



Artificial intelligence-based ChatGPT chatbot responses for patient and parent questions on vernal keratoconjunctivitis

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Key messages

What is Known:

- Vernal keratoconjunctivitis (VKC) is a complex and recurring disease that predominantly affects the pediatric population and can have significant psychological and socioeconomic impact.

What is new:

- Patients and parents often seek information about VKC online, and ChatGPT, an artificial intelligence-based chatbot, is gaining popularity as a source of information on a wide range of topics, including health and disease.
- While ChatGPT often provides relevant responses to typical patient and parent questions on VKC, the study found that it also provides inaccurate and potentially dangerous statements, particularly regarding treatment and potential side effects of medications.
- Patients and parents should be cautious when relying solely on ChatGPT for medical advice, and ophthalmologists should be aware of the trends in information available on the internet.

Vernal keratoconjunctivitis (VKC) is a recurring, bilateral, and severe allergic and inflammatory disease that primarily affects the pediatric population [1]. Symptoms include pain, burning sensation, itching, tearing, and light sensitivity. The management of VKC can be complex, costly, and have psychological and socioeconomic impact [1, 2]. Understandably, patients and parents have many questions and often seek information from various sources on the internet.

ChatGPT (OpenAI, San Francisco, CA, USA) is an artificial intelligence-based chatbot developed using supervised and reinforcement learning strategies. It was launched in December 2022, is freely accessible, and has become incredibly popular [3]. ChatGPT can respond to questions on various topics. In this study, we evaluated the accuracy of responses to typical patient-related questions on VKC. These questions were formulated by two experienced clinical experts on VKC (M.L.R.R. and A.L.) and dealt with four different categories (general questions/etiology, prognosis, treatment/prevention, and allergy-related). We asked 25 questions consecutively five times each thus totally 125 responses. These responses were rated on a Likert scale from 1 to 5 by two experts (M.L.R.R. and A.L.) independently, which were later compared for agreement. We then summarized the scores from both experts for descriptive statistics, which meant that for each question, we performed descriptive statistics on 10 scores. The Likert scale was defined as:

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1. Very poor/unacceptable inaccuracies
2. Poor/minor potentially harmful inaccuracies
3. Moderate/potentially misinterpretable inaccuracies
4. Good/only minor non-harmful inaccuracies
5. Very good/no inaccuracies

All questions and ChatGPT responses are available as Supplementary file 1. The experts were in high agreement on their evaluation (Cronbach's alpha: 0.97; 95% confidence interval: 0.96–0.98).

All questions and summary scores are listed in Table 1. Highest scores were obtained for the questions “*why do you mostly get vernal keratoconjunctivitis in the spring and the summer?*” (general questions/etiology), “*what is the prognosis for vernal keratoconjunctivitis?*” (prognosis), and “*can you use makeup if you have vernal keratoconjunctivitis?*” (allergy-related). Lowest scores were obtained for the questions “*how can vernal keratoconjunctivitis be treated?*” (treatment/prevention), “*what type of surgeries are available for vernal keratoconjunctivitis?*” (treatment/prevention), “*can you get side effects from the eye drops for treating vernal*

keratoconjunctivitis?” (treatment/prevention), and “*are the eye drops used in vernal keratoconjunctivitis dangerous?*” (treatment/prevention).

Responses to treatment/prevention questions obtained lower scores than the rest. Some suggestions were inadequate (e.g., calcineurin inhibitors were never mentioned), while some were considered harmful (e.g., removal of the conjunctiva). For questions regarding side effects of eye drops, the chatbot was unable to recognize the potential serious side effects of therapy. Below is a response to “*are the eye drops used in vernal keratoconjunctivitis dangerous?*”:

“Yes, there can be side effects from the eyedrops used to treat vernal keratoconjunctivitis. These can include stinging, burning, or itching of the eyes, redness or irritation of the eyelids, and increased sensitivity to light. These side effects are usually temporary and will go away after a few days of use. If you experience severe or prolonged side effects, you should contact your doctor.”

This response does not include potential serious side effects from topical corticosteroid use, which is important

Table 1 Summary of the questions and expert ratings

Category	Question	Score, median (interquartile range) [range]
<i>General questions/etiology</i>	What is vernal keratoconjunctivitis?	4 (3–4) [3–5]
	Why did my child get vernal keratoconjunctivitis?	4 (3–5) [3–5]
	Who gets vernal keratoconjunctivitis?	4 (3–5) [3–5]
	Is it only children who get vernal keratoconjunctivitis?	4 (3–4) [3–4]
	How do I know if my child has vernal keratoconjunctivitis?	3 (2–4) [2–4]
	Why do you mostly get vernal keratoconjunctivitis in the spring and the summer?	5 (4–5) [3–5]
	Is vernal keratoconjunctivitis inherited?	4 (4–4) [2–5]
	What is the spectrum of severity of vernal keratoconjunctivitis?	4 (4–4) [3–4]
	Can vernal keratoconjunctivitis be treated by a general ophthalmologist?	4 (3–5) [2–5]
	<i>Prognosis</i>	What is the prognosis for vernal keratoconjunctivitis?
When will my kid's vernal keratoconjunctivitis go away?		2 (2–3) [2–5]
Can you get vernal keratoconjunctivitis as an adult?		3 (3–3) [2, 3]
Can you go blind from vernal keratoconjunctivitis?		4 (3–5) [2–5]
Can you have a normal life with vernal keratoconjunctivitis?		4 (3–4) [3–4]
<i>Treatment/prevention</i>	What can I do to prevent vernal keratoconjunctivitis?	4 (3–4) [3–4]
	How can vernal keratoconjunctivitis be treated?	1 (1–2) [1–4]
	What type of surgeries are available for vernal keratoconjunctivitis?	1 (1–2) [1, 2]
	What eye drops should I get for vernal keratoconjunctivitis?	3 (3–3) [3]
	Can you get side effects from the eye drops for treating vernal keratoconjunctivitis?	1 (1–1) [1]
	Are the eye drops used in vernal keratoconjunctivitis dangerous?	1 (1–1) [1]
	Can you use makeup if you have vernal keratoconjunctivitis?	5 (5–5) [4–5]
<i>Allergy-related</i>	My kid has vernal keratoconjunctivitis? Should I get him tested for allergies?	3 (3–3) [2–4]
	Will it help my vernal keratoconjunctivitis to get allergy vaccinated?	3 (2–3) [2, 3]
	Why does my child have vernal keratoconjunctivitis when no allergy was found?	3 (2–5) [2–5]
	Can my kid have a pet if he has vernal keratoconjunctivitis?	4 (4–5) [3–5]
	Can you use makeup if you have vernal keratoconjunctivitis?	5 (5–5) [4–5]

to understand and accept, and this response is therefore considered unacceptable. However, it should be noted that many responses from ChatGPT also included advice to contact a physician when experiencing side effects or for other matters dealing with treatment/prevention.

ChatGPT is only a few mouse clicks away, and fortunately, this new tool provide relevant answers to many questions. Being aware of its few but important shortcomings may allow us to better understand the information presented to our patients and their parents, and allow us to better understand their thoughts and decisions.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s00417-023-06078-1>.

Declarations

Conflict of interest Author M.L.R.R. declares to have received speaker's fee from Santen, not related to this work. Author Y.S. declares to have received speaker's fee from Bayer and Roche, not related to this work. The other authors declare that no potential conflicts of interests exist in relation to this work.

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