

NLP and oral health information

Dear Editor,

We would like to address the increasing attention and debate around the generative artificial intelligence (AI) powered by natural language processing (NLP) systems such as ChatGPT. Our concerns limit to oral health and information pertaining to oral pathology.

Artificial intelligence (AI) is a branch of computer science that focuses on creating intelligent machines that can think and act like humans.^[1] The concept of AI in its current form was introduced in 1956. It has grown rapidly and is now widely applied in the fields of finance, retail, autonomous automobiles, internet of things (IoT), medical diagnosis and healthcare.

ARTIFICIAL INTELLIGENCE (AI)

AI involves computer programming language, statistics and machine learning algorithm and tools. It encompasses machine learning (ML), deep learning and natural language processing (NLP). Machine learning is used in big data, data mining, and profiling NLP uses neural networks to generate connections mimicking human communication. It simulates nodes and layers, which are weighted to determine appropriate response by mathematical programming [Figure 1].^[2,3] There are many programs that utilise NLP. One such program that has become all pervasive and is garnering much attention is ChatGPT (generative pre-trained transformer) by a company called OpenAI. ChatGPT is a chat bot ('A computer program designed to simulate conversation with human users, especially over the internet')^[4] that has evolved to generate responses to questions in a 'human manner'.

The growth of ChatGPT is both exciting and concerning. In a recent editorial published in *JAMA* on the use of NLP in scientific publication and medical education, attention was drawn to 'potential misuse to cheat on homework, write essay assignments and exams including medical licensing examinations'. In January 2023, *Nature* reported four manuscripts in the fields of science and health, which had ChatGPT as co-author. This raises many ethical issues about its potential use and misuse.

In this current scenario, as ChatGPT is freely accessible to the general public, we decided to do a search in this NLP

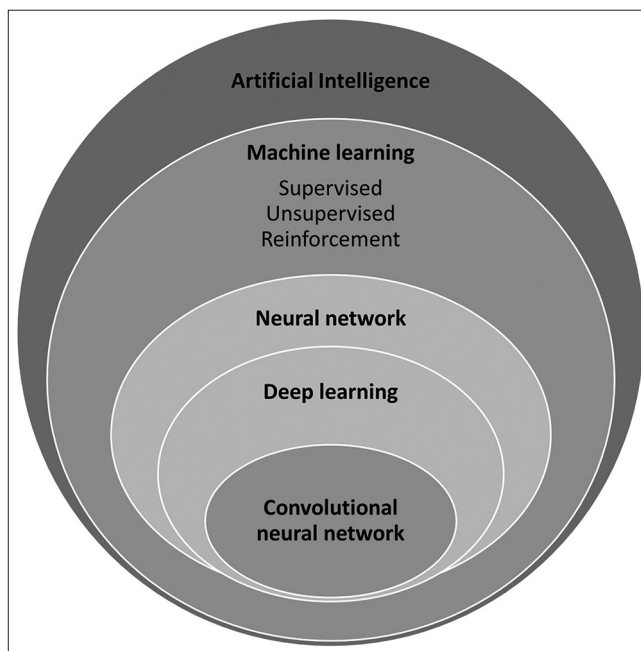


Figure 1: Elements of artificial intelligence

for five often asked questions both by patients and general practitioners, with respect to oral cancer. The questions encompassed general and specific information to ascertain the level of information/misinformation that can arise from this generative NLP.

Below are the questions and excerpts from the answers derived from ChatGPT response.

Question 1. Health effects of tobacco

Answer 1

- 'Tobacco use is a major cause of preventable death and disease worldwide, causing cancer, heart disease, stroke, lung diseases and other health problems...'
- 'Tobacco use is a major cause of preventable death and disease worldwide...'
- 'In addition to cancer, tobacco use can also cause a variety of respiratory problems...'
- 'Pregnant women who smoke are at a higher risk of complications during pregnancy...'
- 'Tobacco use also has a significant impact on oral health'.
- 'In addition to the health effects, tobacco use also has social and economic consequences...'

- ‘Tobacco use also has a major impact on the economy, through increased health care costs and lost productivity due to illness and death...’.
- ‘In conclusion, tobacco use has significant health, social and economic consequences. Quitting tobacco use can greatly improve overall health and reduce the risk of these health problems. Support and resources are available to help individuals quit smoking and lead a healthier life’.

Question 2. ‘Benefits’ of arecanut

(This question was framed as arecanut is not considered harmful in many communities.)

Answer 2

- ‘Areca nut and tobacco are widely used products with different cultural and traditional significance. Areca nut is consumed as a stimulant in many parts of Asia and is considered to have medicinal properties’.
- ‘Arecanut and tobacco are two widely consumed products in different parts of the world for various purposes.... Despite their widespread use, both these products have their own set of benefits and drawbacks’.
- ‘Arecanut has been used for medicinal purposes for centuries in Southeast Asia and is believed to have anti-inflammatory, anti-cancer and anti-bacterial properties. It is also used as a stimulant, which can help to improve focus and alertness’.

Question 3. Oral potentially malignant disorders (OPMD) – most important histopathological and cytological features

Answer 3

- ‘Oral potentially malignant disorders (OPMDs) are conditions that have the potential to develop into oral cancer. The most important histopathological features of OPMDs include dysplasia, which is an abnormal growth of cells, and atypia, which is an abnormal shape of cells...’.
- ‘These conditions include leukoplakia, erythroplakia, oral submucous fibrosis and lichen planus...’.
- ‘Histopathological features of OPMDs include dysplasia, which refers to the abnormal growth of cells, and atypia, which refers to the abnormal shape of cells...’.
- ‘Cytological features of OPMDs can be evaluated through oral smears...’.
- ‘It is important to note that the presence of histopathological and cytological abnormalities does not necessarily indicate the development of cancer.’

