 males with an average of 24 years. The study included 125 Undergraduates, 44 Post graduate students, and 31

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Faculty/Clinicians. 73.5 % were aware that AI might be utilised in medicine. According to 87.5 %, it should be incorporated in the curriculum. 79 % feel it will play an important role in diagnostic and treatment planning in the future. Although the participants have a limited understanding of AI, they are eager to learn more about it. Participants expressed optimism, believing that AI will have a beneficial influence on medical practise in future. Artificial Intelligence approaches and development trends will focus on machine learning based on data acquired from the most recent diagnostic modalities, such as multi-omics (e.g., genomics, metabolomics) and imaging technologies, especially in areas where objective detection methods are missing. Finally, developing global and national standards and laws is required to accelerate the use and spread of AI in health and medicine. It will be useful in forecasting the prognosis, recurrence, and survival rate of oral cancer patients and also to predict the malignant transformation of pre-malignant lesion in high-risk patients.

**KEYWORDS:** AI (Artificial Intelligence), Attitudes, Awareness, Machine learning, Digital Pathology, Survey

## EL PAPEL EMERGENTE DE LA INTELIGENCIA ARTIFICIAL EN LA ONCOLOGÍA ORAL.

### RESUMEN

La Inteligencia Artificial (IA) y su aplicación están proporcionando nuevos horizontes en la investigación y la ciencia aplicada. El objetivo de este estudio fue determinar el nivel de

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conocimiento, las actitudes y las perspectivas futuras sobre la IA entre los estudiantes y profesionales de odontología y su aplicación en la patología digital. Se llevó a cabo una encuesta con un cuestionario entre los estudiantes de odontología de grado y postgrado y los profesores/clínicos a través de Google Forms. Se clasificó en secciones con el objetivo de determinar los conocimientos, las actitudes y las perspectivas futuras de la IA y sus posibles aplicaciones en patología. La identidad de los encuestados se mantuvo en el anonimato. Un total de 200 personas respondieron a la encuesta, con 136 mujeres y 64 hombres con una media de 24 años. En el estudio participaron 125 estudiantes de grado, 44 de postgrado y 31 profesores/clínicos. El 73,5% sabía que la IA podría utilizarse en medicina. Según el 87,5%, debería incorporarse al plan de estudios. El 79% cree que desempeñará un papel importante en la planificación del diagnóstico y el tratamiento en el futuro. Aunque los participantes tienen un conocimiento limitado de la IA, están deseosos de aprender más sobre ella. Los participantes se mostraron optimistas y creen que la IA tendrá una influencia beneficiosa en la práctica médica en el futuro. Los enfoques y las tendencias de desarrollo de la Inteligencia Artificial se centrarán en el aprendizaje automático basado en los datos adquiridos a partir de las modalidades de diagnóstico más recientes, como la multiómica (por ejemplo, la genómica, la metabolómica) y las tecnologías de imagen, especialmente en áreas en las que faltan métodos de detección objetivos. Por último, es necesario desarrollar normas y leyes mundiales y nacionales para acelerar el uso y la difusión de la IA en la salud y la medicina. Será útil para pronosticar el pronóstico, la recurrencia y la tasa de supervivencia de los pacientes con cáncer

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oral y también para predecir la transformación maligna de la lesión premaligna en pacientes de alto riesgo.

**PALABRAS CLAVE:** IA (Inteligencia Artificial), Actitudes, Conciencia, Aprendizaje automático, Patología digital, Encuesta

## INTRODUCTION

Artificial intelligence (AI) focuses on the creation of intelligent machines to replicate human cognitive functions and execute intelligent activities based on algorithms, learning from experience, adapting to new inputs and in healthcare industry (1). AI uses a statistical methodology which becomes more scientific proof, aids in diagnosis and treatment planning, also in the fields of radiology and pathology by optimization of radiologic flow, quantitative radiology, and the identification of genetic markers. [2][3] Digital pathology helps to digitise histologic slides and testing. (4) The purpose of this poll is to determine the knowledge, attitude and future prospects about AI.

