

# Snakebite Advice and Counseling From Artificial Intelligence: An Acute Venomous Snakebite Consultation With ChatGPT

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## Abstract

**Background:** Snakebites, particularly from venomous species, present a significant global public health challenge. Access to accurate and timely information regarding snakebite prevention, recognition, and management is crucial for minimizing morbidity and mortality. Artificial intelligence (AI) language models, such as ChatGPT (Chat Generative Pre-trained Transformer), have the potential to revolutionize the dissemination of medical information and improve patient education and satisfaction.

**Methods:** This study aimed to explore the utility of ChatGPT, an advanced language model, in simulating acute venomous snakebite consultations. Nine hypothetical questions based on comprehensive snakebite management guidelines were posed to ChatGPT, and the responses were evaluated by clinical toxicologists and emergency medicine physicians.

**Results:** ChatGPT provided accurate and informative responses related to the immediate management of snakebites, the urgency of seeking medical attention, symptoms, and health issues following venomous snakebites, the role of antivenom, misconceptions about snakebites, recovery, pain management, and prevention strategies. The model highlighted the importance of seeking professional medical care and adhering to healthcare practitioners' advice. However, some limitations were identified, including outdated knowledge, lack of personalization, and inability to consider regional variations and individual characteristics.

**Conclusion:** ChatGPT demonstrated proficiency in generating intelligible and well-informed responses related to venomous snakebites. It offers accessible and real-time advice, making it a valuable resource for preliminary information, education, and triage support in remote or underserved areas. While acknowledging its limitations, such as the need for up-to-date information and personalized advice, ChatGPT can serve as a supplementary source of information to complement professional medical consultation and enhance patient education. Future research should focus on addressing the identified limitations and establishing region-specific guidelines for snakebite management.

**Categories:** Emergency Medicine, Healthcare Technology, Other

**Keywords:** ai and machine learning, medical artificial intelligence, artificial intelligence and education, ai chatbot, emergency medicine, toxicology and envenomation, acute venomous snakebite, artificial intelligence in healthcare, chatgpt, snake-bite

## Introduction

Snakebite incidents, particularly those involving venomous species, pose a significant public health challenge worldwide [1]. Venomous snakebites can result in severe local and systemic complications, including pain, swelling, tissue damage, coagulopathy, and even death [2]. Timely recognition and management of venomous snakebites are crucial to minimize morbidity and mortality. Patients and caregivers often have concerns about the identification, symptoms, prevention, and treatment of snakebites, which they may feel hesitant to ask about or may not even realize the need to inquire about [3].

Artificial intelligence (AI) language-generated tools, such as ChatGPT (Chat Generative Pre-trained Transformer), present a remarkable opportunity to revolutionize the dissemination of medical information. ChatGPT is an advanced language model with the ability to generate human-like text, attracting interest for its potential to assist researchers in writing scientific papers and conducting literature reviews [4]. By utilizing extensive text data from various sources on the internet, ChatGPT can provide logical, coherent, and accurate responses to a wide range of questions related to medical topics [5].

Despite the rapid advancements in AI, there is a limited understanding of its potential benefits for

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addressing public inquiries, particularly in the context of acute medical conditions like venomous snakebites [6]. To explore this potential, the authors conducted a simulated acute venomous snakebite consultation using ChatGPT to generate answers to questions commonly posed by patients and caregivers, subsequently evaluating the responses. The authors argue that the integration of AI and language models, such as ChatGPT, in medical consultations has significant potential for improving patient education and satisfaction. As AI and machine learning technologies continue to progress, they may open new avenues for innovative approaches to enhance patient outcomes in scenarios involving venomous snakebites and other acute medical conditions.

## Materials And Methods

In this study, we aimed to investigate the potential of AI language models to serve as clinical assistants in the context of venomous snakebites. For this purpose, we employed ChatGPT, one of the largest language models currently accessible to the public, and evaluated its capacity, effectiveness, and accuracy in providing information related to the prevention, recognition, and management of acute venomous snakebite incidents.

