How Artificial Intelligence Can Benefit Pregnant Women's Mental Health: Analysis of Emerging Artificial Intelligence to Pregnancy Prediction

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Abstract: *As artificial intelligence (AI) continues to change the healthcare industry, models are being utilised to make labour and delivery safer for moms and newborns. Predicting pregnancy diseases including preeclampsia and gestational diabetes, controlling and treating ectopic pregnancies, and more have all benefited from the usage of AI approaches. We also discovered that AI technologies were utilised to evaluate risk variables and monitor the safety of pregnant ladies. Thus, artificial intelligence - driven devices could enhance the care given to expectant mothers.*

Keywords: AI, Pregnancy, Healthcare, women risk, newborn baby

1. Introduction

In recent years, artificial intelligence (AI) has completely changed how healthcare is provided. The study of cutting - edge AI methods, such as deep learning, to create prediction models for the early diagnosis of diseases, is growing. These predictive algorithms use mobile health (mHealth) data from wearable sensors and smartphones to find cutting - edge methods for diagnosing and treating mental health issues and chronic diseases. Having a child is an amazing experience. However, a lot of women say having a baby is like going on an emotional rollercoaster, especially when it comes to their mental health. Depression during pregnancy is rather prevalent since hormonal changes are at their most pronounced. However, embracing cutting - edge technology now may pave the path for the future. **(Abuelezz *et al.* 2022)**

When it comes to spotting early mental issues during pregnancy, artificial intelligence can be helpful. To create a comprehensive medical picture of expectant mothers and new mothers, AI uses a variety of data inputs. According to the World Health Organization, depression affects 20% of women in developing nations after giving birth and approximately 16% of women during pregnancy. According to statistics, 13% of new mothers and 10% of pregnant women both experience mental disorders**. (Abuelezz *et al.*2022)**

In certain cases, the mother's sadness could be so bad that it might drive her to consider suicide. Rarely, she can develop psychosis that endangers her unborn child. Women can have anxiety throughout pregnancy (prenatal depression) or after giving birth, which can be more than just a "moody feeling" or the "pregnancy blues" (postnatal depression). These are afflictions of the body. Untreated depression has been linked in studies to postpartum complications like low birth weight. In extreme circumstances, the youngster may also experience learning, behavioural, and developmental issues. (**"Using AI to predict risks for pregnancy and delivery"** n. d.)

Pre - and postnatal depression are difficult to identify because pregnant women's mental health is not often acknowledged. Pregnancy symptoms like fatigue, decreased appetite, anxiety, attention problems, and emotional instability might mimic the signs of prenatal depression. When these signs continue, a problem develops. But with the correct assistance, depression can be treated if it is identified early. AI has the potential to completely alter the game by scanning trillions of data points and using permutations and combinations to identify and measure potential mental health concerns as they emerge. **(Bertini *et al.*2022)** The influence of the woman's current lifestyle choices can be evaluated by providers, payers, governments, and pharmaceutical researchers in order to choose the most effective solution to prevent mental health issues.

Assess, Interface
We are in the midst of a "digital revolution" in the industrial age, one that has the potential to fundamentally alter how we diagnose and comprehend mental diseases. Expectant moms may experience depression for a variety of reasons, including sociodemographic characteristics, family dynamics, chronic illnesses, problems from pregnancy, or even a combination of variables. *See figure - 1*

Figure I

AI is able to analyse these data and identify the precise demographic subgroups that are predisposed to serious mental health issues. AI creates a distinct psycho - social profile of the mother by separating groups with and without suicide risk using data mining techniques. While treating early symptoms in expectant mothers, AI gives advice or recommendations to carers and medical professionals. A change in lifestyle might be advised by doctors in order to assist expectant moms in overcoming difficulties both during and after pregnancy. According to the severity of the mental ailment, the algorithms, which learn on their own, can also identify behavioural patterns that human interviewers could miss and recommend help. *("The new role of artificial intelligence in NIH pregnancy research | NIH MedlinePlus Magazine" n. d.)*

The techniques used to collect data become crucial since AI systems rely on large amounts of data input to produce its prediction outputs. Building a strong system that can use data to aid in more understanding research on mental health disorders among new mothers from a variety of populations is essential.

Currently, the psychiatric evaluation comprises both the expert's subjective evaluation of the woman's maternal journey and monitoring of the woman's mental state during and after delivery. These techniques occasionally have biases and may have delays. Additionally, patient interviews only provide a scant understanding of a person's mental health.

