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REVİEW

A Review on Fertility Bracelets: The Integration of Wearable Technologies into Women's Health

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ABSTRACT

Recent years developments in digital health technologies have enabled women to monitor their fertility cycles more accurately and continuously. Fertility monitors developed using digital health technologies support the prediction of ovulation and the determination of the fertility cycle by monitoring physiological parameters such as basal body temperature, heart rate, respiratory rate, body temperature, and sleep patterns. This review presents an evidence-based perspective on the use of fertility bracelets in women's health services, in line with the current literature, covering their contribution to fertility monitoring, their effectiveness and limitations, and their integration into midwifery care. A literature review was conducted by searching publications from 2017 to 2024 in the PubMed, Scopus, Web of Science, and Google Scholar databases using the keywords “fertility bracelet”, “fertility tracking”, “wearable reproductive health technology”, and “wearable fertility tracking”. Fertility bracelets are an effective tool for increasing women's fertility awareness, supporting natural pregnancy planning processes, and developing in enhancing their self-efficacy in monitoring their own health data. Ava Fertility bracelets stands out as an exemplary digital fertility wristband that contributes to determining the fertility window by comprehensively monitoring physiological indicators such as skin temperature, heart rate, heart rate variability, and respiratory rate thanks to its sensor-based structure. Studies have reported an accuracy rate of 89–90 per cent in ovulation prediction. Fertility bracelets require midwives to utilise their digital mentoring and data literacy roles more effectively, ensuring women benefit from these technologies in a safe, informed and ethical manner.

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Introduction

Fertility, which is the foundation of reproduction, proliferation, and development, means a woman's ability to conceive and have a baby. (Silva et al., 2020) Fertility monitoring plays an important role in reproductive health in terms of achieving planned pregnancies, correctly applying fertility awareness methods, and supporting natural family planning. The limited accuracy of traditional methods (e.g. calendar method, basal body temperature measurement) has increased interest in digital technology. In recent years, the development of digital health technologies has enabled wearable devices used in fertility monitoring to continuously track women's physiological parameters, Offering more accurate and personalised fertility monitoring (Goodale et al., 2019; Lyzwinski et al., 2024). Fertility bracelets are widely used by women planning pregnancy, those wishing to regularly monitor their menstrual cycle, couples preferring natural family planning methods, and individuals experiencing fertility challenges. They provide these groups with personalised, reliable data for cycle tracking (Goodale et al., 2019; Shilaih et al., 2017; Lyzwinski et al., 2024). Fertility bracelets, one type of wearable device, are a user-friendly digital health technology, particularly for monitoring the menstrual cycle, detecting ovulation, and determining the fertility cycle (Shilaih et al., 2017). These technological advancements not only enhance women's health awareness but also enable the effective use of digital health technologies in health practices and education. This ensures the provision of accessible, evidence-based, and future-oriented reproductive health services (Konttila et al., 2019; Wakelin et al., 2023). To evaluate the scientific evidence on fertility bracelets in the review, studies published between 2017 and 2024 were searched in the PubMed, Scopus, Web of Science, and Google Scholar databases using the keywords "fertility bracelet", "wearable reproductive health technology", and "wearable fertility tracking". The aim of this review is to examine the current literature concerning the use of fertility bracelets in women's health services, to evaluate these technologies' contributions to fertility monitoring, their effectiveness and limitations, and to present an evidence-based perspective on their integration in to midwifery care.

The History of Fertility Bracelets

Wearable technology is a concept that has emerged from the direct integration of technology into accessories or clothing and is considered one of the most significant innovations of the 21st century. Initially born from the intersection of technology and fashion, this approach has made it possible to produce devices capable of monitoring users' daily activities and collect health data (Yetmen, 2017). Among the first examples are prototype smartwatches developed in the 1950s, wearable cameras designed for the visually impaired in the 1970s, and Steve Mann's multimedia-enabled portable systems in the 1980s. Since the 2000s, these technologies became more functional in the fields of health and sports, products such as sensor based rings, smart shirts, and pedometer kits have been able to continuously monitoring individuals' physiological data (Çelik et al., 2024). The miniaturisation of technology and increased sensor sensitivity have enabled women to more accurately estimate their fertility cycles and make informed decisions based on scientific data when planning pregnancies. Fertility bracelets designed to track the fertility cycle were developed in the 2010s (Cromack and Walter, 2024).