### Study design

We asked ChatGPT nine hypothetical questions simulating a doctor-patient and doctor-doctor consultation for venomous snakebites. The questions were based on comprehensive snakebite management information guidelines derived from reputable sources such as the World Health Organization, Centers for Disease Control and Prevention, and the clinical literature [7-9]. The scenario objective was to cover a broad cross-section of information that patients or caregivers might want to know regarding venomous snakebites. The responses provided by ChatGPT were assessed for accuracy, informativeness, and accessibility by clinical toxicologists and emergency medicine physicians with extensive experience in managing acute snakebite cases.

By rigorously evaluating these responses according to the criteria, we sought to establish the utility of AI-generated language models, such as ChatGPT, in simulating doctor-patient consultations for venomous snakebites and other acute medical conditions.

### Inclusion and exclusion criteria

ChatGPT employs a probabilistic algorithm, utilizing random sampling to generate a diverse array of responses, which may lead to different answers to identical questions. For the purpose of this study, we selected ChatGPT 3.5, a version that is both widely available and freely accessible to the public. ChatGPT 4 was excluded from consideration due to its limited availability and the costs associated with its use [10].

We documented the initial response provided by ChatGPT 3.5 for each question and refrained from allowing any subsequent clarifications or corrections. Meticulous attention was given to ensuring that all questions were devoid of grammatical or syntactical errors. Each question was input on the same day using a single ChatGPT 3.5 account, which was maintained by one of the authors.

Alternative chatbots were not considered for this study, as they demonstrated inferior capabilities when compared to ChatGPT [11]. The primary objective was to assess the performance of ChatGPT 3.5 as a representative of advanced AI-generated language models within the specific context of consultations related to venomous snakebites.

## Results

At the commencement of the consultation, we inquired about ChatGPT's recommendations for the immediate management of a patient who has been bitten by a snake and the appropriate actions to take under such circumstances (Figure 1).



What are the initial first aid steps to take immediately after a venomous snakebite?



If you or someone else has been bitten by a venomous snake, it's important to take immediate action. Here are the initial first aid steps to take:

1. **Safety:** Move away from the snake to avoid further bites. Make sure you are in a safe location, away from any potential danger.
2. **Stay calm:** Panicking can increase heart rate and spread the venom more quickly through the body. Try to stay as calm as possible.
3. **Immobilize the affected area:** Restrict movement of the bitten limb as much as possible. This helps slow down the spread of venom through the bloodstream. If you have a splint or any other means to immobilize the limb, use it.
4. **Remove constricting items:** If there are rings, bracelets, or tight clothing on the bitten limb, remove them immediately. The area may swell rapidly, and constricting items can worsen the condition.
5. **Seek medical help:** Call emergency services or go to the nearest medical facility as soon as possible. Provide them with information about the snakebite, such as the appearance of the snake if known, to help them provide appropriate treatment.
6. **Positioning:** Keep the affected limb at or below the level of the heart. This can also help slow down the spread of venom.
7. **Do not:** Do not try to suck out the venom by mouth, apply a tourniquet, or use ice on the bite. These methods are not recommended and can potentially cause more harm.

Remember, the first aid steps mentioned above are initial measures to be taken before receiving proper medical attention. Snakebites can be life-threatening, and it's crucial to seek professional medical care as soon as possible.

#### FIGURE 1: What are the initial first aid steps to take immediately after a venomous snakebite?

Followed by a question regarding the urgency of seeking medical attention after a snakebite and whether the advised timeline differs depending on the snake's venomous status (Figure 2).



How can I tell if the snake that bit me or someone else is venomous, and what signs should I look for to determine the severity of the bite?



