The Futuristic trend of Artificial Intelligence in Health Care

Supurna Pandit[1] Sanchit Pradhan [2], Mayank Das [3], Jeevan Josh[4], Mohnish Muchhal.[5], Dhruv Garg [6]

[1,3,5]Assistant Professor ,Department of Public Health Dentistry, Subharti Dental College and Hospital, Swami Vivekanand Subharti University, Meerut ,India

[2]Associate Professor ,Department of Public Health Dentistry, Subharti Dental College and Hospital, Swami Vivekanand Subharti University, Meerut .India

[4]Assistant Professor ,Department of Public Health Dentistry ,Sudha Rustagi College of Dental Sciences and Research , Faridabad . India

[6]Assistant Professor, Department of Oral Medicine and Radiology, DJ college of Dental Sciences & Research , Modinagar, India

Abstract

Artificial intelligence (AI) has revolutionized many industries, including healthcare. In particular, AI has tremendous potential to improve public health dentistry. Public health dentistry is the branch of dentistry that focuses on promoting oral health and preventing dental disease in the population as a whole. With AI, public health dentists can now enhance their ability to identify dental diseases, improve diagnosis and treatment planning, and develop personalized preventive strategies for individuals and communities.

Key words: Artificial Intelligence, Surveillance, dental, health, public.

Introduction

In this era, the goal of modern dentistry is to manage oral lesions and conditions, non-invasively through remineralization techniques(1)or by rapidly developing technologies. Artificial intelligence continues to be one of the computer science's fastest blooming technology. Healthcare could undergo a major shift thanks to AI, which could greatly increase diagnosis accuracy. John McCarthy in Dartmouth Conference1956 give artificial intelligence though many research were done earlier, it enables human intelligence and computer technology to strengthen the healthcare to serve humankind.(2)

AI defines as the combination of human intelligence and computer technology the enhances the potential of the health care industry for the patient care and wellbeing (3)

Health care delivery is primarily the responsibility of state and national governments, but sinking funds, heavy work burden, lack of equipment's, and high absenteeism crop up as roadblocks impinging the government's efforts.(4) Inspite of such roadblocks, Government is now promoting the use of AI which has now become the emerging field and it can significantly improve diagnostic precision and radically change the healthcare sector. Because it can locate and distinguish lesions that are hidden from the human eye, computer-based diagnostics is becoming more and more popular and paving the way for a holistic approach to medicine record making , immunization ,dosage algorithms, health promotion , health prevention, health protection , public health surveillance and also assist doctor in doing personalized medicine, individualized treatment plans, patient monitoring, and forecasting and tracking the spread of epidemic diseases

To explore and interpret the impact of the overall illness pattern on oral health, ai is anticipated to bridge the gap between medicine and dentistry. Applications of AI in healthcare span the spectrum from patient outcome analytics to therapeutic interventions, preventive, and emergency situations.(5)

Application Of Artifical Intelligence In Medicine

❖ Medical Imaging: AI algorithms are used to analyze medical images such as X-rays, CT scans, and MRIs. AI systems can quickly and accurately detect abnormalities, assist in diagnosing diseases like cancer, and aid in the interpretation of complex images.

❖ Disease Diagnosis: AI models are developed to analyze patient data, including symptoms, medical records, and genetic information, to help diagnose diseases. AI can provide insights, suggest potential diagnoses, and assist doctors in making informed decisions.

- ❖ Drug Discovery and Development: AI is being used to expedite the process of drug discovery and development. Machine learning algorithms can analyze vast amounts of biological and chemical data to identify potential drug candidates, predict their efficacy, and simulate their interactions with the human body.
- ❖ Personalized Medicine: AI enables the customization of medical treatment based on an individual's unique characteristics. By analyzing patient data, AI algorithms can help determine the most effective treatment plans, predict disease progression, and identify personalized interventions.
- ❖ Virtual Assistants and Chatbots: AI-powered virtual assistants and chatbots can provide basic medical advice, answer questions, and assist with triaging patients. They can offer support and information, reducing the burden on healthcare providers and improving patient access to healthcare resources.
- ❖ Predictive Analytics and Early Intervention: AI models can analyze patient data to identify patterns and predict health outcomes. This helps healthcare providers intervene early, prevent complications, and provide timely treatments.
- ❖ Remote Monitoring and Telemedicine: AI-enabled devices can continuously monitor patients remotely, collect data, and alert healthcare professionals in case of anomalies. Telemedicine platforms leverage AI for virtual consultations, remote diagnosis, and treatment recommendations
- ❖ Administrative Tasks and Workflow Optimization: AI systems can automate administrative tasks such as documentation, scheduling, and billing. This helps streamline workflows, reduce paperwork, and free up healthcare professionals' time for more direct patient care.