Fertility bracelets developed in the early stages relied on methods where users manually entered their menstrual cycle data into the application and measured and recoded their basal body temperature themselves. Manual data entry led to reporting errors, difficulties in remembering days, and accuracy issues in women with irregular cycles (Earle et al., 2021). With technological advances, automatic temperature sensors, heart rate, heart rate variability, and sleep cycle analyses have been integrated into these systems, transforming fertility bracelets into advanced digital health technologies that can identify menstrual cycle phases such as ovulation, luteal phase, and menstruation through continuous physiological monitoring without requiring user intervention (Grant et al., 2020). In a study conducted by Patel et al. (2024), it was found that 65.3% of users found the cycle predictions of their period cycle applications to be accurate, while 38.0% forgot to enter data regularly, which contributed to an increase in cycle prediction errors.

Working Principles and Technological Infrastructure of Fertility Bracelets

Fertility bracelets are wearable technologies developed to track women's menstrual cycles and ovulation periods, continuously monitoring physiological parameters. Fertility bracelets are equipped with various sensors designed to detect biological changes occurring in the body before and after ovulation. These sensors measure multiple biophysical parameters such as basal body temperature, resting heart rate, body temperature, respiratory rate, skin conductance, sleep patterns, and, in some models, heart rate variability, and analyse the data obtained using artificial intelligence-based algorithms. The analysis results of all data enable inferences to be made about women's fertility periods (Cromark et al., 2024; Lyzwinski et al., 2024; Zhu et al., 2021). Studies have demonstrated that in Zurich physiological parameters such as wrist skin temperature, heart rate, heart rate variability, respiratory rate, and skin perfusion undergo significant changes throughout the menstrual cycle. It has been reported that monitoring these multiple biomarkers together achieves approximately 89–90 per cent accuracy in predicting ovulation time (Shilaih et al., 2017; Goodale et al., 2019).

To enhance the reliability of wearable fertility monitoring technologies, some devices have been

evaluated by the US Food and Drug Administration (FDA) under the 510(k) process and found suitable for clinical use. The Ava Fertility Tracker, shown in Figures 1, 2, and 3, is a system that estimates ovulation and fertility periods by measuring physiological parameters via the wrist and has been approved by the FDA under the classification 'Fertility Diagnosis, Proceptive' with the number K200163 (U.S. Food and Drug Administration, 2025). The device contributes to determining the fertility window by holistically monitoring multiple biomarkers such as wrist skin temperature, heart rate, heart rate variability, and respiratory rate. This example demonstrates that fertility bracelets are not only considered consumer technology but are also evaluated as medical devices and undergo regulatory processes.