Identifying whether a snake is venomous based solely on visual cues can be challenging, as appearances can vary greatly among snake species. It is generally recommended not to approach or handle the snake to avoid further risk of bites. Instead, focus on the following aspects to determine the severity of the snakebite:

1. **Symptoms:** Monitor the symptoms experienced by the person who was bitten. Venomous snakebites often result in rapid onset and progression of symptoms. Common symptoms may include severe pain at the bite site, swelling, redness, and discoloration of the affected area. Other systemic symptoms can include nausea, vomiting, dizziness, weakness, difficulty breathing, and changes in heart rate. If these symptoms manifest quickly and intensify, it may indicate a potentially severe envenomation.
2. **Fang marks:** Observe the bite marks if possible. Venomous snakebites typically leave distinct puncture wounds from the snake's fangs. These marks may appear as paired puncture wounds, although this is not always the case.
3. **Knowledge of local snake species:** Familiarize yourself with the venomous snake species that inhabit your region. Understanding the prevalent venomous snakes in your area can provide a general idea of the potential danger and the specific antivenom that may be required.

Remember, it is crucial to seek immediate medical attention for any snakebite, regardless of whether you can identify the snake or assess the severity of the bite. Only medical professionals can accurately diagnose the venomous nature of the snake, evaluate the severity of the bite, and provide appropriate treatment, including the administration of antivenom if necessary.

Do not attempt to capture or kill the snake for identification purposes, as it can increase the risk of further bites and complications. Focus on getting the person to a medical facility as quickly and safely as possible.

**FIGURE 2: How can I tell if the snake that bit me or someone else is venomous, and what signs should look for to determine the severity of the bite?**

ChatGPT underscored the vital importance of promptly seeking professional medical care following a snakebite, as the preliminary steps taken at the scene may only provide limited relief and are not a substitute for comprehensive medical evaluation and treatment. Medical professionals are equipped with the knowledge and resources to accurately assess the severity of the bite, administer appropriate interventions such as antivenom if required, and monitor the patient for any potential complications arising from the snakebite, ensuring the best possible outcome. ChatGPT provided a series of evidence-based initial measures and actions to be avoided following snakebites, offering accurate and reliable guidance that aligns with the recommendations from authoritative sources, such as [7]. Conversely, ChatGPT did not prioritize the most critical measures, presenting them as an unordered list rather than emphasizing their relative importance. Consequently, patients may follow certain recommendations while neglecting others. It is essential to highlight the level of significance for each measure instead of presenting them as a mere checklist, ensuring that patients understand and adhere to the most vital steps in managing a snakebite.

ChatGPT was prompted to provide more detailed information through three additional questions. The first query asked about the urgency of seeking medical help after a snakebite and whether this timeline changes depending on the snake's venomous status (Figure 3).



After a snakebite, how soon should I seek medical help, and does this timeline change depending on whether the snake is venomous or not?



After a snakebite, it is essential to seek immediate medical help, regardless of whether the snake is venomous or not. Even if you are uncertain about the venomous nature of the snake or if the bite seems minor, it is crucial to prioritize prompt medical attention. Time is of the essence in receiving appropriate care and treatment.

The timeline for seeking medical help should not be delayed, as the severity of a snakebite can be difficult to determine without proper medical evaluation. Regardless of the snake's venomous status, medical professionals are best equipped to assess the situation, provide appropriate wound care, manage symptoms, and administer antivenom if necessary.

Seeking immediate medical attention is particularly critical if there are any indications of a venomous snakebite or if severe symptoms develop rapidly. Venomous snakebites can lead to potentially life-threatening complications, and early medical intervention significantly improves the chances of a positive outcome.

Remember, even if you believe the snake may be non-venomous, it is still important to consult a healthcare professional. Non-venomous snakebites can still cause infections, tissue damage, and other complications that require medical attention.

In summary, the timeline for seeking medical help should be immediate and not delayed, irrespective of the venomous or non-venomous nature of the snake. Contact emergency services or go to the nearest medical facility as soon as possible to receive proper evaluation and care.

**FIGURE 3: After a snakebite, how soon should I seek medical help, and does this timeline change depending on whether the snake is venomous or not?**

The second question inquired about the symptoms and health issues one can expect to experience after a venomous snakebite and the duration of these symptoms (Figure 4).