## MATERIALS AND METHOD

A cross-sectional online survey was conducted in the institution for the study. Medical students and professionals were given a web-based survey form. The questionnaire was divided into two segments. The first half of the survey included sociodemographic factors such as age, gender, and educational attainment, while the second half focused on the applicability of AI in pathology. The second section of the questionnaire was broken down into three sections:

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knowledge, attitude, and future outlook. A random selection approach was carried out to identify 200 medical undergraduates, postgraduates, and faculty members. This is done to alleviate bias. SPSS version 24 was used to tabulate and analyse the data. A frequency and Chi-Square test were performed on the data. Pie charts were used to display the results.

## RESULTS

According to the results of the survey, there were 136 (68%) female respondents and 64 (32%) male respondents. The participants were 125 (62.5 percent) undergraduates, 44 (22%), postgraduates, and 31 (15.5 percent) clinicians. The study participants varied in age from 18 to 45 years old with mean age of 24 years. Table 1

**Table 1. Demographic Data**

| DEMOGRAPHIC DATA | | |
|---|---|---|
| **Age** | Mean Age (Years) | 24 |
| **Gender** | Male | 64(32%) |
| | Female | 136(68%) |
| **Group** | Undergraduate | 125(62.5%) |
| | Postgraduate | 44(22%) |
| | Faculty | 31(15.5%) |

## ASSESSMENT OF KNOWLEDGE

The survey reveals that 139 (69.5%) of respondents were familiar with AI and machine learning ideas, 33 (16.5%) had no

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idea, and 28 (14%) were sceptical. 147 (73.5%) of the participants were aware of AI's medical applicability, 30 (15%) were unaware, and 23 (11.5%) were doubtful. According to 146 (76%) of respondents, AI can help with diagnosis, whereas 49 (24.5%) are sceptical and 5 (2.5%) believe it cannot. 67 (33.5%) of respondents were familiar with and had used a digital microscope, whereas 118 (59%) had never used one and 15 (7.5%) were unsure Figure 1.

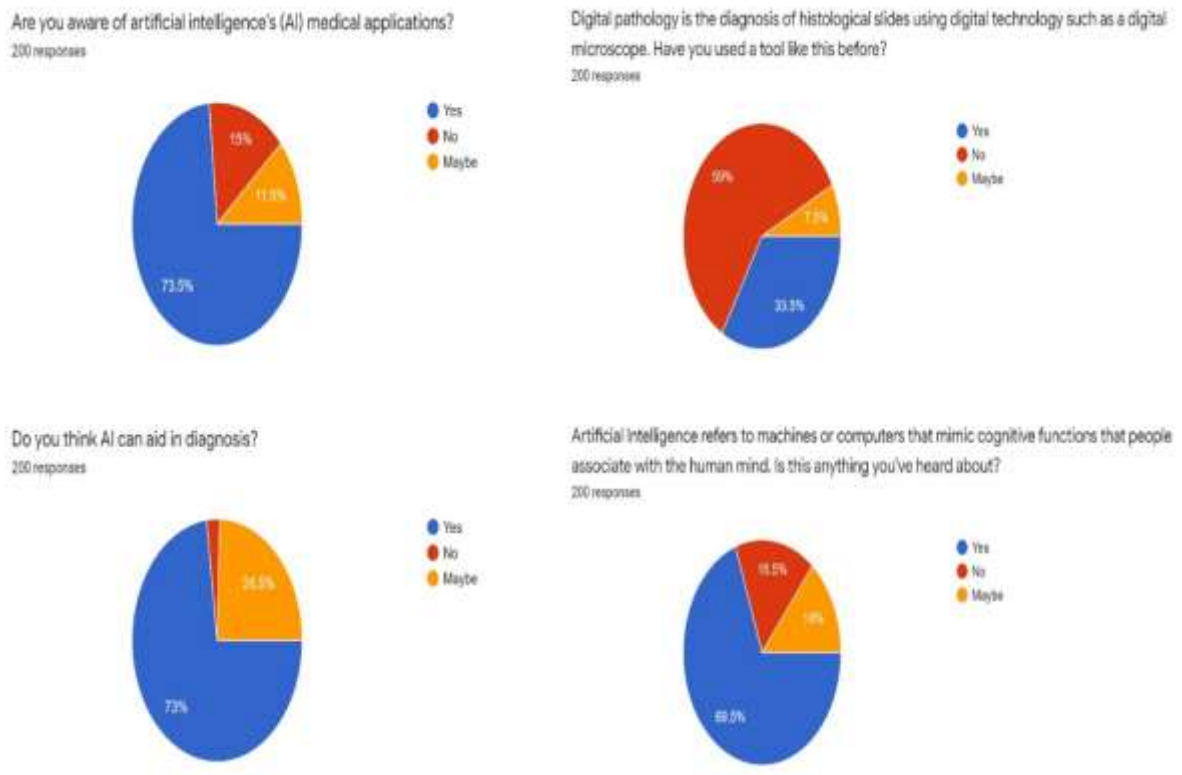


**Figure 1: Assessment of knowledge**

**Assessment of Attitude**

The survey shows, 173 (86.5%) people are eager to study AI to enhance diagnosis and