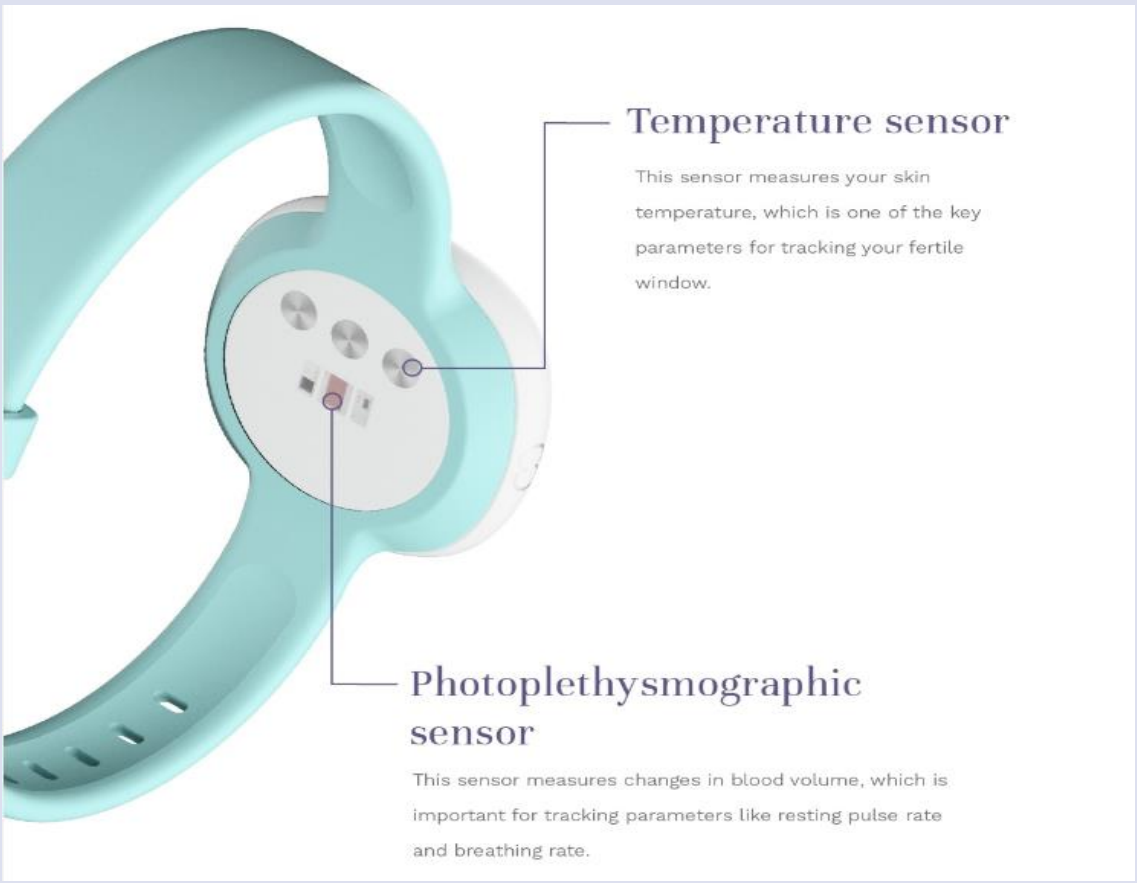


Figure 1. Sensors in the fertility bracelet. (*Ava Science Inc, 2021)*



Figure 2. View showing the accelerometer sensor of the fertility bracelet. (*Ava Science Inc, 2021)*



Figure 3. Fertility bracelet and mobile application interface. (*ResearchGate, 2025).*

Fertility bracelets mobile applications guide women with features such as graphical data presentation, alerts, and daily logs. With these features, women can better identify their cycles, planing natural pregnancies, and gain awareness about their bodies (Zhu et al., 2021). The accuracy levels of fertility bracelets may vary depending on environmental and individual factors. On the other handd the accuracy levels, of the devices may be effectedd by sensor calibration, usage method and duration, individual physiological differences, and environmental conditions. Therefore, fertility bracelets should be considered a supportive tool for fertility monitoring; however, they should not be used alone as a clinical diagnostic tool (Hrabovska et al., 2023). Zhu et al (2021) also emphasised that fertility trackers alone do not provide sufficient reliability for preventing unwanted pregnancies.

