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Original Research Article

Study on Patient's Awareness towards Role of Artificial Intelligence in Dentistry

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ABSTRACT

Introduction: With AI, the entire process of analysis can be automated to assess the image as a whole to detect dental pathologies more quickly and accurately. Correct diagnosis is the key to a successful clinical practice. In this regard, it was revealed that adequately trained neural networks can be a boon to diagnostician. AI could shape the future of public health and health care delivery. The major objective is to study the knowledge of patient regarding role of artificial intelligence in dentistry among respondents.

Material & methods: Altogether 196 respondents male and female of 15 years of age and above were included in the study. Data collection was done from the dental clinics located in Prayagraj district of Uttar Pradesh by pretested interview schedule. The data analysis was carried out using SPSS program.

Result: The findings include that public understanding of AI is "broad" (75.5% using healthcare apps) but not "deep" (77% don't know the fact that AI helps in clinical decision making).

Conclusion: It can be concluded that, at present the extent of the opportunities and limitations is just being explored. Majority of patients had satisfactory knowledge and are optimistic towards its increasing involvement in clinics and daily life. It is evident that there also exists misapprehension regarding this emerging technology. AI could shape the future of public health and health care delivery. AI application in dentistry could help clinician provide the best possible care, thus making high quality health care services available to all, and could increase people's engagement in their own health.

Keywords: Artificial Intelligence (AI), dentistry, public health.

INTRODUCTION

The field of AI was founded at a conference in 1956. Artificial Intelligence" is used when a machine mimics "cognitive" functions that humans relate with other human minds, such as "learning" and "problem. solving". [1] John McCarthy, the father of artificial intelligence, describes AI as the science and engineering of making intelligent machines, especially intelligent computer programs. It helps humans to amalgamate human intelligence with a computer technology to enhance the potential of the healthcare industry to serve better. Healthcare, in general, is a very natural client for artificial intelligence applications. FDA creating regulatory pathways to encourage developers of medical decision support software, analysts predict that the use of artificial intelligence in healthcare will rise tenfold in the next few years.

The Dentistry AI team has a platform for caries detection that is in the final stages of clinical evaluation. Commercial availability of a reliable caries

detection tool based on artificial intelligence expected in the next 1 to 2 years. Machine learning algorithms are increasingly common in cancer diagnosis and prognosis. [2] CADCAM has replaced the time consuming and lengthy process of conventional casting and reducing the human error factor in final prosthesis. [3] Design assistant, RaPid integrates CAD/CAM technique basically creates a two-dimensional and three- dimensional models and their materialization by numerically controlled mechanics. It has replaced the time consuming and lengthy process of conventional casting and reducing the human error factor in final prosthesis. **S**horter operation time, safer manipulation around delicate structures and higher intraoperative accuracy are the rewards of AI. [4]

Oral disease affected half of population of world (3.58 billion) with dental caries in permanent teeth. [5] Dental treatment is costly, averaging 5% of total health expenditure & 20% of out of pocket health expenditure in most high income countries**.** The incidence of oral cancer is highest in India, South and Southeast Asian countries. [6] I t is particularly important for Indian healthcare providers to leverage this technology as the country is facing a serious health crisis due to growing burden of diseases and poor doctor-patient ratio. Further, the ever-growing reach of broadband Internet and smart phones give India ample opportunity to bridge the healthcare gap.

In India, 20 per 1,00,000 population are affected by oral cancer types of cancer. Correct diagnosis is the key to a successful clinical practice. Adequately trained neural networks can be a boon to diagnostician. The analysis of data and individual medical profiles by AI might accurately predict a genetic predisposition for oral cancer for large populations. Further, personalized medicine, long-term treatment outcomes, recurrences and survival of oral cancer patients might be specifically calculated by AI algorithms. AI can serve as a useful modality in diagnosis and treatment of lesions of the oral cavity and can be used in screening and classifying suspicious altered oral mucosa undergoing premalignant and malignant changes. The advantage would be no observation fatigue and treatment of lesions of the oral cavity and can be used in screening and classifying suspicious altered oral mucosa undergoing premalignant and malignant changes. AI will not replace dentists, in no ways, there exists a doubt in the supremacy of integrating AI into practice, it can never replace the role of a dentist since clinical practice is not only about diagnosing but also correlating with clinical findings and providing personalized patient care. Although AI can assist in numerous ways, final call has to be made by a dentist as dentistry is a multidisciplinary approach. [7] Understanding AI technology and adapting with change with redefined roles by dentist will be prerequisite for future clinical practice. The major objective is to study the knowledge regarding role of artificial intelligence in dentistry among respondents.

