



(REVIEW ARTICLE)



Role of ChatGPT in antenatal care

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World Journal of Advanced Research and Reviews, 2024, 23(01), 230–236

Publication history: Received on 25 May 2024; revised on 03 July 2024; accepted on 05 July 2024

Article DOI: <https://doi.org/10.30574/wjarr.2024.23.1.2045>

Abstract

ChatGPT, developed by OpenAI, represents a significant advancement in AI technology, particularly noted for its ability to engage in human-like conversations. This review article is about role of ChatGPT in antenatal care during pregnancy and its limitations in addressing health-related issues. While ChatGPT offers accessible and empathetic responses to queries about pregnancy and childbirth, its reliability and accuracy remain concerns. The model's reliance on statistical patterns in data often leads to biased or incomplete information, lacking necessary citations. Despite these limitations, ChatGPT shows promise in supporting clinical decision-making but requires oversight to ensure medical advice is precise and appropriate. Ethical considerations, including privacy and misuse risks, underscore the need for further development and validation in healthcare applications.

Keywords: AI in healthcare; ChatGPT; antenatal care; Limitations; Medical advice; Ethical concerns; Clinical decision-making

1. Introduction

OpenAI, headquartered in San Francisco, is a leading artificial intelligence (AI) research and development firm focused on creating safe AI software that can benefit society [1]. One of their notable innovations is the Generative Pre-Trained Transformer (ChatGPT), a chatbot introduced in November 2022. ChatGPT uses advanced language processing and machine learning techniques to facilitate interactive conversations with a virtual assistant [2]. The chatbot has garnered significant global attention for its ability to produce text that closely mimics human writing. In one study, human reviewers mistakenly identified 32% of the generated abstracts as authentic, as ChatGPT's outputs cleverly bypassed plagiarism detection systems. While scientific research underpins evidence-based medical treatments, ethical issues have arisen due to ChatGPT's potential for generating inaccurate abstracts and the current lack of automated verification

tools for checking their originality and accuracy [3]. As ChatGPT's usage becomes more widespread, it is increasingly employed to address pregnancy-related inquiries. A recent study highlighted that ChatGPT provided high-quality and empathetic responses to patient questions in an online forum [4]. In this review article, we explore the role of ChatGPT in antenatal care during pregnancy and discuss its limitations in addressing health issues

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2. CHatGPT and Antenatal Care

In recent years, the healthcare sector has seen continuous advancements, yet it still faces several challenges that need to be addressed. Firstly, issues like diagnostic and treatment errors, resource wastage, inefficient workflows, and inequities have resulted in escalating costs for healthcare systems globally. Additionally, the intricate and ever-evolving nature of medical knowledge and technology demands significant time and effort from doctors to acquire, update, and maintain their expertise. This combined with the high-intensity work and extensive learning time required, leads to a lengthy period for training competent medical professionals. Furthermore, the advancement of medical technology has generated vast amounts of data, making it challenging for researchers to clean, mine, and analyze this information effectively. The integration of AI technologies, such as ChatGPT, into the healthcare industry offers a promising solution to improve cost-effectiveness and efficiency [5].

ChatGPT is not the first endeavor to create intelligent medical solutions. Historically, healthcare providers have utilized various established AI tools to aid in diagnosis and treatment, such as disease risk prediction models, medical imaging-assisted diagnostics, and triage systems [6, 7]. Unlike these AI assistants, ChatGPT encompasses all these functionalities and additionally provides patients with medical knowledge. Moreover, ChatGPT demonstrates superior accuracy and consistency in addressing medical queries compared to other AI chatbots [8]. This makes ChatGPT a potentially valuable asset in the healthcare sector, promising notable enhancements in efficiency.

Globally, there are over 200 million pregnancies each year, with more than 40% being unintended. Early prenatal care is crucial in these cases to prevent adverse perinatal outcomes and complications. The essential factors for a healthy pregnancy and reproductive life include preventing, identifying, and addressing preconception health issues, ensuring pregnancy readiness, obtaining early prenatal care, and minimizing risks during the perinatal and interconception periods [9]. Nowadays, pregnant women are increasingly turning to new technologies and AI, such as ChatGPT, to seek answers and find online solutions to their concerns.