Fertility Bracelets: The Effectiveness, Advantages and Limitations

Fertility bracelets provide a scientific basis for fertility awareness-based methods, enabling women to closely monitoringg their menstrual cycle and ovulation periods non-invasively and understand their reproductive cycles more consciously. One of the most significant advantages of these devices is that they are user-friendly and can continuously measure physiological parameters (e.g., body temperature, heart rate, respiratory rate) (Goodale et al., 2019; Lyzwinski et al., 2024). Thus, women can determine their fertility cycle more accurately and plan pregnancy at the appropriate time. Furthermore, these devices, which operate integrated with mobile applications, increase fertility awareness by providing personalized data and contribute to informed decision-making regarding reproductive health. (Cromack and Walter, 2024; Shilaih et al., 2017). Monitoring parameters such as sleep patterns, heart rate variability, and mood

also broadens the scope of these devices beyond fertility to general health monitoring (Nulty et al., 2022). For subfertile women, accurately recognizing their fertility cycle not only increases the chance of conception but also contributes to the more conscious and effective use of natural contraception methods in addition to conventional contraceptive methods (Cromark et al., 2024; Saugat et al., 2023).

In a study conducted by Shilaih et al (2017) indicated that the nocturnal pulse rate showed a significant difference between menstrual phases, and this data is usable for fertility prediction. Goodale et al. (2019) reported that they could predict the fertility cycle with 90% accuracy using a machine learning-based algorithm. Nulty et al (2022) stated that the fertility wristband provided high user satisfaction in sleep and pulse measurements, was reliable in fertility tracking, but had limited data accuracy during pregnancy. Zhu et al. (2021) demonstrated in their study that continuously measured wrist skin temperature (fertility bracelet) during sleep has higher sensitivity in determining ovulation compared to basal body temperature (e.g.,measured upon waking in the morning before getting out of bed). Shilaih et al. (2018) emphasised that the ability to perform uninterrupted temperature measurements throughout the night and the automatic analysis of measurement changes by smartphone applications or computer software made the method less susceptible to user-related measurement errors (e.g., waking up at different times in the morning). Futurely, it is predicted that technology will be used more effectively to increase fertility tracking and menstrual cycle awareness, and that an innovative and inclusive approach will be adopted (Cromark et al., 2024). Cromark et al. (2024) state that ovulation can be predicted more accurately not only by a single physiological parameter, but by integrating multiple physiological data collected through wearable technologies with hormonal indicators using algorithms. It is recommended that the wearable devices to be developed have user-friendly interfaces and focus on discovering alternative biomarkers for non-invasively detection of ovulation (Cromark et al., 2024).

Fertility bracelets also have some limitations. For example, these devices have lower sensitivity and specificity compared to standard diagnostic methods such as transvaginal ultrasound or serum hormone levels (Zhu et al., 2021). Furthermore, the accuracy of the devices varies depending on user compliance, skin type, sleep duration, and environmental factors (Hrabovska et al., 2023). Some studies have found low correlations, particularly in parameters such as heart rate variability, and it has been noted that this could affect the clinical reliability of the data (Nulty et al., 2022). Moreover, the high cost of some models with advanced technology may limit access to these devices for individuals with low socioeconomic status. in Addition, the digital collection of health data, issues of data privacy and ethical security must also be carefully addressed (Cromack and Walter, 2024; Lyzwinski et al., 2024). Another limitation for our country is the absence of a digital, sensor-based fertility monitoring bracelet that qualifies as a medical device. In our country, bracelets made from natural stones, which are traditional and cultural in nature, are commonly used. However, since these types of natural stone bracelets do not have medical functions such as physiological monitoring, ovulation detection, temperature or heart rate measurement, they are not recognised as medical devices according to international standards.

Fertility Bracelets and Midwife

The selection of a fertility bracelet in accordance with individual needs, the tracking of relevant data, and particularly the interpretation of these data in ovulation monitoring (Cromack and Walter, 2024; Shilaih et al., 2017) require professional counseling, as these devices do not work with the same accuracy for every individual and are influenced by both environmental and personal factors, as well as issues related to data privacy and access inequality (Hrabovska et al., 2023). The role of midwives in advising on the safe, correct and effective use of fertility bracelets is critical; however, the healthy integration of this technology into midwifery practice requires not only counselling but also the fulfilment of educational requirements. Midwifery degree programmes must include content such as digital health, data literacy, sensor technologies, privacy, and data security to develop knowledge and skills related to the use of digital health technologies, particularly sensor-based fertility monitoring systems.