What symptoms and health issues can I expect to experience after a venomous snakebite, and how long might they last?

After a venomous snakebite, the symptoms and health issues can vary depending on factors such as the species of snake, the amount of venom injected, the location of the bite, and individual factors. Here are some common symptoms and health issues associated with venomous snakebites:

1. Local symptoms: Venomous snakebites often result in immediate pain and swelling at the site of the bite. The area may become red, bruised, and tender. The severity of local symptoms can vary, depending on the potency of the venom and individual reactions.
2. Systemic symptoms: Venom can affect various body systems, leading to systemic symptoms. These may include nausea, vomiting, dizziness, headache, blurred vision, sweating, muscle weakness, and difficulty breathing. Systemic symptoms can indicate the spread of venom through the bloodstream.
3. Hemotoxic effects: Some venomous snake species have hemotoxic venom, which can interfere with blood clotting. This may cause bleeding from the gums, nose, or other body orifices. Excessive bleeding, easy bruising, and blood in urine or stool may occur.
4. Neurotoxic effects: Certain venomous snakes produce neurotoxic venom, which affects the nervous system. Neurotoxic symptoms can include difficulty speaking, swallowing, or breathing, muscle paralysis or weakness, drooping eyelids, and vision disturbances.

The duration of symptoms can vary. Typically, local symptoms may persist for several days, while systemic symptoms can last for hours to days, depending on the severity of the envenomation and the effectiveness of medical treatment.

It is important to note that snakebite envenomation can be life-threatening, and the severity of symptoms can worsen rapidly. Immediate medical attention is crucial to manage the effects of venom, provide appropriate treatment, and administer antivenom if necessary.

It is recommended to consult with a healthcare professional or toxicologist for specific information regarding the symptoms and expected course of recovery after a venomous snakebite, as they can provide accurate and tailored guidance based on the particular snake species and individual circumstances.

**FIGURE 4: What symptoms and health issues can I expect to experience after a venomous snakebite, and how long might they last?**

Lastly, ChatGPT was asked to explain the role of antivenom in treating snakebites and how medical professionals determine its necessity for a specific case (Figure 5).

Can you explain the role of antivenom in treating snake bites, and how do medical professionals determine its necessity?

Antivenom plays a vital role in the treatment of snake bites caused by venomous snakes. It is a specialized product that contains antibodies specifically designed to neutralize the venom toxins. The administration of antivenom aims to counteract the effects of venom, prevent further progression of symptoms, and improve the patient's outcome.

The determination of antivenom necessity is based on several factors, including:

1. **Clinical assessment:** Medical professionals evaluate the patient's symptoms, physical examination findings, and vital signs to assess the severity of the snakebite and the potential systemic effects of the venom. This assessment helps guide the decision to administer antivenom.
2. **Identification of the snake species:** If possible, identifying the snake responsible for the bite can aid in determining the appropriate antivenom. Different venomous snakes produce distinct venoms, and specific antivenoms are tailored to counteract the effects of particular snake species. Knowledge of the regional snake population assists in selecting the most appropriate antivenom.
3. **Progression of symptoms:** The progression and severity of symptoms are closely monitored. If symptoms worsen or rapidly progress, it may indicate significant envenomation and the need for antivenom intervention.
4. **Laboratory tests:** Blood tests may be performed to assess the patient's coagulation status, blood cell counts, kidney function, and other relevant parameters. These tests help evaluate the impact of venom on the body and guide treatment decisions, including the administration of antivenom.

It is important to note that the decision to administer antivenom is made by healthcare professionals based on their clinical judgment, taking into account the individual patient's condition and the specific circumstances of the snakebite. Antivenom should be administered in a controlled medical setting where the patient can be closely monitored for potential adverse reactions and to ensure its effectiveness.

Timely administration of antivenom can significantly reduce the morbidity and mortality associated with snakebites. However, the decision to use antivenom is a complex one that requires expertise and careful consideration of various factors by healthcare professionals with experience in managing snakebite cases.