Recent research has assessed the dependability and accuracy of ChatGPT in offering pregnancy-related information. Wan (2023) discovered that only half of the responses were acceptable, with the remaining answers being either incomplete or incorrect, indicating the necessity for careful scrutiny of the AI-generated content [10]. Similarly, Onder (2024) pointed out ChatGPT-4's potential as a supplementary information source for hypothyroidism during pregnancy but stressed the need for enhancements in reliability and readability [11]. Tsai (2023) and Oruçoğlu (2023) investigated ChatGPT's ability to provide personalized pregnancy nutrition advice and information on anti-rheumatic drug use during pregnancy, respectively [12, 13]. Although both studies reported satisfactory performance in terms of accuracy and completeness, they also identified instances of incorrect information, suggesting that ChatGPT should not be solely relied upon for making decisions regarding pregnancy-related issues.

3. Our Observations

In this review we also added some responses of CHatGPT about antenatal care during pregnancy shown in Table1.

Table 1 Conversation with ChatGPT about antenatal care in pregnancy

<p>1. What over-the-counter medications are safe during pregnancy?</p>	<p>During pregnancy, it's essential to consult with a healthcare provider before taking any medication, including over the counter (OTC) ones, to ensure they're safe for you and your baby. However, some common OTC medications are generally considered safe for use during pregnancy when taken as directed. These include:</p> <p>Acetaminophen (Tylenol): Used for pain relief and reducing fever. It's generally considered safe during pregnancy when taken at recommended doses.</p> <p>Antacids: Some antacids like Tums or Rolaids can be used for heartburn relief during pregnancy. They contain calcium carbonate, which is usually safe.</p> <p>Antihistamines: Certain antihistamines like diphenhydramine (Benadryl) are often considered safe for treating allergies, itching, and mild nausea. Always consult with your healthcare provider before taking any medication during pregnancy.</p> <p>Fiber supplements: Some women experience constipation during pregnancy, and fiber supplements like Metamucil or Citrucel can be helpful. Ensure you drink plenty of water when taking fiber supplements.</p>
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	<p>Certain topical medications: Topical creams or ointments containing ingredients like hydrocortisone, for mild skin irritations or itching are generally considered safe when used as directed.</p> <p>Saline nasal spray: For congestion relief, saline nasal sprays can be used. They help to moisturize nasal passages and can alleviate congestion without medication.</p> <p>Always read the labels carefully and consult with your healthcare provider before taking any medication during pregnancy, even if it's available over the counter. They can provide personalized recommendations based on your health status and the specific stage of your pregnancy.</p>
<p>2. What vaccinations should I get during pregnancy?</p>	<p>During pregnancy, vaccinations play a crucial role in protecting both the mother and the baby from certain preventable diseases. However, the vaccines recommended during pregnancy may vary depending on factors such as your health status, vaccination history, and specific recommendations from your healthcare provider. Here are some vaccinations commonly recommended during pregnancy:</p> <p>Flu Vaccine (Influenza): The flu vaccine is recommended for all pregnant women during flu season, typically from September to mid-May in the Northern Hemisphere. Getting vaccinated against the flu can reduce the risk of serious complications from influenza for both the mother and the baby.</p> <p>Tdap Vaccine (Tetanus, Diphtheria, and Pertussis): The Tdap vaccine is recommended during each pregnancy, ideally between weeks 27 and 36, to provide passive immunity to the newborn against pertussis (whooping cough). Pertussis can be severe in infants, so receiving the Tdap vaccine during pregnancy helps protect them until they can receive their own vaccinations.</p> <p>In addition to these routine vaccinations, certain other vaccines may be recommended based on individual circumstances and risk factors. These may include:</p> <p>Hepatitis B Vaccine: If you are at risk of hepatitis B infection, your healthcare provider may recommend the hepatitis B vaccine during pregnancy.</p> <p>Pneumococcal Vaccine: In some cases, the pneumococcal vaccine may be recommended for pregnant women who are at increased risk of pneumococcal disease.</p> <p>Other Travel Vaccines: If you are planning to travel to areas where certain diseases are endemic, your healthcare provider may recommend additional vaccinations based on your destination and travel itinerary.</p> <p>It's essential to discuss vaccination recommendations with your healthcare provider early in your pregnancy to ensure that you receive the necessary vaccinations at the appropriate times. Vaccinations are generally safe during pregnancy and provide important protection for both you and your baby. Your healthcare provider can address any concerns you may have and help you make informed decisions about vaccination during pregnancy.</p>
<p>3. What's the likelihood I'll need a C-section?</p>	<p>The likelihood of needing a cesarean section (C-section) during childbirth can vary depending on various factors, including maternal health, previous pregnancy history, fetal well-being, and the specific circumstances of labor and delivery. Here are some factors that may influence the likelihood of needing a C-section:</p> <p>Previous C-section: Women who have had a previous C-section may have a higher likelihood of requiring a repeat C-section in subsequent pregnancies, although vaginal birth after cesarean (VBAC) is an option for many women under certain circumstances.</p> <p>Maternal Health Conditions: Certain maternal health conditions, such as preeclampsia, gestational diabetes, placenta previa, or other complications, may increase the likelihood of needing a C-section.</p> <p>Fetal Position: The position of the baby in the uterus, particularly if the baby is breech (feet or buttocks first) or in a transverse position (lying sideways), may necessitate a C-section delivery.</p> <p>Labor Progress: Failure to progress in labor, such as slow dilation of the cervix or failure of the baby to descend into the birth canal despite adequate contractions, may lead to a decision for a C-section.</p> <p>Fetal Distress: Signs of fetal distress during labor, such as abnormal fetal heart rate patterns, meconium-stained amniotic fluid, or other indications of compromised fetal well-being, may prompt the need for an emergency C-section.</p>