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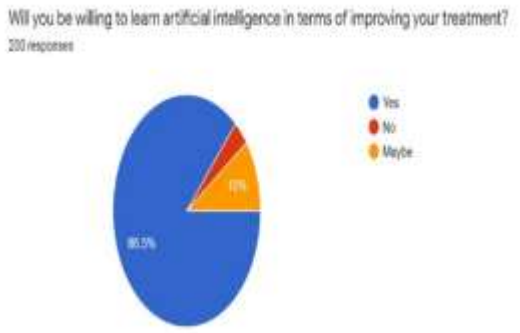
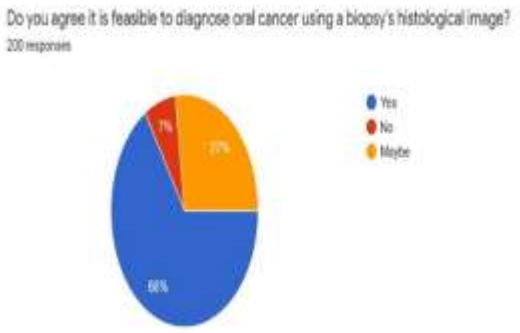
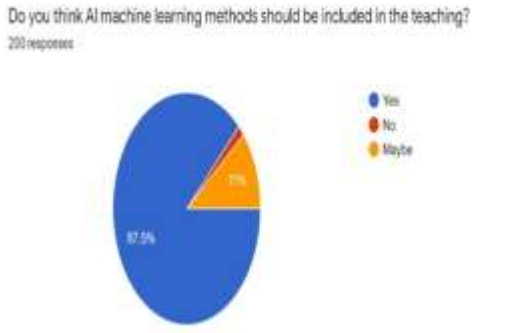
treatment planning, whereas 7 (3.5%) people are hesitant to learn it and 20 (10%) people are indifferent. 175 (or 87.5 percent) feel it should be included in the curriculum, 3 (or 1.5 percent) disagree, and 22 (or 11 percent) are uncertain. 132 (66 percent) believe it is possible to utilise a biopsy picture for diagnosis, 14 (7%) disagree, and 54 (27 percent) are suspicious. In the event of a disagreement between your perspective and AI's, 47 (23.5%) will believe themselves, 34 (17%) will prefer AI's viewpoint, and 119 (59.5%) will validate it using sophisticated procedures or with the help of another expert, Figure 2.



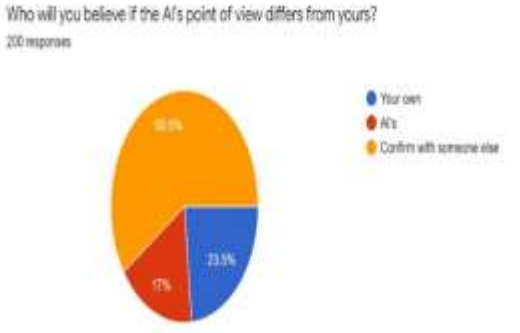



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**Figure 2: Assessment of attitudes**

**Assessment of Future Outlook**

The survey reveals, 158(79%) believe it will play a critical role in diagnostic and treatment planning in the future, 5(2.5%) do not believe so, and 37(18.5%) are hesitant. According to 118 (59 percent), AI-based software will be able to recognise normal, possibly malignant, and malignant conditions, whereas 9 (4.5 percent) disagrees and 73 (36.5 percent) are unsure. Artificial Neural Networks will be useful in forecasting the prognosis, recurrence, and survival rate of oral cancer patients, according to 127 (63.5%), whereas 8 (4%) disagree and 65 (32.5%) are apprehensive. 118 (59%) of respondents feel India is ready to embrace AI in the future, while 26 (13%) do not and 56 (28%) are uncertain, Figure 3, Table 2.