A novel pregnancy chatbot powered by artificial intelligence is intended to safeguard expectant mothers and lower maternal morbidity and death. Women's health continues to receive incredibly little funding and research. This has significant implications for the treatment and care provided to expectant mothers and their unborn children**. (Islam *et al.2*022)**

One of life's most lovely phases is pregnancy. If something goes wrong, it can also get very dramatic and upsetting. Being a mother of two, I have personally encountered this. Most pregnancies are successful, at least in our

industrialised countries, but access to high - quality treatment varies widely by region due to a growing lack of OBGYNs and the entry of new practitioners like midwives and sonographers. The risk factors associated with diabetes, obesity, maternal age, and in vitro fertilisation have all significantly increased as well.

The desire for change and new learning that pregnancy brings with it may make women feel anxious, afraid, worried, or even depressed, according to the study's authors.

Affective computing systems may enable emotional contact with the expectant mother and, for instance, identify emotional changes and enable the system to provide advice or recommendations, which it would have previously obtained from doctors. In addition to reducing the typical sensations of anxiety or worry that can occasionally result in physical difficulties, this can help the patient feel safer and more connected to her health care.

Launch of AI scan trial

A novel scanning technique is currently being tested by scientists in hopes of identifying pregnant women who are at a greater risk of having unfavourable outcomes, such as stillbirth and pre - eclampsia. Similar to the first trimester risk assessment for Down's syndrome that is commonly provided at this time in women's pregnancies, the device employs artificial intelligence to analyse ultrasound images acquired during women's 12 - week scans and assign them a risk score. To lower their chance of unfavourable outcomes, those identified as high risk may be given access to further scans or medications.

Foetal growth restriction, a disease where the baby is smaller than expected or where its growth slows or stops during pregnancy, is the single highest risk factor for stillbirth, which affects about eight families each day in the UK. (**Abuelezz *et al.2*022**)

Pre - eclampsia, a disease that can result in high blood pressure or issues with the liver or kidneys, affects about 6% of pregnant women and can be dangerous if left untreated. Both illnesses are thought to be caused by issues with the placenta, the organ that connects the mother's blood supply to that of the foetus.

A screening algorithm is being implemented in some NHS hospitals that determines a woman's pre - eclampsia risk using routinely collected antenatal data, including an ultrasound measurement of the uterine blood supply. This algorithm may allow doctors to intervene with additional screening or an early delivery of the baby if necessary**. (Islam *et al.2*022)**

Prof. Sally Collins, a consultant obstetrician and medical lead for women's health at Perspectum Ltd., an Oxford University spin - out company that is developing the technology, said: "Many studies have shown that if you have a small placenta in the first trimester, you will have a small placenta at term, and a small placenta makes a small baby. "

The tool may be able to distinguish between women with pre - eclampsia and those with foetal development restriction,

according to a pilot trial including 143 women. The new research, which began this week, will examine whether adding this data to the NHS algorithm can increase accuracy even more. It plans to enrol 4, 000 women, giving them a placental ultrasound along with standard care at their 12 - week appointment, and then monitor them to determine if the predictions made by the improved algorithm were accurate. **(Abuelezz *et al.2*022)**

A woman's physical and mental health may be affected during pregnancy, making it a complicated and important time in her life. On the one hand, adjusting to the significant physiological changes that take place during pregnancy may be challenging. On the other hand, a crucial component of her emotional behaviour and psychological health is ensuring both her own and her foetus' wellbeing. This quest for wellbeing may necessitate the acquisition of new skills, alterations to one's lifestyle (diet, exercise, sleep, employment, etc.), as well as appropriate medical attention and prompt follow - ups. The probability of experiencing health issues during pregnancy, particularly if there is a high likelihood of difficulties, is another crucial factor that might have a detrimental effect on the pregnant woman's psychological health.

AI Can Now Predict Birth Issues years ahead
Models are being used to make labour and delivery safer for mothers and newborns as artificial intelligence (AI) transforms the healthcare sector. The number of births in the United States has been declining over time, while labor - related issues have been rising. The rate of delivery issues among American women grew by more than 14% between 2014 and 2018, according to a 2020 study by the Blue Cross Blue Shield Association. Women who experience these problems may suffer negative long - term consequences such as trauma, injury, and infertility. The risks can be costly as well because, according to Commonwealth Fund data from 2021, issues during pregnancy and childbirth can have a social cost of up to $32.3 billion annually. (*"Can AI Lead to Pregnancy? - IEEE Spectrum" n. d.)*

In a novel diagnostic model for labour, the application of artificial intelligence could help protect women from these difficulties and give medical professionals crucial guidance on how to proceed during a potentially risky birth. The new health care AI model was reported in a study that was published this week in PLOS One, a peer - reviewed academic publication with a focus on science and medicine, by researchers at the Mayo Clinic, a nonprofit U. S. medical research centre. They said that the recent discoveries, along with ongoing research, could aid in preventing a number of dangerous outcomes for both pregnant women and new - borns.

