

CHATGPT IN DENTISTRY: DECODING TRUE POTENTIAL AND IDENTIFYING SHORTCOMINGS**Pallavi Taneja¹ and Gayathri Krishnamoorthy²**¹ Manipal College of Dental Sciences, Manipal, Karnataka, India² Reader, Department of Prosthodontics and Crown & Bridge, Manipal College of Dental Sciences, Manipal, Karnataka, India¹ pallavioman@gmail.com and ² gayathri.km@manipal.edu**ABSTRACT**

With advances in technology, artificial intelligence (AI) has begun to integrate itself in almost every field including dentistry. One of the latest advances in AI is Chat Generative Pre-Trained Transformer (ChatGPT), a ChatBot wherein the user can ask any question and is provided by a prompt, real time response which enables the user to experience a human like conversation. Though it has made a vast amount of information readily accessible to people, its use in dentistry comes with major drawbacks, the most important of which being misleading inaccurate and inadequate information. Its use by an inexperienced clinician can prove detrimental to the patient. Consequently, extreme caution and human supervision must be exercised whenever ChatGPT is to be used. The following clinical report demonstrates the shortcomings of ChatGPT by providing examples of signs and symptoms of patients which were put into ChatGPT and the responses provided by it; thus, showcasing how important it is for clinicians to be aware of the possibility of such outcomes when using this software.

Index Terms – Artificial intelligence, technology, ChatGPT, dentistry, diagnosis, differential diagnosis, limitations, inaccuracy, reliability

INTRODUCTION

Artificial intelligence (AI) is a branch of computer science that has the potential to imitate human intellect to make predictions and make complicated decisions [1]. It has acquired the ability to perform tasks previously carried out by humans with the help of Artificial Neural Networks (ANNs) which may be composed of as many as 100 layers of neurons which are able to process large amounts of increasingly complex data [2]. Like various fields, AI has also gained widespread application in medicine and dentistry where it is being used to assist in diagnosis and treatment planning, reduce the number of postoperative complications, identify pathologies and abnormal structures [1]. ChatGPT is one such type of AI application which was launched by OpenAI in 2022, a large language model (LLM), trained on massive amounts of data sets which can respond to human input in a conversational manner [3]. ChatGPT has numerous applications in dentistry where it can be used as a supplementary tool in diagnosis and make decisions regarding patient treatment thus saving time. It can help predict the possible mishaps during treatment and consequently prevent them, it can aid in scientific research and even in patient education [4]. Despite these advantages, there have been concerns regarding the possibility of inaccurate results leading to possible misdiagnosis and incorrect patient treatment. It can also lead to the spread of misinformation and bias and can be a risk to patient privacy as the patient's medical information needs to be entered into the software [3,4]. To further assess the limitations of ChatGPT, we conducted the following experiment wherein we fed signs and symptoms of certain diseases into the software and analyzed the results provided by it.

CLINICAL REPORT

Input 1: Patient presents with diffuse, greyish white opalescent lesion occurring bilaterally on the buccal mucosa. what is it? FIG.1

ChatGPT response: Based on the description provided, the diffuse, greyish white opalescent lesion occurring bilaterally on the buccal mucosa could potentially be a condition called leukoplakia.

SUB-INPUT 1a - It cannot be scraped off and it disappears or fades upon stretching.

CHATGPT RESPONSE - If the lesion cannot be scraped off and it disappears or fades upon stretching, it is more likely to be a condition known as lichen planus.

SUB-INPUT 1b - It is not a potentially malignant disorder and is a normal anatomic variation.

CHATGPT RESPONSE. If the lesion is a normal anatomic variation and not a potentially malignant disorder, it could be a condition known as Fordyce granules or Fordyce spots.

SUB-INPUT 1c - Why cannot it be leukoedema?

CHATGPT RESPONSE- I apologize for not considering leukoedema as a possibility. Leukoedema is another condition that can present as a diffuse, greyish white opalescent lesion on the buccal mucosa.

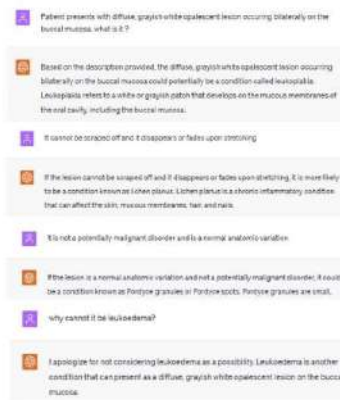


Fig.1

INPUT 2- Patient presents with pain the right upper back tooth for 2 days. Pain is short, sharp and lasts only for a moment. Pain occurs only on application of stimulus. What is the diagnosis? FIG.2

CHATGPT RESPONSE- Based on the description provided, the diagnosis for the patient's symptoms is likely to be dentinal hypersensitivity.