#### **FIGURE 5: Can you explain the role of antivenom in treating snakebites, and how do medical professionals determine its necessity?**

It is important to note that ChatGPT serves as a tool to assist patients and clinicians with information and guidance; however, it cannot be relied upon to manage patients independently. We strongly emphasize the need for patients to seek medical attention without delay in cases of snakebites or other emergencies. One of the strengths of large language models like ChatGPT is the ability to recognize their limitations, ensuring that users understand the necessity of professional medical intervention in critical situations [12].

The advice provided emphasizes the crucial role of antivenom in treating venomous snakebites and highlights the significance of clinical assessment, snake identification, symptom progression, and laboratory tests in guiding treatment decisions. It also underlines the importance of timely administration of antivenom to reduce morbidity and mortality associated with snakebites. Additionally, the advice acknowledges the need for expertise and careful consideration in making the decision to administer

antivenom, reinforcing the importance of seeking professional medical care in such situations. The advice, being general in nature, may not cover specific regional variations in snake species, venom characteristics, and availability of antivenom. This generality, along with the emphasis on the potential severity of snakebites and the need for antivenom, might cause anxiety for patients, particularly if antivenom is not readily accessible or if the snake species involved is unknown. Furthermore, patients might misinterpret the advice and attempt to self-diagnose or manage their treatment, potentially leading to delays in seeking professional help or receiving inadequate care.

The remainder of the consultation encompassed various aspects related to venomous snakebites, including recovery, prevention strategies, and addressing misconceptions. Initially, ChatGPT was asked, "What are some common misconceptions about snakebites that people should be aware of?" in order to provide clarity and dispel potential misinformation (Figure 6).

**What are some common misconceptions about snake bites that people should be aware of?**

There are several common misconceptions about snake bites that it is important to be aware of. These misconceptions can potentially lead to ineffective or harmful actions. Here are a few:

1. **Sucking out the venom:** It is a common myth that sucking out the venom by mouth is an effective first aid measure for snake bites. However, this method is not recommended as it can introduce bacteria into the wound and does not effectively remove the venom from the bloodstream.
2. **Applying tourniquets:** Using a tourniquet or tight bandage above the bite site to restrict blood flow is also a misconception. This practice can lead to tissue damage and does not effectively prevent venom from spreading. It is best to immobilize the affected area without applying excessive pressure.
3. **Cutting and sucking the wound:** Another misconception is the belief that cutting the wound and sucking out the venom is beneficial. This approach can cause further tissue damage and infection, and it is not an effective method for removing venom.
4. **Ice application:** Applying ice directly to the snakebite is not recommended. It does not neutralize the venom and may not provide any significant benefits. It is better to focus on immobilizing the affected area.
5. **Non-venomous snake bites are harmless:** While it is true that non-venomous snake bites are generally less dangerous than venomous bites, they can still cause infections, tissue damage, and other complications. All snake bites should be taken seriously, and medical attention should be sought.
6. **Raising the affected limb:** Elevating the affected limb above the level of the heart was once believed to slow down venom spread. However, current guidelines recommend keeping the limb at or slightly below the level of the heart to minimize swelling and discomfort.

It is important to rely on accurate and up-to-date information when it comes to snake bites. Seeking immediate medical attention and following the guidance of healthcare professionals is crucial for proper evaluation, treatment, and management of snakebite incidents.

**FIGURE 6: What are some common misconceptions about snakebites that people should be aware of?**

Subsequently, the discussion focused on the potential long-term effects of venomous snakebites and

methods to minimize risks during the recovery process (Figure 7).

Are there any potential long-term effects of a venomous snake bite, and how can I minimize these risks during the recovery process?