The study claims that the algorithm can predict if a delivery would lead to a "unfavourable labour outcome, " such as whether the delivery will result in a mother losing a lot of blood or whether a baby has to be provided ventilation after delivery. By making patient counselling and decision - making easier, this ground - breaking tool could reduce risks for moms, newborns, and caesarean deliveries. The Mayo Clinic's machine learning model for labour outcomes is merely the latest recent example of how A. I. technology is transforming healthcare. Artificial intelligence is already having a substantial impact on how medical professionals discover and diagnose issues, treat illnesses, and make decisions, according to a 2017 report by consulting firm PwC.

Artificial Intelligence Improves the Health of Pregnant Women
Most scientific fields, including health and medicine, use artificial intelligence extensively. Both the mother and the foetus' lives may be in danger from certain pregnancy - related problems or disorders. Additionally, a wealth of research supports the notion that emotional factors may be important risk factors for pregnancy (such as stress, anxiety, or depression).

Potential Health Benefits of AI
Following pretraining, artificial neural networks like GoogleNet and AlexNet were successfully employed as diagnostic tools to precisely differentiate between chest X - ray pictures indicative of tuberculosis and healthy images. Similar to this, neural network algorithms have proven successful in correctly grading gliomas, breast, cervical, and detect cancer stages. **(Abuelezz *et al.2*022)**

- In determining the likelihood of recurrence in breast cancer, morbidity following surgery for head and neck squamous cell carcinoma, or post - surgical complications in non - small cell lung cancer, artificial intelligence algorithms have been proven to be superior to traditional statistical analysis.
- AI can be a time - saving tool in the drawn - out, expensive process of drug discovery. The DeepVS neural network was successful in correctly identifying a target receptor that met a study's needs.
- Targeted nanorobots are cutting - edge drug delivery technologies.
- Similar to this, AI has demonstrated efficacy in predicting prognosis by evaluating the efficacy of chemotherapy in breast cancer patients (using, for example, RECIST 1.1) or in identifying the locations for radiation therapy in cancer.
- It's also interesting to note that AI can give feedback to doctors who engage with patients by pointing out unnoticed issues or cues during talks to enhance diagnosis and treatment.
- A. I. helpers could quickly sift through millions of pages to bring doctors up to date on clinical studies.
- On an institutional level, artificial intelligence (A. I.) could play a crucial role in data management, including the gathering, storing, standardising, and tracing of data. The current healthcare system will be completely altered by this.
- AI can shorten waiting times.

Gynecology and obstetrics is a medical specialty that is progressively gaining from applications of artificial intelligence. In earlier research, we showed how obstetric management by doctors and Artificial Intelligence (AI) technology can improve pregnancy health, resulting in better pregnancy outcomes and a better overall experience while also reducing any potential long - term effects that can be produced by complications. In this article, a data gathering approach for ethical AI in health is presented, together with

a case study in the area of pregnancy. (Abuelezz *et al.*2022) It is a qualitative descriptive study on the preferences and hopes that expectant mothers have for affective computing and responsible AI. Questions about AI's potential negative effects have emerged due to the significant potential disruptive and revolutionary influence it can have on both a social and individual level. The Responsible Artificial Intelligence (RAI) methodology was developed in response to the need to assure an ethical, open, and accountable usage of AI. (Bertini *et al.*2022)

There is a lot of literature that supports the idea that a pregnant woman's emotional state influences harmful pregnancy conditions and outcomes, like preeclampsia. As was mentioned in the previous section, very few studies on AI applied to pregnancy health and well - being used emotional data to develop prediction models. Preeclampsia - specific risk factors include emotional stress, high blood pressure, stressful life events including trauma or death, sleep difficulties, irregular circadian rhythms, obesity, hyperinsulinemia, recent miscarriages, and a personal or family history of the condition. Numerous writers link anxiety and depression to pregnancy issues include a higher risk of developing preeclampsia, having a c - section, having a baby with low birth weight, or having a baby prematurely.

2. Conclusion

Future research that focuses on further integrating those technologies into the creation of digital health systems and bringing multidisciplinary development and design teams closer to regulatory and standard framework compliance is a promising direction. In spite of their importance, data security and privacy issues were only discussed in 7% and 23% of the studies, respectively, which presents a gap in the current body of study and a chance for future research. It is also obvious that community efforts to replicate and validate findings will aid in the development of more reliable and useful research guidelines. Finally, this paper offers knowledge for scholars and professionals interested in expanding their understanding of affective computing and artificial intelligence applications in the disciplines of obstetrics and gynaecology. Artificial intelligence (AI) has recently attracted a lot of attention from a wide range of sectors and industries, including healthcare and medicine. Prediction typically refers to a diagnosis in the context of medical research, which is the likelihood that a specific ailment is present but has not yet been identified. In particular, AI research has been used in the medical field to anticipate a wide range of health - related issues, including diabetes cardiovascular diseases obesity, cancer and disorders connected to pregnancy. Several categories can also be used to classify prediction research.

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