Application Of Artifical Intelligence In The Field Of Dentistry

With a focus on diagnostic records of virtual IOPAs/RVGs, 3-D scans, and cone-beam computed tomography, AI is quickly advancing into the field of radiography treatment planning ,virtual dental assistant, robotics assisted dental surgery, conservative endodonticsand orthodontics and dentofacial orthopaedics(6) By the use of computer-aided design and production techniques , ensures that the prosthesis fits the wearer precisely (7) and may have a substantial effect on orofacial and craniofacial prosthesis ,endodontic and implantology as well.(8) AI has potential to enhance the precision , efficiency and quality of dental care , enabling dentist to deliver more personalized and effective treatments while improving patient outcomes .

Application Of Artifical Intelligence In The Field Of Public Health Dentistry

Artificial intelligence (AI) has revolutionized many industries, including healthcare. In particular, AI has tremendous potential to improve public health dentistry. Public health dentistry is the branch of dentistry that focuses on promoting oral health and preventing dental disease in the population as a whole. With AI, public health dentists can now enhance their ability to identify dental diseases, improve diagnosis and treatment planning, and develop personalized preventive strategies for individuals and communities.Artificial intelligence has the potential to give more accurate and sophisticated tools for diagnosis, treatment planning, health promotion , health prevention, health protection , public health surveillance. With measurable success, artificial intelligence has been incorporated into academic research and inference activities across the wider economic system.In order to spot trends, forecast the course of diseases, and create efficient preventative policies.

HEALTH PROMOTION

AI offers tailored and focused health advice based on a person's risk profile and behavioral tendencies. Experts have a variety of skills, depending on their training and prior experience. This has led to an increase in interest in using computer-aided decision making, among other things.(9) For Example The public or commercial health sectors can virtually give oral health education and dialogues to target populations and communities for the benefit of all through the use of Metaverse software..

HEALTH PROTECTION

Artificial intelligence has the potential to be used in the field of health protection by studying data patterns for close-to-real-time surveillance and ailment identification and promotion of health.(10) For instance, it can be used for the identification and management of oral cavity lesions as well as screen for and identify suspected altered mucosa that is undergoing premalignant and malignant modifications. The naked eye would not otherwise be able to detect tiny changes in individual pixels.

HEALTH SERVICE

AI improves the effectiveness of healthcare services. Using artificial intelligence to find anomalies automatic evidence generation aided by machine learning government application. Documentation, scientific coding,

organizing scientific complexity, storing and maintaining patient databases, tracking patient orders, keeping tabs on patient conditions, and taking preventive measures like setting up recurring reminders for patients who are taking part in tobacco or smoking cessation programs are some of the most widespread applications of artificial intelligence's natural language processing (NLP) in the healthcare sector. It aids in guiding researchers when they are developing cohorts for costly clinical studies.(11)

PUBLIC HEALTH SURVELLIENCE

Identifying, describing, monitoring, and reacting to disease outbreaks, other health hazards, and other population-related health phenomena is the process of public health surveillance. To ensure a prompt, targeted, and effective reaction to emerging health events that happen at the time of disasters(12), these surveillances take place at the local, state, national, and international levels and frequently need the integration of numerous organizations.(13)

Early, automatic detection of emerging outbreaks and other health-related phenomena can help public health. Artificial intelligence and mechanical learning can play a role in this. Significant advancements in epidemic detection techniques have been made over the past ten years, including the integration of different data streams, local and temporary data analysis, and enhanced detection performance measurement measures.(14)

The vast majority of the data used in today's diagnostic programs comes from non-traditional sources, such as user-generated web content, electronic health records, sensor networks, mobile phones, and other location-aware devices. In order to determine large amounts of data, useful patterns, and support public health decision-making, functional diagnostic systems will need to consistently change their methods of data analysis at the public scale. These methods will include techniques from artificial intelligence, machine learning, and data mining. Experts will place a great deal of reliance on instruments and systems that employ cutting-edge statistical techniques to precisely distinguish related ineffective patterns, scalable algorithms to process enormous amounts of complex, highly dimensional data, and machine learning techniques to further enhance system performance from user feedback.