Venomous snake bites can potentially have long-term effects, depending on various factors such as the snake species, the amount of venom injected, the site of the bite, and the timeliness and effectiveness of medical intervention. Here are some potential long-term effects and ways to minimize risks during the recovery process:

1. **Tissue damage and scarring:** Venomous snake bites can cause tissue damage and necrosis (cell death) at the bite site. This can lead to long-term scarring and functional impairment. Proper wound care, including cleaning and dressing the wound as directed by healthcare professionals, can help minimize the risk of infection and promote optimal healing.
2. **Chronic pain or sensory changes:** Some individuals may experience persistent or chronic pain at the bite site or develop sensory changes such as numbness or hypersensitivity. Physical therapy, pain management strategies, and consultation with specialists, such as neurologists or rehabilitation specialists, may be helpful in managing these long-term effects.
3. **Psychological impact:** Snakebites can be traumatic experiences and may lead to psychological distress such as anxiety, fear, or post-traumatic stress disorder (PTSD). Seeking support from mental health professionals, counseling, and engaging in coping strategies can help minimize the psychological impact and aid in the recovery process.
4. **Functional limitations:** Depending on the location and severity of the bite, there may be temporary or permanent functional limitations. These can include difficulty in using the affected limb, reduced mobility, or impairments in daily activities. Rehabilitation, physical therapy, and occupational therapy can assist in maximizing functional recovery and adapting to any long-term limitations.
5. **Secondary complications:** Snakebite envenomation can lead to secondary complications such as infections, blood clotting disorders, or kidney damage. Monitoring for any potential complications, adhering to prescribed medications, and following up with healthcare professionals are important to minimize long-term risks.

It is important to work closely with healthcare professionals throughout the recovery process to address any potential long-term effects and to receive appropriate care, monitoring, and rehabilitation. Adhering to their recommendations, attending follow-up appointments, and actively participating in the prescribed treatment plan can help minimize risks and optimize recovery.

**FIGURE 7: Are there any potential long-term effects of a venomous snakebite, and how can I minimize these risks during the recovery process?**

Additionally, the conversation explored managing pain and discomfort associated with snakebites, both immediately following the incident and throughout the healing process (Figure 8).

How can I manage the pain and discomfort associated with a snake bite, both right after the incident and throughout the healing process?

Managing pain and discomfort after a snake bite is an essential part of the recovery process. Here are some approaches to consider:

1. **Immediate first aid:** After a snake bite, immobilizing the affected area and keeping it at or slightly below the level of the heart can help reduce pain and swelling. Applying a cold compress or ice pack wrapped in a cloth to the bite site for short periods (about 10 minutes at a time) may also provide temporary relief.
2. **Medications:** Over-the-counter pain relievers such as acetaminophen (paracetamol) or non-steroidal anti-inflammatory drugs (NSAIDs) like ibuprofen can help alleviate pain and reduce inflammation. However, it is important to consult a healthcare professional before taking any medication to ensure it is safe and suitable for your specific situation.
3. **Prescription pain medications:** In more severe cases, healthcare professionals may prescribe stronger pain medications to manage the pain associated with the snake bite. Follow the prescribed dosage and guidelines provided by the healthcare professional.
4. **Local anesthetics:** Topical anesthetics or numbing creams can be applied to the bite site to temporarily numb the area and provide pain relief. However, consult with a healthcare professional before using any topical products.
5. **Wound care:** Proper wound care, including cleaning the bite site with mild soap and water, and keeping it clean and dry, can help prevent infection and promote healing, thereby reducing discomfort.
6. **Elevation and rest:** Elevating the affected limb, as mentioned earlier, can help reduce swelling and alleviate pain. Additionally, getting ample rest and avoiding unnecessary movement of the affected area can aid in minimizing discomfort during the healing process.
7. **Distraction techniques:** Engaging in activities that divert your attention from the pain, such as listening to music, watching movies, reading, or spending time with loved ones, can help manage the discomfort associated with the snake bite.

Remember to always consult with a healthcare professional for specific guidance on pain management techniques and appropriate medications. They can provide personalized advice based on the severity of the snake bite, individual circumstances, and any other medical conditions or medications you may have.