	<p>Multiple Gestations: Women carrying twins or higher-order multiples may have an increased likelihood of needing a C-section, depending on factors such as the position and presentation of the babies.</p> <p>Maternal Choice or Preference: In some cases, women may elect to have a planned C-section for personal or medical reasons, such as a history of traumatic birth experiences or concerns about vaginal delivery.</p> <p>It's important to note that while C-sections are sometimes necessary and can be life-saving in certain situations, they also carry risks and potential complications for both the mother and the baby. Whenever possible, healthcare providers aim to support vaginal birth when it is safe and appropriate for both the mother and the baby.</p> <p>Ultimately, the decision to perform a C-section is made on a case-by-case basis, taking into account the individual circumstances and preferences of the pregnant woman, along with considerations for maternal and fetal well-being. Women should discuss their birth preferences and concerns with their healthcare providers to develop a birth plan that aligns with their needs and values.</p>
<p>4. When will I start to feel baby kicking?</p>	<p>Feeling the baby's movements, often referred to as quickening, is a significant milestone in pregnancy and typically occurs between 18 and 25 weeks gestation. However, the exact timing can vary from woman to woman and pregnancy to pregnancy. First-time mothers may tend to feel movements later in pregnancy, usually closer to 20 weeks or beyond, while women who have been pregnant before may recognize fetal movements earlier, sometimes as early as 16 weeks. Factors such as the position of the placenta, the mother's body size and shape, and the baby's activity level can also influence when movements are felt. At first, fetal movements may feel like fluttering sensations or gentle taps, similar to gas bubbles or muscle twitches. As the pregnancy progresses, these movements typically become more pronounced and recognizable as distinct kicks, punches, or rolls. It's essential to note that every pregnancy is unique, and there's a wide range of normal when it comes to feeling fetal movements. If you haven't felt any movement by 24 weeks, or if you notice a significant decrease in fetal movements after feeling them regularly, it's important to contact your healthcare provider for evaluation and reassurance. Keep in mind that feeling the baby move is a positive sign of fetal well-being, and it can be an exciting and reassuring experience for expectant parents as they bond with their growing baby.</p>
<p>5. How do I know if my water has broken?</p>	<p>Knowing whether your water has broken, also known as ruptured membranes or "breaking your water," is an important aspect of labor and childbirth. Here are some signs that may indicate your water has broken:</p> <p>Sensation of Fluid Leakage: If you experience a sudden gush or continuous trickle of fluid from the vagina, it may indicate that your water has broken. Some women describe it as feeling like they've "peed themselves," but the fluid is typically clear and odorless, unlike urine.</p> <p>Confirmation of Amniotic Fluid: If you're unsure whether the fluid is amniotic fluid or urine, you can perform a simple test at home to help determine. Put on a clean pad and lie down for about 30 minutes. Afterward, if you stand up and feel a sudden gush or trickle of fluid when you weren't expecting it, it's more likely to be amniotic fluid.</p> <p>Contractions: Rupture of membranes often occurs before or during labor, but it can also happen before contractions begin. If you experience regular contractions along with fluid leakage, it's a strong indication that your water has broken.</p> <p>Change in Color or Odor: Amniotic fluid is typically clear and odorless. If the fluid is discolored (greenish or brownish) or has a foul odor, it may indicate meconium (baby's first stool) in the amniotic fluid, which requires medical attention.</p> <p>Continuous Leakage: After your water breaks, you may continue to leak small amounts of fluid with movements or contractions. If the leakage is continuous or you notice a significant decrease in fluid volume, it's essential to contact your healthcare provider.</p> <p>If you suspect that your water has broken, it's important to contact your healthcare provider or midwife for further evaluation, especially if you're not yet in active labor. They can assess the situation, confirm whether your water has indeed broken, and provide guidance on the next steps, which may include monitoring for signs of infection, initiating labor if it hasn't already begun, or preparing for childbirth. Prompt medical attention is crucial to ensure the health and safety of both you and your baby.</p>