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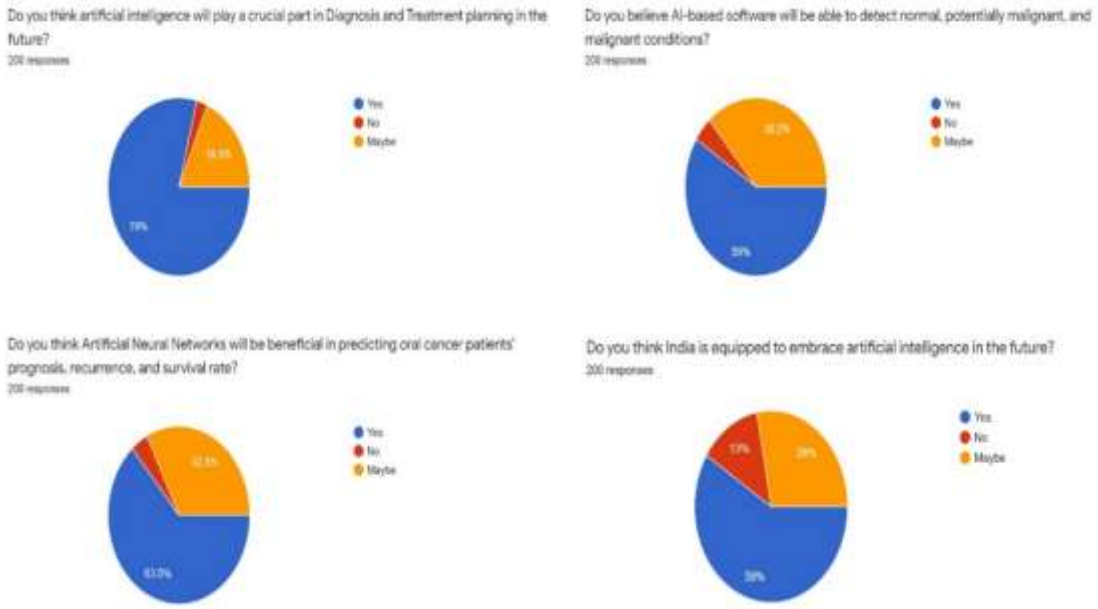


**Figure 3: Assessment of Future Outlook**

**TABLE 2: Understanding and knowledge of Survey questionnaire among study groups**

| **Understanding and knowledge of Survey questionnaire among study groups** | | | | | |
|---|---|---|---|---|---|
| **QUESTIONS** | **GROUPS** | **YES** | **NO** | **MAY BE** | **p-Value** |
| Q.1 Are you aware of artificial intelligence's (AI) medical applications? | Undergraduates | 85 | 22 | 18 | 0.193 |
| | Postgraduates | 35 | 6 | 3 | |
| | Faculty/Clinician | 27 | 2 | 2 | |
| Q.2 Do you think AI can aid in diagnosis? | Undergraduates | 88 | 4 | 33 | 0.399 |
| | Postgraduates | 31 | 1 | 12 | |

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| | | | | | |
|---|---|---|---|---|---|
| | Faculty/Clinician | 27 | 0 | 4 | |
| Q.3 Digital pathology is the diagnosis of histological slides using digital technology such as a digital microscope. Have you used a tool like this before? | Undergraduates | 48 | 64 | 13 | **0.008(S)** |
| | Postgraduates | 7 | 35 | 2 | |
| | Faculty/Clinician | 12 | 19 | 0 | |
| Q.4 Artificial Intelligence refers to machines or computers that mimic cognitive functions that people associate with the human mind. Is this anything you've heard about? | Undergraduates | 78 | 24 | 23 | 0.074 |
| | Postgraduates | 36 | 5 | 3 | |
| | Faculty/Clinician | 25 | 4 | 2 | |
| Q.5 Will you be willing to learn artificial intelligence in terms of improving your treatment? | Undergraduates | 110 | 5 | 10 | 0.592 |
| | Postgraduates | 36 | 2 | 6 | |
| | Faculty/Clinician | 27 | 0 | 4 | |
| Q.6 Do you think AI machine learning methods should be included in the teaching? | Undergraduates | 109 | 2 | 14 | 0.853 |
| | Postgraduates | 39 | 0 | 5 | |
| | Faculty/Clinician | 27 | 1 | 3 | |
| Q.7 Do you agree it is feasible to diagnose oral cancer using a biopsy's histological image? | Undergraduates | 83 | 10 | 32 | 0.36 |
| | Postgraduates | 27 | 1 | 16 | |
| | Faculty/Clinician | 22 | 3 | 6 | |
| | Undergraduates | 99 | 3 | 23 | 0.757 |

