

ARTIFICIAL INTELLIGENCE: A NEW ERA IN DENTISTRY**Dr. Sayali V. Kadam^{*1}, Dr. Vinod V. C.², Dr. Nikhil Diwan³, Dr. Rashmi Sapkal⁴ and Dr. Roza R. Baviskar⁵**¹Post -Graduate Student, Department of Oral Medicine and Radiology, M.A. Rangoonwala college of Dental Sciences and Research Centre, Pune.²Professor & HOD, Department of Oral Medicine and Radiology. A Rangoonwala College of Dental Science and Research Centre Pune.³Professor, Department of Oral Medicine and Radiology, M. A Rangoonwala College of Dental Science and Research Centre Pune.⁴Professor, Department of Oral Medicine and Radiology, M. A Rangoonwala College of Dental Science and Research Centre Pune.⁵Post -Graduate Student, Department of Oral Medicine and Radiology, M. A Rangoonwala College of Dental Science and Research Centre Pune.***Corresponding Author: Dr. Sayali V. Kadam**

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ABSTRACT

Artificial intelligence (AI) has recently become a very popular buzzword, as a consequence of disruptive technical advances and impressive experimental results, notably in the field of image analysis and processing. In medicine, specialties where images are central, like radiology, pathology or oncology, have seized the opportunity and considerable efforts in research and development have been deployed to transfer the potential of AI to clinical applications. This report aims to summarize the fundamental concepts of Artificial Intelligence (AI), and to provide a non-exhaustive overview of AI applications in dental imaging, comprising diagnostics, forensics, image processing and image reconstruction.

KEYWORDS: Artificial intelligence, Medical imaging, Dentistry, Oral and Maxillofacial Radiology.**INTRODUCTION**

The human brain has been one of the most intriguing structures to researchers and technologists for as long as history dates back. Technologies are being developed based on the principles that try to mimic the functioning of human brain; however even today the machine that can think like a human is still a dream.

An enormous amount of modern computer and technologies were inspired by Aristotle's early attempt to formulate logic and thinking through his syllogism (three parts of deductive reasoning) History dates back as early as 400 B.C when Plato envisaged a basic model for brain functioning.^[1]

AI has taken hold in public healthcare as more and more people try to make diagnosis using technology that allows work faster and more accurately reducing the cost and number of medical error.^[2] The future is based on ever increasing quest for innovation and development to achieve high quality in treatment of patients.

AI was born at summer workshop held in Dartmouth in 1956 and had potential to open up several major avenues of research including neural network, natural language

processing, theory of computation and other topics of interest.^[3] In late 1900 AI experienced a resurgence after Deep Blue (IBM Expert System) beat the world chess champion Garry Kasparov.^[4] Alan Turing a young British polymath devised Turing test to suggest that machine can use available information and reason to solve problems like humans.

The term "Artificial intelligence" was coined by John McCarthy in 1956.^[5]

AI is defined as a field of science and engineering concerned with computational understanding of what is commonly called intelligent behaviour and with creation of artifacts that exhibit such behavior.^[1]

Two types of AI are available for general health care system physical and virtual. Physical applications are represented by sophisticated robots as automated robotic arms (Wang et al 2019), virtual components are software algorithms that support critical decision making.

AI functioning is based on the set of linked units or nodes creating a complex system roughly patterned after human brain called artificial neural network (ANN). AI

is a branch of machine learning ANN with complex multi layer are referred to as deep learning. Deep learning has a more complex way of linking layers as compared to other network to communicate complex models, more computing power to train, and automated feature extraction.^[6] Machine learning was first mentioned by Arthur Samuel 1959 who defined it as a process that enables computer to learn without being explicitly programmed.^[7] Applications of AI include bioprinting where living tissue and even organs can be constructed, reconstructed of hard and soft tissue lost due to pathological or accidental reason and robotic surgery where robotic surgeon perform semi-automated surgical tasks with increasing efficacy under guidance of an expert surgeon.^[8] AI technologies have achieved remarkable success and have also influenced daily life in form of search engine (as Google Search), online assistants (as Siri) and games (as Alpha Go), are developing quiet broadly into various field of medicine.^[9]

Current Dentist may believe that AI is a threat to the specialty as

1. Human being will one day be beaten by AI.
2. AI will replace need for trained radiologists.
3. They will lose jobs in the near future.

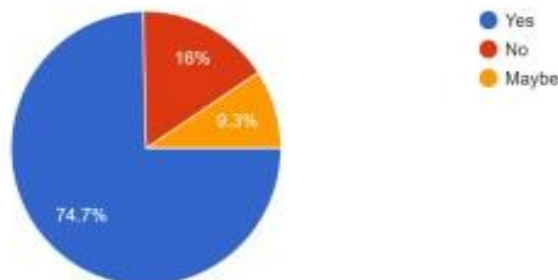
The kick started as hype-wave is still rolling to this day, and shows no signs of breaking just yet.