As per our observation, ChatGPT can answer every question in an organized manner, with detailed answers presented in simple words which even a layman might not have trouble understanding. Since pregnancy symptoms can progress to severe complications, Chat GPT is sensible enough to guide the user to see the healthcare professional in response to most of these questions. For example, "If you haven't felt any movement by 24 weeks, or if you notice a significant decrease in fetal movements after feeling them regularly, it's important to contact your healthcare provider for evaluation and reassurance." It also makes sure to deliver pragmatic information such as " Ultimately, the decision to perform a C-section is made on a case-by-case basis, taking into account the individual circumstances and preferences of the pregnant woman, along with considerations for maternal and fetal well-being." However, the unverified nature of these responses poses a challenge in terms of authenticity, as they lack any cited sources or references to validate the information.

4. CHatGPT limitations

ChatGPT is a powerful tool, but it has several notable limitations. These include concerns about accuracy and reliability, limitations in critical thinking and problem-solving abilities, diverse impacts on learning and development, technical constraints related to input and output, and ethical, legal, and privacy issues [14]. The model often generates biased or inappropriate responses due to its reliance on statistical patterns in text data, which poses significant challenges [15]. Additionally, ChatGPT's autoregressive functioning can result in linguistic limitations, such as the creation of machine-like language and incorrect references [16]. These issues raise crucial ethical concerns, including the potential for misuse and privacy breaches [17].

ChatGPT also help in supporting clinical decision-making, it currently lacks the precision and appropriateness necessary for delivering medical advice without physician oversight [18, 19]. Although it can provide technically accurate information, it often lacks citations or references for its answers [19]. Despite its capability to offer relevant and fair medical advice in certain instances, it does not consistently provide tailored guidance [20]. However, ChatGPT has demonstrated an ability to produce high-quality and empathetic responses to patient inquiries, indicating its potential usefulness in assisting healthcare professionals [4].

Abbreviations

AI: Artificial Intelligence

ChatGPT: Chat Generative Pre-trained Transformer

OTC: Over-The-Counter

Tdap: Tetanus, Diphtheria, and Pertussis

VBAC: Vaginal Birth After Cesarean

C-section: Cesarean Section

5. Conclusion

In conclusion, ChatGPT and other similar AI models are the way forward for future medical advice and patient assistance. Obstetricians in particular should be able to integrate ChatGPT into their daily practice and use it for providing detailed and verified information to patients through outpatient consultations and teleconsultations. One way of doing so is by developing new AI software dedicated to obstetrics and gynecology, which would be able to respond to patient queries and doubts with highly credible and precise answers. This interaction can be improved by letting accomplished obstetricians and physicians be part of the team which deals with the regulation and editing of this information, with the help of medical books and journals, so that the final answer presented to the patient can be trusted and followed without any hesitation.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare no conflicts of interest.

Funding

This work is not supported by any external funding.

Data Availability Statement

The data is available from the corresponding author upon reasonable request.

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