Post-graduation continuing professional development programmes should also include training on the evaluation of digital fertility monitoring tools, data interpretation, and counselling practices, supporting midwives in using these devices from an evidence based perspective. The risks that may arise from the use of fertility bracelets further highlight why midwives should play an active role in this process. Situations such as unwanted pregnancy due to misinterpretation of sensor data, incorrect prediction of ovulation due to disregard of cycle variability, failure to notice measurement errors in the device, or overconfidence in the accuracy of the application can pose significant risks to women's health (Cromack & Walter, 2024; Hrabovska et al., 2023). The midwife evaluates the data, taking into account the individual's physiological variability, environmental factors and the limitations of the device; informs the woman about the consequences of incorrect or inappropriate use and provides scientifically based guidance.

When used correctly and consciously, fertility bracelets can help women better understand their cycles, increase their fertility awareness, and share their questions about reproductive health more openly with their midwives (Shilaih et al., 2017). This process strengthens communication between midwives and women, supports women in taking a more active role in managing their own reproductive health, and makes the counselling process more functional. Therefore, increasing midwives' competence in digital fertility monitoring technologies enables women to use these devices consciously and enhances the quality of reproductive health services.

Conclusion

Fertility bracelets are among the significant innovations of digital health technologies reflected in the field of reproductive health. By continuously tracking physiological parameters such as body temperature, heart rate, respiration rate, and sleep patterns, they contribute to determining the ovulation period, enhance women's fertility awareness, and support natural pregnancy planning processes (Goodale et al., 2019; Lyzwinski et al., 2024). Studies have shown that fertility bracelets have high accuracy rates in predicting ovulation (Goodale et al., 2019; Lyzwinski et al., 2024; Zhu et al., 2021); however, it has been emphasized that this level of accuracy varies depending on individual and environmental factors (Hrabovska et al., 2023). In addition, fertility bracelets are considered not as a replacement for clinical diagnostic tools but as a complementary monitoring method (Cromark et al., 2024; Saugat et al., 2023).

From the perspective of midwifery, fertility bracelets strengthen the role of midwives in areas such as woman-centered care, digital health literacy, reproductive health counseling, and self-management support. The responsibility of midwives to evaluate the data obtained from these devices, provide guidance on their safe and ethical use, and support women in using the technology consciously becomes increasingly prominent. To support the effective, safe, and evidence-based use of fertility bracelets, various policy and education-based regulations must be implemented. It is considered important to make content such as digital health literacy, biosensor technologies, data interpretation, privacy, and ethics mandatory in undergraduate and postgraduate continuing professional development programmes. The increasing prevalence of fertility bracelets necessitates the integration of these technologies into clinical guidelines and national reproductive health programmes, thereby enabling midwives to provide standardised and evidence-based counselling. Furthermore, it is necessary to develop enhanced privacy policies for data security, ensure device manufacturers comply with transparent data management standards, and implement regulations to protect users' personal health data. As fertility bracelets may not currently be affordable for every woman, it is important to develop strategies to reduce economic access inequalities. All these suggestions reinforce the effective and ethical use of fertility trackers in reproductive health services, support midwife-woman collaboration, and contribute to the safer and more equitable adoption of digital health technologies at the community level.

Declarations

Acknowledgments
Not applicable.

Conflict of Interest
The authors declare no conflicts of interest.

Ethics Statement
No ethical approval was obtained due to the nature of this study.

Informed Consent
Not applicable.

Author Contributions
Conceptualization: NA, GD; Methodology: NA, GD; Literature search: NA, GD; Writing – original draft preparation: NA, GD; Writing – review & editing: NA, GD; Supervision: NA, GD.

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Data Availability
The data used to support the findings of this study can be made available upon request to the corresponding author.

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