AIM AND OBJECTIVES

The aim of the study was to analyse the need for AI in

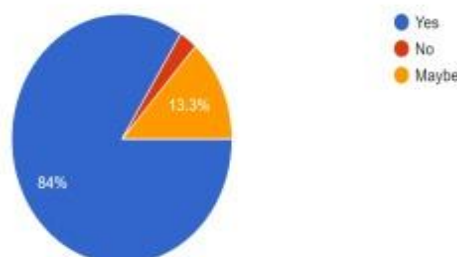
RESULTS

Are you aware of artificial intelligence in dentistry?
75 responses



Question 1:- (Fig:1)

Do you think artificial intelligence is transforming the way people receive healthcare?
75 responses



Question 2:- (Fig :2)

the field of dentistry.

The objective was to assess the basic knowledge about Artificial intelligence among Dentists.

MATERIALS AND METHOD

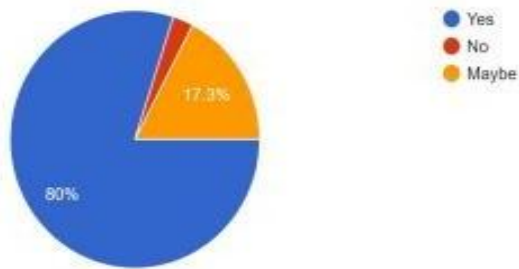
Study Design: The study setting included an online survey involving undergraduates and postgraduates professionals from different locations. The sampling method used was stratified random sampling. The measures taken to minimize the sampling bias were stratification and matching independent variables in a selected sample.

Survey Instrumental: Data was collected by using google questionnaire forms.

A questionnaire contained a set of 9 questions with a validity checking. Data collection software was used. The list of output variables that were to be assessed were the effect of knowledge on the use of AI in dentistry. The method of representation of each output variable was pie chart. The questionnaire was distributed through an online survey link. The study population were well explained about the purpose of the study. The questions were carefully studied and the responses of each individual had been recorded.

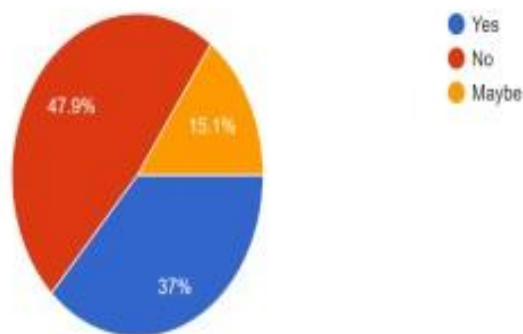
The results were statistically analysed through an online platform named google.

Do you think artificial intelligence is helpful in diagnosis?
75 responses



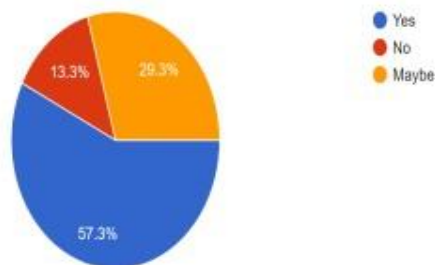
Question 3:- (Fig:3)

Are you aware about different algorithm used in artificial intelligence?
73 responses



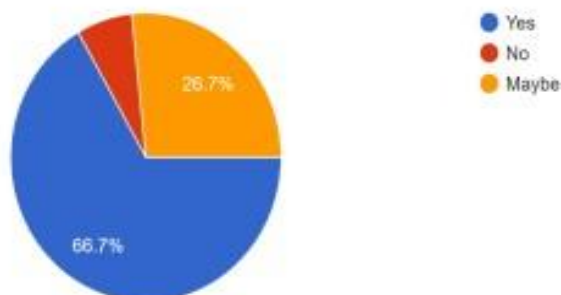
Question 4:-(Fig:4)

Do you think artificial intelligence allows to integrate different & heterogeneous data domain for example in medical / dental history?
75 responses



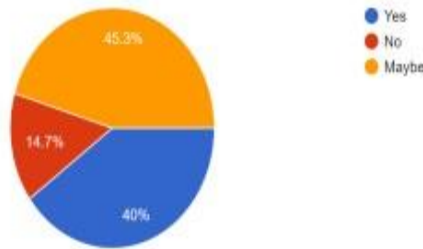
Question 5:- (Fig:5)

What do you think it helps us as diagnostic assistance system?
75 responses



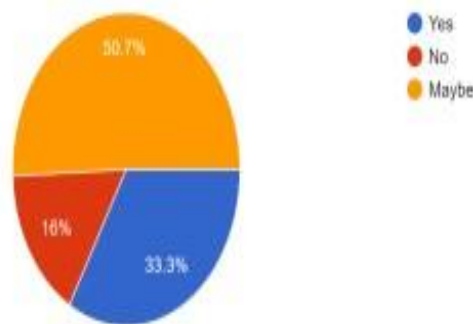
Question 6:- (Fig:6)

What do you think due to data protection concern ,the medical and dental data is not as available as other data?
75 responses