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| | | | | | |
|---|---|---|---|---|---|
| Q.8 Do you think artificial intelligence will play a crucial part in Diagnosis and Treatment planning in the future? | Postgraduates | 33 | 2 | 9 | |
| | Faculty/Clinician | 26 | 0 | 5 | |
| Q.9 Do you believe AI-based software will be able to detect normal, potentially malignant, and malignant conditions? | Undergraduates | 72 | 6 | 47 | 0.624 |
| | Postgraduates | 25 | 3 | 16 | |
| | Faculty/Clinician | 21 | 0 | 10 | |
| Q.10 Do you think Artificial Neural Networks will be beneficial in predicting oral cancer patients' prognosis, recurrence, and survival rate? | Undergraduates | 78 | 4 | 43 | 0.288 |
| | Postgraduates | 27 | 4 | 13 | |
| | Faculty/Clinician | 22 | 0 | 9 | |
| Q.11 Do you think India is equipped to embrace artificial intelligence in the future? | Undergraduates | 76 | 16 | 33 | 0.412 |
| | Postgraduates | 27 | 7 | 10 | |
| | Faculty/Clinician | 15 | 3 | 13 | |
| Q.12Who will you believe if the AI's point of view differs from yours? | | **Your own** | **Confirm with others** | **AI's** | |
| | Undergraduates | 30 | 72 | 23 | 0.828 |
| | Postgraduates | 10 | 29 | 5 | |

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| | | | | | |
|---|---|---|---|---|---|
| | Faculty/Clinician | 7 | 18 | 6 | |

## DISCUSSION

Deep learning and machine learning are two kinds of AI, the latter being very recently introduced. Machine learning is an AI branch which use algorithms to find patterns in available data and then trains itself to make predictions based on new data. Machine learning algorithms are designed to learn multiple prediction models by calculating the parameters of an artificial neural network model during a training phase. After that, in an evaluation stage, the trained model's prediction accuracy is evaluated using blinded data to determine which model has the least generalisation error (4-6).

AI is a multidisciplinary approach towards understanding, modelling, and recreating intelligence and cognitive processes that incorporates ideas and methodology from a wide range of areas, including computers, mathematics, logic, and biology. AI is now used in a broad range of fields, including robots, image and speech recognition, computational linguistics, and expert systems along with biggest achievements into the field of medical science in the form of data digitization (7-8).

The majority of AI's digital pathology pictures are digitised from H&E-stained slides. Pathology specimens go through processes such as formalin fixation, grossing, paraffin embedding, tissue sectioning, and staining. Color, brightness, contrast, and scale may all be affected by each phase of the process, as well as the

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many equipment and software that are utilised with digital imaging scanners (9).

AI is being used to gather health data to aid cancer therapy, which is a new concept that is gaining popularity. As a result, AI's applications in medicine will become more beneficial in identifying and treating patients. Correct diagnosis is critical in cancer, thus research that combines AI with oncologic pathology is highly commended. One of the major advantages of integrating machine learning with automated microscopic image analysis is the ability to substantially reduce intra- and inter-observer variability, as well as improve objectivity and reproducibility. We will be able to enhance research reporting and, as a result, our understanding of illness history development by achieving such uniformity and reproducibility among pathologists (4,9).