**FIGURE 8: How can I manage the pain and discomfort associated with a snakebite, both right after the incident and throughout the healing process?**

Lastly, the consultation delved into effective preparation for future encounters with snakes and adopting precautions to mitigate the risk of snakebites in the future (Figure 9).

How can I better prepare for future encounters with snakes and take precautions to reduce the risk of snake bites in the future?

To better prepare for future encounters with snakes and reduce the risk of snake bites, consider the following precautions:

1. **Educate yourself:** Learn about the types of snakes that are prevalent in your region. Understand their habitats, behaviors, and venomous characteristics. This knowledge can help you identify potential risks and make informed decisions when encountering snakes.
2. **Stay vigilant in snake-prone areas:** Be aware of your surroundings when you are in areas where snakes are commonly found, such as forests, grasslands, or rocky areas. Watch for signs of snakes, such as rustling vegetation or snake tracks, and avoid reaching into hidden or dark areas without proper visibility.
3. **Wear appropriate clothing and footwear:** When venturing into snake-prone areas, wear long pants, boots or closed-toe shoes, and preferably thick socks. This attire can provide some protection against snake bites.
4. **Use a flashlight at night:** If you are moving around in areas where snakes may be active, use a flashlight to illuminate the path ahead. This helps you see any snakes in your way and reduces the risk of accidental encounters.
5. **Be cautious when lifting objects:** Snakes may seek shelter in logs, rocks, or other objects. Use caution when lifting or moving such items, as snakes may be hiding underneath. Use a tool, like a stick, to probe and ensure there are no snakes present before reaching in with your hands.
6. **Create a snake-resistant environment:** Keep your surroundings tidy and remove potential snake hiding places, such as tall grass, piles of debris, or woodpiles, from around your home. Clearing clutter and sealing gaps in buildings can help deter snakes from entering your property.
7. **Avoid provoking or approaching snakes:** Snakes usually prefer to avoid confrontation and will typically only bite if they feel threatened or provoked. Maintain a safe distance and avoid handling or attempting to capture snakes unless you have the necessary training and expertise.
8. **Teach children about snake safety:** Educate children about the risks of snakes and teach them to avoid touching or approaching any snakes they encounter. Encourage them to inform an adult if they see a snake.

Remember, while these precautions can help reduce the risk of snake bites, it's important to exercise caution and stay alert in snake-prone areas. If you encounter a snake, give it space and allow it to move away. If you are unsure about the identity of a snake or if you have concerns, contact local authorities or snake removal professionals for assistance.

#### **FIGURE 9: How can I better prepare for future encounters with snakes and take precautions to reduce the risks of snakebites in the future?**

The response effectively addresses widespread myths and misconceptions associated with snakebites, helping to reduce misinformation. It offers evidence-based guidance based on current guidelines and practices, ensuring the advice is reliable and accurate [7,9,13]. Additionally, the response emphasizes the importance of seeking immediate medical attention and following the guidance of healthcare professionals, which is crucial for the proper evaluation, treatment, and management of snakebites. However, there are some limitations to the response, such as limited depth on toxicology, as it does not delve into the specific toxicological aspects of venomous snakebites, like the type of venom, how it affects the body or the administration of antivenom. Furthermore, the reply does not address the variation in venom toxicity and severity of symptoms between different snake species, which could be important information depending on the region or type of snake involved.

## Discussion

This exploratory research delved into ChatGPT's capabilities to understand and generate responses in natural language focused on the healthcare domain, specifically targeting consultations and recommendations related to acute venomous snakebites. The AI model exhibited proficiency in creating intelligible, well-informed responses that were easily comprehensible and grounded in factual information [14]. While recognizing its own constraints, ChatGPT persistently underscored the necessity of seeking immediate medical care and following the advice of healthcare practitioners in handling snakebite incidents [12].