MATERIAL AND METHODS

A cross sectional study was conducted in Prayagraj district of Uttar Pradesh, India among 196 respondents comprising of dental patients in dental clinics of Prayagraj Dental patients both male and female who visited the clinic on the day of survey and willing to participate in the study were included. According to previous study, 85% of dentists are using laptop including AI driven software in their office. [8] On the basis of this static, the sample size was determined using the following formula:

$N=Z^2P(1-P)/e^2$

n = Desired sample

z = confidence interval 1.96

p = prevalence taken 85 % $(0.85)^5$.

p = 85% (0.85)

q = 1- P

= 1 – 0.85

= 0.15

Confidence level (z) = 1.96%

Permissible error (e) = 0.05
According to formula, sample size (n**)** = z^2pq/e^2
Here,
n = sample size, z = 1.96% confidence interval, e = permissible error

$$n = \frac{(1.96)^2 * 0.85*0.15}{(0.05)^2}$$

n = 195.9
Thus, the Sample Size was 196.

Sampling Technique In the first stage, Prayagraj district of Uttar Pradesh, India was selected purposively for the study. In second stage**,** Random sampling (sequential) method was used. A list of registered dental clinic in Prayagraj was made; list was procured from leading trusted site for dentist search (100 clinics), Prayagraj. From the given sample list prime numbered clinic were selected for the study. In the third stage random sampling (sequential) method was used and further every odd numbered clinic is selected for study from already selected list. Out of 100 clinics 13 were selected finally for study 15 patients from each clinic were selected randomly. Data collection from dental patients was done through pretested interview schedule. Data collection was done from January to June 2019. The data analysis was carried out using SPSS program.

The scoring was made as 3 to 1 (3-YES, 2-NO, 1-DON'T KNOW) for given set of 10 questions. A total score for each respondent by adding scores against each response. The knowledge level only gives a numerical score, it does not have standardized categories of low, average and high level of knowledge. Because of this a self definition of categories range was developed (Max. score 30 & min. score=10). Therefore three levels of knowledge are Good (21-30), average (11-20) poor (Below 10). Thus, It was found that majority of participants (83.16%) have average level of knowledge.

RESULTS

Description of study participants: Majority of participants were of age group 25-35 years (26.5%). Out of 196 respondents 69.4% were male and 30.6% female. Majority of respondents belong to Hindu religion (66.3%). About half of the participants were undergraduate. Majority belongs to low income group and about one fourth belong to government service (24%).

Knowledge level of respondents: Relationship between occupation and knowledge level of respondents shows that p value=0.042 which was statistically significant. Another relationship between income and knowledge level of respondents shows that p value=0.000 which was also found statistically significant.

Table 1: Personal profile of the respondents(n=196).* Statistically significant result

Variables	F (n=196)	Percentage	P Value
Age(years) 15-25	34	17.3	0.139
25-35	52	26.5	
35-45	51	26.0	
45-55	41	20.9	
55-65	18	9.2	
Income(INR) 1(BELOW 30000)	99	50.5	0.000*
2(30000-60000)	62	31.6	
3(60000-90000)	24	12.2	
4(ABOVE 90000)	11	5.6	
Qualification Matriculation	4	2.0	0.127
Intermediate	39	19.9	
Under graduation	101	51.5	
Pg & above	52	26.5	
Religion Hindu	130	66.3	0.266
Muslim	43	21.9	
Sikh	10	5.1	
Christian	4	2.0	
Other(Jain, Buddhist)	9	4.6	
Gender Male	136	69.4	
Female	60	30.6	
Occupation Govt service	34	17.3	0.042*
Private service	47	24.0	
Business	42	21.4	
Housewife	31	15.8	
Student	42	21.4	

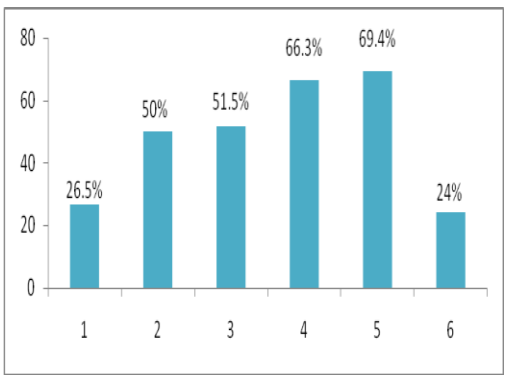

Fig. 1. Personal profile of the respondents

1-Age (25-35,) 2-Income (Below 30000), 3-Qualification (Undergraduate), 4-Religion (Hindu), 5-Gender (Male), 6-Occupation (Private service).