According to a survey of AI's awareness, more than 70% of those polled are aware of AI and its potential benefits in medicine, and they believe it may aid diagnosis. (table/figure) Our findings are consistent with those of Ranjana et al, Sur et al, and Pinto et al (10-12)

According to the analysis of Attitude towards AI, more than 85% of respondents are eager to learn about AI and believe it should be incorporated in the curriculum. When asked whether biopsy pictures might be used to diagnose oral cancer, 66% of those surveyed said yes. Our findings are consistent with those of Musulin et al, who found that an AI-based approach using histological image has a lot of potential for diagnosing OSCC. (13) When asked how they would validate the discrepancy between their point of view and AI's, 59.5 percent of participants said they would use

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another method. The findings of our study are in accordance with those of Yüzbaşolu et al., Veta et al., and Dong et al. (14-16)

In relation to future perspective evaluation, more than 60% of participants believe AI will be able to recognise normal, potentially malignant, and malignant conditions, as well as predict oral cancer patients' prognosis, recurrence, and overall survival. As a result, future diagnostic outcomes and treatment plans will be reliant on AI. (17-21) Overall, 59% of respondents feel that India is ready to embrace AI, but with caution and human oversight to avert mistakes and keep up to date on emerging and rare diseases.

Nonetheless, despite AI's promise, numerous concerns must be solved. Medical and dental databases are not as freely accessible as other data due to data security concerns and organisational obstacles. Datasets are generally unstructured and tiny when compared to other datasets in the AI field. Each patient's data is complicated, multifaceted, and private, with few alternatives for intercepting or verifying it. Medical and dental data, such as that obtained from electronic medical records, has a low level of variable completion, with data lacking systematically rather than at random (22).

Data processing, assessment, and validation are usually insufficiently reproducible and robust in dentistry AI research. How datasets were picked, verified, and pre-processed remains a mystery. Data, particularly training and test data, is widely used, leading in a problem known as "data snooping bias." It's difficult to define a "hard" gold standard, and there's no agreement on how many experts are required to identify a data point or how to

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integrate numerous "fuzzy" gold standard tags. (22-24) In most cases, AI results in dentistry are ineffective. Currently, most dental AI applications only provide a portion of the information needed to make tough treatment decisions. (25).

The exponential rise in computer power and data storage capacity has accelerated the proliferation of scholarly literature in the field of AI, notably in the last ten years. Existing systems may face new challenges if AI advances quickly. Future AI approaches and development trends will focus on machine learning based on data acquired from the most recent diagnostic modalities, such as multi-omics (e.g., genomics, metabolomics) and imaging technologies, especially in areas where objective detection methods are missing. Finally, developing global and national standards and laws is required to accelerate the use and spread of AI in health and medicine (26).

## CONCLUSION

Within the study's criteria, the extent of AI awareness was examined. Following an examination, it was revealed that medical practitioners had only rudimentary grasp of artificial intelligence, which might be improved. AI and its use in the medical field are becoming increasingly essential in wake of recent events. Since AI technology has the potential to grow into such an innovative platform capable of determining more complex medical data, a deeper understanding and analysis of the technology is required. The influx of scientific data in the form of clinical, genetic, and imaging data is projected to rise as precision and customised medicine become more widespread.

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**REFERENCES:**

1. Ahuja AS. The impact of artificial intelligence in medicine on the future role of the physician. PeerJ. 2019 Oct 4;7:e7702.
2. Lee SI, Celik S, Logsdon BA, Lundberg SM, Martins TJ, Oehler VG, Estey EH, Miller CP, Chien S, Dai J, Saxena A, Blau CA, Becker PS. A machine learning approach to integrate big data for precision medicine in acute myeloid leukemia. Nat Commun. 2018 Jan 3;9(1):42.
3. Hung K, Montalvao C, Tanaka R, Kawai T, Bornstein MM. The use and performance of artificial intelligence applications in dental and maxillofacial radiology: A systematic review. Dentomaxillofac Radiol. 2020 Jan;49(1):20190107.
4. Xing F, Yang L. Machine learning and its application in microscopic image analysis. In: Machine Learning and Medical Imaging. Elsevier Inc.; 2016:97-127.
5. Badrick T, Banfi G, Bietenbeck A, Cervinski MA, Loh TP, Sikaris K. Machine Learning for Clinical Chemists. Clin Chem. 2019;65(11):1350-1356.
6. Philibert A. L'intelligence artificielle, avenir de l'intelligence ou intelligence de l'avenir? [Artificial intelligence, the future of intelligence or the intelligence of the future?]. Orthod Fr. 2020 Jun 1;91(1-2):139-144. French.
7. Liu HC. [Artificial intelligence stomatology]. Zhonghua Kou Qiang Yi Xue Za Zhi. 2020 Dec 9;55(12):915-919.