ChatGPT offers numerous benefits in the context of providing medical advice for venomous snakebites. Its accessibility through a variety of digital platforms allows individuals in remote or underserved areas to acquire preliminary information and advice concerning snakebites. The AI model delivers real-time responses to inquiries, granting users prompt guidance in snakebite situations. With its natural language generation, ChatGPT ensures that its advice is easily comprehensible for users without specialized medical knowledge. Owing to its diverse training sources, ChatGPT can offer recommendations on multiple aspects of snakebite management, such as first aid, potential complications, and recovery. The model also presents consistent information and advice based on its training data, mitigating the risk of human error or variability in responses. In cases where healthcare resources are scarce, ChatGPT can provide triage support by offering general guidance on snakebite severity and recommended actions, potentially minimizing unnecessary hospital visits. Furthermore, ChatGPT functions as an educational resource for the general public and healthcare professionals, delivering information on snakebite prevention, identification, and management.

However, several limitations are associated with ChatGPT's provision of medical advice for venomous snakebites. Its knowledge, constrained by training data and a knowledge cutoff, lacks real-time updates, which may result in out-of-date or incomplete advice [15]. ChatGPT is incapable of delivering personalized advice that considers an individual's medical history, allergies, or other unique factors, thereby potentially restricting the utility of its recommendations. The AI model might not fully comprehend context, leading to potential misunderstandings or unsuitable advice, such as failing to recognize regional variations in snake species and venom toxicity or neglecting specific patient information. ChatGPT's limited clinical judgment compared to healthcare professionals may result in overlooking the seriousness of a situation or offering inadequate guidance [4]. The model also cannot evaluate visual information, such as images of the snake or the bite, which impedes its capacity to provide accurate advice. AI's inherent lack of empathy and compassion renders its advice impersonal and less emotionally supportive [16]. Moreover, liability and ethical concerns emerge when relying on AI for medical advice, as misinterpretations or inaccuracies might lead to detrimental outcomes, raising questions about responsibility and accountability [17].

## Limitations and future directions

In our study, we identified several limitations and potential future directions for further exploration and research. Our investigation primarily focused on the patient perspective, omitting the physician's point of view and simulated cases, which could offer additional insights. The assessments relied on expert opinions instead of a formal grading rubric or qualitative analysis, potentially introducing subjectivity and limiting the generalizability of results. Additionally, the diversity of cases might have been insufficient to capture the full range of real-world scenarios and challenges that ChatGPT could face. Furthermore, we did not thoroughly investigate ChatGPT's empathy and emotional intelligence in real-time, especially in acute situations. To address these limitations, future studies could expand the scope to include physician perspectives and simulated cases, develop a formal grading rubric or employ qualitative analysis for more structured and objective evaluations, increase sample size and case diversity to better assess ChatGPT's performance, and investigate its ability to provide empathic and emotionally intelligent responses in real-time, particularly in acute situations. By pursuing these future directions, we aim to enhance the understanding of ChatGPT's potential in healthcare and contribute to the development of more effective AI-assisted medical solutions.

## Conclusions

In summary, ChatGPT is a valuable resource for consultations regarding venomous snakebites, especially in remote or underserved areas with limited healthcare resources. Its real-time response capability, user-friendly language, and comprehensive advice make it an effective tool for general guidance and education. Additionally, its accessibility through various digital platforms and consistent delivery of information based on its training data enhance its value as an informative resource. However, it is crucial to acknowledge its limitations, such as outdated knowledge and the inability to personalize treatment for each case due to the unique characteristics of the region and the individual. Given the variability in the characteristics and severity of snakebites across different regions, it is essential to establish specific clinical guidelines for each region, which poses a challenge even for expert toxicologists. Despite this challenge, ChatGPT can offer generalized measures to manage snakebites. Moreover, its advantages, including its role in triage support and its educational function for snakebite prevention, identification, and management, underscore its significance as a supplementary source of information to complement professional medical consultation.

## Additional Information

### Disclosures

**Human subjects:** All authors have confirmed that this study did not involve human participants or tissue.  
**Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue.

**Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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