CHALLENGES FACED BY ARTIFICAL INTELLIGENCE IN HEALTHCARE

Although the use of AI in healthcare has a very promising future, there are still certain technological and ethical obstacles to overcome because AI-based systems are machine-based, managed, and operated by computer scientists without any medical experience, this has led to a very problem-focused approach to applying AI in healthcare delivery.(15) Additionally, modern healthcare delivery methods that only rely on clinician abilities and patient-clinician dialogue cannot be replaced by AI. The use of robotic helpers has led to a number of problems in the healthcare industry.(16) The adoption of AI based technology by the dental practitioner is hesitant. A model that incorporates both AI and human components is preferable since it will make data gathering and categorization easier while preserving the human features of clinical treatment

FUTURE OUTLOOK OF ARTIFICIAL INTELLEGENCE

Artificial Intelligence (AI) has rapidly advanced in various fields, revolutionizing industries and transforming the way we work and live. In dentistry, AI is poised to play a significant role in shaping the future of dental healthcare, improving diagnostic accuracy, treatment planning, and patient care.

One of the most promising applications of AI in dentistry is in image analysis and diagnostics. AI algorithms can analyze dental images, such as X-rays and scans, with remarkable accuracy, aiding in the early detection of oral diseases, such as cavities, periodontal diseases, and even oral cancers. This can lead to more timely interventions, improved treatment outcomes, and potentially life-saving diagnoses.

AI-powered systems can also assist in treatment planning and decision-making processes. By analyzing vast amounts of patient data, including medical history, clinical records, and treatment outcomes, AI algorithms can provide personalized treatment recommendations based on evidence-based guidelines and best practices. This can help dentists make more informed decisions and develop tailored treatment plans for each patient, resulting in improved patient sam3wstisfaction and better overall oral health.

Moreover, AI-powered virtual assistants and chatbots are becoming increasingly popular in dental practices. These intelligent systems can interact with patients, answer their questions, provide oral hygiene instructions,

and even schedule appointments. This not only enhances the patient experience but also helps streamline administrative tasks, allowing dental professionals to focus more on providing quality care.

Looking ahead, the future of AI in dentistry holds great promise. With further advancements in machine learning, deep learning, and natural language processing, AI systems will continue to evolve, becoming more accurate, efficient, and capable of handling complex tasks. Dentists and dental professionals will benefit from AI tools that can assist in diagnosing, planning, and treating patients, ultimately leading to enhanced oral healthcare outcomes for individuals and populations as a whole. However, it's important to note that while AI can augment and support dental professionals, human expertise and judgment will always remain crucial in providing comprehensive dental care.

Conclusion

In conclusion, AI has tremendous potential to improve public health dentistry by providing more accurate and sophisticated tools for diagnosis, detection, improving disease detection public health surveillance, precision medicine, health care resource management, treatment planning, and preventive care and in green dentistry(17) . AI-based systems can analyze dental images and clinical data to identify dental pathologies with high accuracy and speed. In addition, AI can help dentists to develop personalized treatment plans and preventive strategies based on a patient's individual needs and risk factors. A careful attention must be given to the data quality, privacy, bias, ethics and regulatory framework to maximize the benefit of AI while minimizing potential risk However, there are also significant challenges and limitations that need to be addressed, such as the lack of access to dental data and the need for training and education. With further research and development, AI can become an invaluable tool for promoting oral health and preventing dental disease in the population as a whole