Table2: Knowledge of respondent regarding AI

Questions	Yes	No	Don't know	Knowledge level
Aware of AI driven healthcare apps, devices.	148	48	-	Good
Connectivity with dentist on social media	72	113	10	Average
AI helps in clinical decision making	15	30	151	Poor
AI have improved doctor-patient relationship	165	19	12	Good
Data security	151	10	35	Good
Accountability	152	6	38	Good
Confidentiality issue	33	24	139	Poor
Algorithmic biasness	49	18	129	Poor
Technical mishap can be life threatening	150	12	34	Good
AI mismanagement	15	14	167	Poor

. **Mean** =3.33 **S.D**=2.081

Table3: Analysis of Knowledge level of respondents

Knowledge level	Frequency(n=196)	Percentage
Good (21-30)	29	14.79%
Average (11-20)	163	83.16%
Poor (Below10)	4	2.04%

DISCUSSION

The present study demonstrated that 75.5% (148/196) respondent were aware about AI driven healthcare applications and devices. While a quarter of respondents nearly 24.5% (48/196) have never came in contact with this new technology. Around 52% were aware of the ongoing discussion about AI in radiology and 68% stated 83% of respondents agreed that AI could potentially detect pathologies in radiological examinations but 56% felt that AI would not be able to establish a definite diagnosis. [9] Contrary to this study, the present study suggested that 77% of respondents lack knowledge of AI having role in clinical decision making and only 7.7% (15/196) were aware of it.

The use of social media as a means to facilitate communication between dentists and their patients has been somewhat limited. [10] Another study reported 55% (290/532) of dentists have accounts for their dental practice on various social media platforms. Interestingly, while 73% of patients did not expect their dental practice to have a social media presence, and 44% thought that establishing a friendship with their dentists is not appropriate, the findings show that 36% of patients had searched for their dentists, and 44% of them were happy to establish contacts with dentists on social media. [11] The present study found a similar prevalence of dentist-patient improved connectivity on social media platform which was 36.7% (72/196) reported that connecting dentist would be easier, while 57.7% (113/196) disagreed. This may be due to the fact that the present scenario regarding AI is ambiguous. With the continually growing popularity of the Internet, it may be predicted that in future years, dentists and other health professionals will encounter a still higher prevalence of patients wishing to discuss Internet dental health information with them. The issue of data ownership and privacy needs to be considered as data security is a major concern. As per the observer this study reveals that 77% (151/196) were aware of confidentiality and data securities are major threat.

CONCLUSION

AI is transforming the way people receive healthcare**.** Artificial intelligence is still in its teething stage but the potential is unlimited. [12] It's concluded that, at present the extent of the opportunities and limitations is just being explored. Majority of patients had average knowledge (83.16%) and are optimistic towards its increasing involvement in clinics and daily life. It is evident that there also exists misapprehension regarding these emerging technologies. The findings include that public understanding of AI is "broad" (75.5% using healthcare apps) but not "deep" (77% don't know the fact that AI

helps in clinical decision making). However, there also exists a sizeable number of patients who are already comfortable to connect with their dentists on social media sites. Young people are most optimistic about AI. AI could shape the future of public health and health care delivery. Privacy and data protection implications are not well understood .The AI industry should be accountable and responsible to the public. Data security, confidentiality, accountability were major concern among respondents. AI application in dentistry could help clinician provider in advancement and best possible care, thus making high quality health care services available to all, could increase people's engagement in their own health.

Recommendations

At government level, awareness is essential to eliminate misconception that prevail in society and Support the development of critical safeguards that are essential to enable the adoption of AI. The dental community should seek to enhance the professional self-efficacy of its members in order to enable them to adequately deal with their patients' needs for public health, community health, and health care delivery.

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