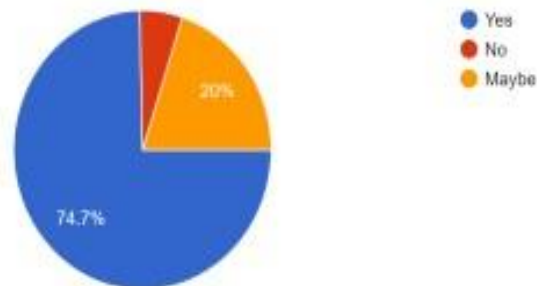
Question 7:- (Fig:7)

What do you think the data used for training and testing leading to data snooping bias?
75 responses



Question 8:- (Fig:8)

Do you believe in future artificial intelligence will make dental care better?
75 responses



Question 9:- (Fig:9)

DISCUSSION

In the question 1 (Fig:1) out of 75 response the blue colour represent 74.7% dentist were aware about artificial intelligence while the 16% were not aware about artificial intelligence.

In the question 2 (Fig:2) 84% dentist stated that artificial intelligence is transforming the way people receive healthcare while 13.3% were not sure about the positive outcome of artificial intelligence in healthcare.

In the question 3 (Fig: 3) 80% population think artificial intelligence is helpful aid in the diagnosis while 17.3% thought it is not helpful in diagnosis.

In the question 4 (Fig :4) the variation regarding the

knowledge of algorithm was noted as majority of dentist (47.9%) were unaware about the algorithms used while 15.1 % were not sure and 37% dentist had knowledge about algorithm used in artificial intelligence.

In the question 5 (Fig: 5) 57.3% dentists stated that artificial intelligence will allow to integrate different heterogenous data domain for the history recording (Medical /Dental) while 29.3% represent no and 13.3% represent maybe.

In the question 6 (Fig:6) larger amount (66.7%) dentist think artificial intelligence will help us as diagnostic assistance system while 26.7% represent maybe and 6.7% represent no.

In the question 7 (Fig :7) 45.3% represent maybe for the availability of data as protective concern to medical and dental data while 40% represent yes and 14.7% represent no.

In the question 8 (Fig:8) 50.7% were not sure about the snooping bias in artificial intelligence as data is used for training and testing, 33.3% dentist represent yes and 16% represent no.

In the question 9 (Fig:9) 74.7% dentist think artificial intelligence will make dental care better in future while 20% represent no.

Compared to the previous studies, When said about the results of AI are accurate in present study.

When said about AI that is helpful in diagnosis, Alexander L. Fogel, et al, in the year 2018, stated that AI is described in prevention, detection, diagnosis and treatment of diseases, 57% stated that it is helpful for AI diagnosis and is revolutionised in an article entitled as Artificial Intelligence as power and digital science - A review.

Even Lin K 20 21, et al, in the year 2020, said that AI improves outcomes, detection and diagnosis of oral cancer by 53%, was said in an article titled as Improving oral cancer and outcomes and imaging through AI – A review.

When said about AI as a threat, Andreas Holzinger, et al, in the year 2019, says that AI enhance trust in medical professionals as future systems in our body and 49% feel that AI technology as a threat, in an article titled as Causability and Explainability of AI in medicinal field - a review.

Thus, in the above articles, most of the results from the previous literature were more or less similar to the results of this survey.

LIMITATIONS

The limitations of this study were that the questionnaire may contain error captions. Due to the small scale of sample size, results may vary. The future scope of this study is that the present data had only 75 responses. The sample size is small, among the general population in future, more numbers of sample size can be used to study different types of population and for better result understanding.

CONCLUSION

AI has the potential that can be applied in various fields of science. Artificial intelligence (AI) is a technology that utilizes machines to mimic intelligent human behaviour. To appreciate human-technology interaction in the clinical setting, augmented intelligence has been proposed as a cognitive extension of AI in health care, emphasizing its assistive and supplementary role to

medical professionals. While truly autonomous medical robotic systems are still beyond reach, the virtual component of AI, known as software-type algorithms, is the main component used in dentistry.

There is a growing demand in the field of medicine, for AI to approach as transparent, trustworthy, etc for human experts in medicine. Thus, the participants of this study were aware about the usage of AI in the field of Dentistry. Dentistry is a field of medicine where new technologies are developing very quickly. Nowadays, artificial intelligence and neural networks are mostly used in dental radiology to facilitate diagnosis, treatment planning, and prediction of the treatment results. Other areas of dentistry where neural networks are used are genetics, psychology, microbiology, and many others. The most frequently used types of neural networks are artificial neural networks and convolutional neural networks. Generally speaking, AI has its limitations so no matter how infatuated or convinced you are about the possibilities of AI and automation, it is simply not realistic to expect it to entirely replace human in near future at all.

Every technological development has come with introduction of element of fear within the field of radiological science and AI appears to have bright future ahead as a potentially “game changing” tool. With time, it is hoped that the promising first results would blossom into practical solutions in which AI and health-care providers may collaborate to improve patient care. AI seems to be promising adjunctive tool for diagnosis, looks like hardworking, reliable friend to dentist and radiologists.

We need to take artificial away from our embrace of technology. The term AI should stand for Augmented Intelligence. Artificial intelligence will not replace Dentist. However, Dentist's who use AI will replace those who don't.

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