SUB-INPUT 2a - Why couldn't it be reversible pulpitis?

CHATGPT RESPONSE- I apologize for not considering reversible pulpitis as a potential diagnosis based on the given information.



Fig.2

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INPUT 3- Patient presents with an erythematous lesion of the palate which has a diffuse border. Patient is on inhalational steroids. What is the diagnosis? FIG. 3

CHATGPT RESPONSE- Based on the information provided, a possible diagnosis for the erythematous lesion of the palate with a diffuse border in a patient with inhalational steroids is steroid induced palatal erythema or steroid induced palatal stomatitis

SUB-INPUT 3a - Could it be erythematous candidiasis?

CHATGPT RESPONSE- Yes, erythematous candidiasis also known as chronic atrophic candidiasis is another possible diagnosis.

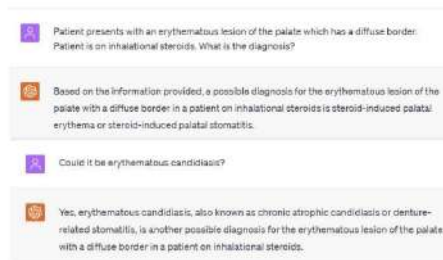


Fig.4

INPUT 4- Patient presents with an erythematous lesion in the center of the posterior part of the dorsum of the tongue. Lesion has an oval configuration. What is the diagnosis? FIG.4

CHATGPT RESPONSE- Based on the description provided, a possible diagnosis could be geographic tongue also known as benign migratory glossitis.

SUB-INPUT 4a- There is no map like configuration.

CHATGPT RESPONSE- Apologies for the confusion, if there is no map like configuration, it could be a traumatic ulcer.

SUB-INPUT 4b - The lesion is asymptomatic and the surface is lobulated.

CHATGPT RESPONSE- Based on the description, a possible diagnosis could be a lingual thyroid nodule.

SUB-INPUT 4c - Could it be median rhomboid glossitis?

CHATGPT RESPONSE- Yes, based on the description, another possible diagnosis could be median rhomboid glossitis.

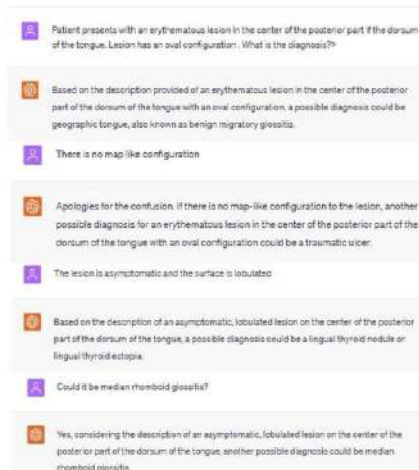


Fig. 4

INPUT 5- Patient presents with vertical white folds in a palisading appearance on the lateral borders of the tongue. It is asymptomatic and cannot be scraped off. What is the diagnosis? FIG.5

CHATGPT RESPONSE- Based on the description, a possible diagnosis could be oral lichen planus.

SUB -INPUT 5a - Could it be oral hairy leukoplakia?

CHATGPT RESPONSE- Apologies for the confusion, yes a possible diagnosis could be oral hairy leukoplakia.

DISCUSSION

Based on the examples of prompts provided, it shows that ChatGPT may provide inaccurate results, which if the clinician is inexperienced, may lead to misdiagnosis of the condition and initiate treatment in the wrong direction. Furthermore, it may provide results that may seem scientifically plausible but are incorrect, a phenomenon called as hallucination effect [5]. It cannot integrate textbooks and medical journals due to which it can only provide responses based on the input which often leads to lack of up-to-date information and inaccurate results especially in case of complex questions [5]. According to a study done by Balel et al who evaluated ChatGPT responses in the field of oral and maxillofacial surgery, it was shown that ChatGPT provided accurate results for most of the patient-oriented questions; however, it failed to do so in case of technical questions due to lack of scientific references. [6]. Though ChatGPT can be a useful tool for patients to learn about their health and gain knowledge about any procedure, the clinician cannot solely rely upon it to make an accurate diagnosis without any human involvement [6]. Another major limitation of this chatbot is that in case of insufficient information by the user, it tends to make assumptions and provides the user with an answer rather than asking for clarifying questions [7]. According to a report by Mayo Clinic published in 2023, the current database of ChatGPT dates back prior to 2021, which in the field of healthcare is a major concern as it is an area of active research and new knowledge is acquired daily [8]. ChatGPT can be used as a supplementary tool only to assist in diagnosis but every answer provided by it should be subjected to scrutiny and evaluation. The extent to which ChatGPT can be used in dentistry is still debatable and further research needs to be done to understand its true potential and applications.

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