Acknowledgement

References

1. Anupriya S, Ragni T, Kamlesh S, Tanupriya S, Sanchit P, Neha S. How demineralised teeth get remineralised- a combat to keep teeth strong and healthy. International Journal of Current Research, 2018;10(04):68030-68033.(http://www.journalcra.com)
2. Jaiswal M, Gupta N, Singh A. Study on patient's awareness towards role of artificial intelligence in dentistry. Int J Health Sci Res. 2019;9(10):35–9.(ISSN: 2249-9571)
3. Dr Neeta Misra and Dr Sneha Agrawal.2020, Artificial Intelligence in Dentistry: the Game Changer. Int J Recent Sci Res. 11(05), pp. 38685-38689. (DOI: http://dx.doi.org/10.24327/ijrsr.2020.1105.5358)
4. Pradhan S,Srivastava A,Tandon S, Yadav N, Pahuja M, Srivastava T. Public-Private Partnership in Oral Health-is it aRequirement or a Need?Indian Journal of Contemporary Dentistry, July-December 2018;6(2)1-6 . (DOI10.5958/2320-5962.2018.00010.4.)
5. Clarkson JE, Ramsay CR, Eccles MP, Eldridge S, Grimshaw JM,Treweek S, et al. The translation research in a dental setting (TRiaDS) programme protocol. *Implement Sci*. 2010;5:57. (doi:10.1186/1748-5908-5-57.)
6. Srivastava A, Pradhan S, Raghav P. Artificial intelligence in dentistry:The ethical and regulatory issues,Journal of Neuroquantology,October 2022;20(11):6953-6967 (DOI: 10.14704/NQ.2022.20.11.NQ66692.)
7. Kikuchi H, IkedaM, Araki K, Evaluation of a Virtual Reality Simulation System for Porcelain Fused to Metal Crown Preparation at Tokyo Medical and Dental University. Journal of Dental Education 2013;77:782-92. DOI:10.1002/j.0022-0337.2013.77.6.tb05530.x
8. Buchanan JA. Experience with virtual reality-based technology in teaching restorative dental procedures. J Dent Educ. 2004;68(12):1258 (https://doi.org/10.1002/j.0022-0337.2004.68.12.tb03875.x)
9. Tariq SA, Gupta NI, Gupta PR, Sharma AD. Artificial Intelligence in Public Health Dentistry. IntHealthc Res J. 2021;5(9). (DOI:10.26440/IHRJ/0509.12489)
10. Muscatello DJ, Churches T, Kaldor J, Zheng W, Chiu C, Correll P, Jorm L. An automated, broad-based, near real-time public health surveillance system using presentations to hospital Emergency Departments in New South Wales, Australia. BMC public health. 2005 Dec;5(1):1-2. (DOI-https://doi.org/10.1186/1471-2458-5-141)

11. Bender EM, Friedman B. Data statements for natural language processing: Toward mitigating system bias and enabling better science. Transactions of the Association for Computational Linguistics. 2018 Jan 1;6:587-604.(DOI:10.1162/tacl_a_00041)

12. Singh AV, Tangade P, Saleem A, Josh J, Pandit S, Kumar S. Disasters Surpassed Every Previous Years in Cruelty- A Narrative Review. Int J Sci Stud 2020;8(8):7-13. (http://www.ijss-sn.com/uploads/2/0/1/5/20153321/03_ijss_nov_ra01_-_2020.pdf)

13. Cooper GF, Dash D, Levander J, Wong W-K, Hogan W, Wagner M. Bayesian Biosurveillance of Disease Outbreaks. Proc. 20th Conf. Uncertainty in Artificial Intelligence;2004,94–103.(DOI https://www.researchgate.net/publication/229157536)

14. Kulldorff, M, Mostashari F, Duczmal L, Katherine Yih W, Kleinman K, Platt R. Multivariate scan statistics for disease surveillance. Statist Med. 2007;26:1824-33.(DOI https://doi.org/10.1002/sim.2818)

15. Coiera EW. Artificial intelligence in medicine: the challenges ahead. J Am Med Inf Assoc. 1996;3(6):363–366. (DOI: 10.1136/jamia.1996.97084510)

16. _Artificial_intelligence_in_medicine_Humans_need_not_applyDiprose W, Buist N. Artificial intelligence in medicine: humans need not apply? N Z Med J. 2016;129(1434):73–76.(DOI https://www.researchgate.net/publication/303019481)

17. Supurna Pandit, Pradeep Tangade , Jeevan Josh , Aditya Veer Singh, "The Modern Era of new eco-friendly dentistry : Green dentistry", IJDSIR- October - 2020, Vol. – 3, Issue - 5, P. No. 160 – 164.(https://www.ijdsir.com/)