However, OPMDs must be closely monitored and properly evaluated to assess the risk of progression to cancer. This can involve repeat biopsies, regular clinical examinations, and ongoing monitoring of symptoms...’.

Question 4. What is leukoplakia ?

Answer 4

- ‘Leukoplakia is a white or grayish thick patch that appears on the tongue or inside of the cheek. It is a potentially precancerous condition that is commonly caused by chronic irritation from habits such as tobacco or alcohol use or from ill-fitting dentures...’.
- ‘Leukoplakia does not go away on its own and can develop into oral cancer if left untreated. A biopsy is usually required to determine if the lesion is benign or if it requires further medical attention. Maintaining good oral hygiene, quitting tobacco use and regularly visiting a dentist can help prevent the development of leukoplakia...’.
- ‘In conclusion, leukoplakia is a potentially precancerous condition that can develop into oral cancer if left untreated. Adopting healthy habits, seeking medical attention and regularly visiting a dentist can help prevent the development of leukoplakia and ensure good oral health’.

Question 5. Difference between oral lichen planus and lichenoid mucositis

Answer 5

- ‘Oral lichen planus (OLP) and lichenoid mucositis are both oral mucosal diseases but they have some distinct differences...’.
- ‘OLP is a chronic autoimmune condition that affects the oral mucosa and is characterised by white or yellow, lacy or reticular lesions. It can be associated with itching or burning sensations...’.
- ‘Lichenoid mucositis is an inflammation of the oral mucosa that results in similar looking lesions as OLP but is caused by an irritant, such as a medication, or an allergic reaction to a dental material.’.
- ‘Unlike OLP, lichenoid mucositis is not a chronic condition and often resolves once the causative factor is removed. In summary, OLP is a chronic autoimmune disease while lichenoid mucositis is an acute inflammatory reaction to an irritant or allergen’.

Question 6. Geographic tongue and cancer

Answer 6

- ‘Geographic tongue is a benign condition where the tongue develops patches without papillae (small bumps) that have a map-like appearance, resulting in a change of the tongue’s surface. There is no known direct link between geographic tongue and cancer. However, some people with cancer can develop oral symptoms such as painful mouth sores or changes in the tongue. If you are experiencing any unusual symptoms in your mouth, it is important to seek medical attention to determine the underlying cause. An accurate diagnosis can only be made by a healthcare professional after a thorough examination and appropriate testing...’.

Question 7. Tooth and cancer

Answer 7

- ‘Tooth and cancer are two different medical conditions. Tooth problems may include cavities, gum disease and tooth loss. Cancer is a disease characterised by uncontrolled growth and spread of abnormal cells. There is no direct link between tooth and cancer; however, poor oral hygiene has been linked to an increased risk of certain types of cancer, such as oral and pharyngeal cancer. It is important to maintain good oral hygiene and regularly visit a dentist to keep your teeth and gums healthy and detect any early signs of cancer...’.

CONCLUSION

ChatGPT has emerged as an immersive technology with more than 100 million active users in a short span of time. It is interesting to note that the answers generated by ChatGPT are generic, non-specific, broad based and do not provide references. In its responses, sentences are rephrased multiple times and presented in the final output. The responses generated are:

1. Broad based
2. No references
3. Rephrasing of sentences multiple times
4. Answer varies depending on the question. Example – Benefits of arecanut (Question 2)
5. If taken out context, it is misleading. Example – Health effects of tobacco (Question 1)

The response seems useful; however, it should be noted that the answers which when taken out of context result in wrong interpretation and have the potential to be misunderstood. They have a broad scope of misinterpretation if taken out of context. Also, the phrasing is important. An example of this is when asked about beneficial effects of arecanut, the

answers are about the presumed beneficial effects when it is used occasionally. It does not provide any information about the chronic effects of arecanut misuse. This is a small template with search responses, informing the pathologist about the potential use of this application. There is a need to appraise the general public, oral health care provider and the academic personnel of the potential limitations of information emerging from such AI generated, summed using non-referenced sources.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Preetha Selvan, Rooban Thavarajah,
Kannan Ranganathan

Department of Oral and Maxillofacial Pathology, Ragas Dental College and Hospital, Uthandi, Chennai, Tamil Nadu, India

Address for correspondence: Dr. Kannan Ranganathan,
Department of Oral and Maxillofacial Pathology, Ragas Dental College and Hospital, 2/102, East Coast Road, Uthandi, Chennai - 600 119, India.
E-mail: ranjay22@gmail.com

Submitted: 20-Feb-2023,

Accepted: 21-Feb-2023, **Published:** 21-Mar-2023

REFERENCES

1. Deng J, Lin Y. The Benefits and challenges of ChatGPT: An overview. *Front Comput Intell Syst* 2023;2:81-3.
2. Flanagan A, Bibbins-Domingo K, Berkwitz M, Christiansen SL. Nonhuman “authors” and implications for the integrity of scientific publication and medical knowledge. *JAMA* 2023. doi: 10.1001/jama.2023.1344.
3. Chiu H-Y, Chao H-S, Chen Y-M. Application of artificial intelligence in lung cancer. *Cancers* 2022;14:1370.
4. Adamopoulou E, Moussiades L. An overview of Chatbot technology. *Artif Intell Appl Innov* 2020;584:373-83.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Access this article online	
Quick Response Code:	Website: www.jomfp.in
	DOI: 10.4103/jomfp.jomfp_85_23

How to cite this article: Selvan P, Thavarajah R, Ranganathan K. NLP and oral health information. *J Oral Maxillofac Pathol* 2023;27:15-7.

© 2023 Journal of Oral and Maxillofacial Pathology | Published by Wolters Kluwer -Medknow