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Depósito Legal: PPI201102ME3815
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8. Elsevier. Artificial Intelligence: How Knowledge Is Created, Transferred, and Used; Elsevier Artificial Intelligence Program: Amsterdam, The Netherlands, 2018.
9. Chang HY, Jung CK, Woo JI, et al. Artificial Intelligence in Pathology. J Pathol Transl Med. 2019;53(1):1-12.
10. Awareness On Application Of Artificial Intelligence In Medicine Among Dental Students - A Survey. Journal of Contemporary Issues in Business and Government, 2021; 27(2): 3130-3142.
11. Sur J, Bose S, Khan F, Dewangan D, Sawriya E, Roul A. Knowledge, attitudes, and perceptions regarding the future of artificial intelligence in oral radiology in India: A survey. Imaging Sci Dent. 2020 Sep;50(3):193-198.
12. Pinto Dos Santos D, Giese D, Brodehl S, Chon SH, Staab W, Kleinert R, Maintz D, Baeßler B. Medical students' attitude towards artificial intelligence: a multicentre survey. Eur Radiol. 2019 Apr;29(4):1640-1646.
13. Musulin J, Štifanić D, Zulijani A, Ćabov T, Dekanić A, Car Z. An Enhanced Histopathology Analysis: An AI-Based System for Multiclass Grading of Oral Squamous Cell Carcinoma and Segmenting of Epithelial and Stromal Tissue. Cancers (Basel). 2021 Apr 8;13(8):1784.
14. Yüzbaşıoğlu, E. Attitudes and perceptions of dental students

Volumen 12, N° 24, Julio/Diciembre 2022
Depósito Legal: PPI201102ME3815
ISSN: 2244-8136
DOI: https://www.doi.org/10.53766/AcBio/2022.12.24.05

towards artificial intelligence. J Dent Educ. 2021; 85: 60– 68.

15. Veta M, Heng YJ, Stathonikos N, et al. Predicting breast tumor proliferation from whole-slide images: The TUPAC16 challenge. Med Image Anal. 2019;54:111-121.
16. Dong F, Irshad H, Oh EY, et al. Computational pathology to discriminate benign from malignant intraductal proliferations of the breast. PLoS One. 2014;9(12):e114885.
17. Karadaghy OA, Shew M, New J, Bur AM. Development and Assessment of a Machine Learning Model to Help Predict Survival Among Patients With Oral Squamous Cell Carcinoma. JAMA Otolaryngol Head Neck Surg. 2019.
18. Bur AM, Holcomb A, Goodwin S, et al. Machine learning to predict occult nodal metastasis in early oral squamous cell carcinoma. Oral Oncol. 2019;92:20-25.
19. Alabi RO, Elmusrati M, Sawazaki-Calone I, et al. Machine learning application for prediction of locoregional recurrences in early oral tongue cancer: a Web-based prognostic tool. Virchows Arch. 2019;475(4):489-497.
20. Arora A, Husain N, Bansal A, et al. Development of a New Outcome Prediction Model in Early-stage Squamous Cell Carcinoma of the Oral Cavity Based on Histopathologic Parameters With Multivariate Analysis: The Aditi-Nuzhat Lymph-node Prediction

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DOI: https://www.doi.org/10.53766/AcBio/2022.12.24.05

Score (ANLPS) System. Am J Surg Pathol. 2017;41(7):950-960.

21. Ilhan B, Lin K, Guneri P, Wilder-Smith P. Improving Oral Cancer Outcomes with Imaging and Artificial Intelligence. J Dent Res. 2020 Mar;99(3):241-248.)
22. Gianfrancesco MA, Tamang S, Yazdany J, Schmajuk G. 2018. Potential biases in machine learning algorithms using electronic health record data. JAMA Intern Med. 178(11):1544–1547.
23. England JR, Cheng PM. 2019. Artificial intelligence for medical image analysis: a guide for authors and reviewers. AJR Am J Roentgenol. 212(3):513–519.
24. Walsh T. 2018. Fuzzy gold standards: approaches to handling an imperfect reference standard. J Dent. 74 Suppl 1:S47–S49.
25. Maddox TM, Rumsfeld JS, Payne PRO. 2019. Questions for artificial intelligence in health care. JAMA. 321(1):31–32.
26. Shan T, Tay FR, Gu L. Application of Artificial Intelligence in Dentistry. J Dent Res. 2021 Mar;100(3):232-244.