

Artificial Intelligence–A Puzzle for Super-skilled Future Obstetricians and ART Specialists

Artificial intelligence (AI), which is being used exponentially in almost all areas of health care, including obstetrics and gynecology and infertility treatment, as an innovative technology today, actually collects and analyzes a large amount of data in a short period of time to help predict, prevent, and diagnose diseases. AI also includes monitoring patients. In obstetrics and gynecology, AI has been actively utilized and integrated into daily medical practice for many years. For experienced obstetricians and gynecologists, AI training is also a part of their professional training.

In the broadest sense, AI is the intelligence that machines demonstrate, and it was first introduced in the early 1960s with the goal of using computers to mimic human intelligence, assimilate data, and reduce the amount of physical work that humans do. The concept of “artificial intelligence” dates back thousands of years to ancient philosophers who considered the issues of life and death. In ancient times, inventors created what they called “automata”, which were mechanical and moved independently of human intervention. The word “automata” comes from ancient Greek and means “acting of one’s own free will.”

One of the first examples of AI in medicine was the development of MYCIN, a computer program in the 1970s that could diagnose bacterial infections and recommend appropriate antibiotic treatment.

AI technology has made further progress in the fields of ultrasound diagnosis and assisted reproductive technology through machine learning and deep learning. Machine learning is a type of algorithm used to process data fed into a machine and then evaluate the results. A subtype of AI, machine learning focuses on the ability of machines to receive data and learn on their own without actually being programmed according to rules. Machine learning models can learn on their own and then adapt and improve the machine as they learn more about the information they are processing. For example, removing artifacts from images obtained during an ultrasound. Machine learning algorithms are divided into supervised and unsupervised learning algorithms. Supervised learning can be further divided into classification (decision trees, support vector machines, etc.) and regression (typical regression algorithms). Unsupervised learning algorithms are given random samples, and their main goal is to discover underlying patterns or similarities in these samples.¹

AI will store data for the entire period to facilitate personalized pregnancy management and improve overall public health, especially in low- and middle-income countries without nearby tertiary referral centers. In the future, there will be various applications in obstetrics and gynecology, and above all, it will generate Indian data to develop models and algorithms suitable for various fields.

AI is used in fetal echocardiography, ultrasound, and magnetic resonance imaging in obstetrics and gynecology. It interprets fetal heart rate (FHR) and cardiotocogram (CTG) to detect pregnancy complications such as preterm labor, fetal distress, and umbilical cord entanglement around the neck, and resolves interpretation discrepancies between clinicians to reduce maternal and child morbidity and mortality. For example, pregnancies with uterine malformations and their consequences. AI systems can be used as a tool to create algorithms that identify asymptomatic women with short cervical lengths who are at risk for preterm birth. Additionally, the vast data capacity of AI storage can help identify risk factors for preterm birth by leveraging multi-omics and rich genomic data. In gynecological surgery, the use of augmented reality can help surgeons differentiate critical structure ovarian cysts, and hydrosalpinx, reducing complications, shortening surgical times, and helping surgeons learn how to practice under realistic conditions. This is the third dimension missing from ultrasound examinations.

AI can help gynecologists make decisions, make diagnoses, and improve case management. This is the gut feeling of a senior obstetrician/gynecologist, built up through years of experience. It can reduce medical errors and provide more reliable predictions for individual patients, thereby reducing healthcare costs. AI systems require more robust data but can accurately provide information about large patient populations at a single clinical site.

The most common application of AI is the selection of embryos for transfer during *in vitro* fertilization. AI systems can identify which embryos will result in a successful pregnancy by examining time-lapse photographs of them. Another one in which AI has demonstrated potential is the optimization of embryo culture settings using self-regulatory skills. This can boost embryo survival and growth, resulting in higher pregnancy rates.

AI is also used to improve prediction of embryo transfer times during *in vitro* fertilization. AI algorithms can analyze data from patient medical records to predict optimal transfer times, thereby increasing the chances of a successful pregnancy.²

In addition to these applications, AI is also being used in other areas of fertility and IVF to improve patient outcomes. For example, AI is being used to predict ovarian reserve, predict the timing of ovulation, and improve the efficiency and cost-effectiveness of fertility clinics that can treat more patients per day with the same resources.

Limitations of AI

AI has limitations in medicine because machines lack the empathy needed to care for patients.

- **Large database requirements:** AI models require large amounts of data for effective training and testing. Behind the machine, there must be a human providing the data. The more data, the more accurate the predictions, such as calculating fetal weight or predicting growth restriction.
- **Data bias:** The data used to train AI models can be biased in the time of supply, which can cause the model to not generalize to all populations or make incorrect predictions when applied to all patient groups. For example, macrosomia and its complications.

- **Limited interpretability:** AI models are regarded as “black boxes” since it might be difficult to grasp on an individual level how they reached certain conclusions or forecasts. This can make it difficult for doctors to trust and use predictions made by AI models. For example, to predict aneuploidy in the first trimester.
- **Inability to handle uncertain data:** AI models can struggle to make predictions when there is a lot of uncertainty or multiple possible outcomes. This can be especially difficult in medicine, where many diagnoses are based on patterns and symptoms. For example, concomitant maternal disease and the result of the same Rh factor immunization.
- **Ethical issues:** There are also ethical issues associated with using AI in medicine, such as the potential to replace human doctors with AI systems.³

Obstetrics has traditionally been a skilled branch with skills being taught and learnt over a period of time. The more experienced the obstetrician, the better she is at decision-making. It remains to be seen whether AI makes them more skilled in decision-making in a short span of time and improves patient care to give better outcomes. Super-skilled obstetricians trained in AI are the future for our country.

References

1. Kim HY, Cho GJ, Kwon HS. Applications of artificial intelligence in obstetrics. *Ultrasonography*. 2023;42(1):2–9. doi: 10.14366/usg.22063. Epub 2022 Jul 20. PMID: 36588179; PMCID: PMC9816710.
2. Iftikhar P, Kuijpers MV, Khayyat A, Iftikhar A, DeGouvia De Sa M. Artificial Intelligence: A New Paradigm in Obstetrics and Gynecology Research and Clinical Practice. *Cureus*. 2020;28;12(2):e7124. doi: 10.7759/cureus.7124. PMID: 32257670; PMCID: PMC7105008.
3. Anusch Yazdani, Sam Costa, Ben Kroon. Artificial intelligence: Friend or foe? *ANZJOG*. 2023;63(2):127–130.

Geetha Balsarkar

Professor & Unit Head

Nowrosjee Wadia Maternity Hospital

Seth GS Medical College, Mumbai, Maharashtra, India