International Research Journal on Advanced Engineering Hub (IRJAEH)
e ISSN: 2584-2137
Vol. 04 Issue: 07 July 2026
Page No: 4684-4689
https://irjaeh.com
https://doi.org/10.47392/IRJAEH.2026.0615

A Digital Women's Health Platform for Ovulation Prediction, Symptom Analysis, and Pain Relief

Deeksha M[1], B.S. Meghana[2], Chinthana HP[3], Keerthi Kumar KM[4]

[1,3,4]Master of Computer Applications Student, Department of Master of Computer Applications, PES College of Engineering, Mandya, 57401, Karnataka, India.

[2]Assistant Professor, Department of Master of Computer Applications, PES College of Engineering, Mandya, 57401, Karnataka, India

Email ID: *deekshamadappa2510@gmail.com[1], meghana@pesce.ac.in[2], chinthana1824@gmail.com[3], keerthikm2003@gmail.com[4]*

Abstract

This paper talks about Flow Control, an app we built to help track menstrual cycles, predict ovulation, and also give some relief from period pain. Most period tracker apps only look at the last period date and average cycle length to guess the next one, but that does not work well for people with irregular cycles or other health issues. So in our app, along with the period date we also take inputs like pain level, mood, food habits and some clinical details, and use this to predict the ovulation window more accurately and show it on a calendar. Apart from this, we added a chatbot for basic health guidance and a TENS device that connects with the app over Bluetooth and gives pain relief through small electrical pulses, so the user does not always have to depend on medicines. This whole idea is inspired by an IEEE paper on privacy-based menstrual tracking, but we have built a simpler version that a student team can actually make and test. Overall the project is meant to make users more aware of their cycle, know their fertile days better, get safe pain relief, and keep a proper record of their symptoms over time.

Keywords: *ovulation prediction, menstrual health tracking, TENS device, dysmenorrhea relief, Bluetooth Low Energy, privacy-first mobile app, health chatbot.*

1. Introduction

Menstrual health is an important part of a woman's overall health because every month the cycle goes through changes that affect not just fertility but also physical comfort, mood and daily routine. A normal cycle has four phases - menstruation, follicular phase, ovulation and luteal phase. Out of these, ovulation is the most important phase because it tells the most fertile time, and it usually comes with changes in symptoms, body temperature, discharge and mood. Most of the period tracking apps that people use are quite basic, they just take the last period date and an average cycle length and predict the next one from that. This kind of method does not work properly if someone has irregular periods, stress, bad sleep, changing routine or PCOS related issues. So a better app should also take other things into account, like how regular the cycle is, how much pain the person has, mood changes, clinical history, food habits, and a continuous log of symptoms, before it tries to predict anything about fertility. Pain is another thing we cannot ignore in a women's health app. Dysmenorrhea, which is basically period pain, can affect concentration, make movement difficult and disturb the whole day for a lot of people. A small TENS device can help here because it gives pain relief without medicine, by sending low level electric pulses through electrodes placed on the skin. Because of this, in our project we decided to combine ovulation prediction and symptom tracking along with a controlled TENS based pain relief feature, all in one single app. We took a 2025 IEEE Internet of Things Journal paper as the base reference for this project, it talks about AI based menstrual tracking using contactless biosensing and federated learning [1]. The main points from that paper are about privacy, prediction based on individual data, and

International Research Journal on Advanced Engineering Hub (IRJAEH)
e ISSN: 2584-2137
Vol. 04 Issue: 07 July 2026
Page No: 4684-4689
https://irjaeh.com
https://doi.org/10.47392/IRJAEH.2026.0615

monitoring through sensors. In our paper, we have taken that same privacy idea and turned it into a working project called Flow Control, where the user enters their own cycle and health data, can check the ovulation calendar, gets tips and chatbot replies, and also controls a smart TENS module directly from the app.

2. Related Work

Rajesh [1] built a privacy-preserving menstrual tracking framework using contactless sensing, physiological inputs, and federated learning, so reproductive health data never has to leave the device for prediction. That matters here too, given how sensitive period dates, pain levels, and clinical details are. Suman et al. [2] applied deep learning to sharpen period prediction. Symul and Holmes [3] used hidden semi-Markov models to label self-reported menstrual events despite gaps in the logs. Murayama et al. [4] tried abdominal skin temperature during sleep as an easier substitute for basal body temperature. The common thread: prediction improves once a system tracks patterns over time instead of one entry at a time. Work on ovarian health and PCOS makes the same case. Ghosh and Srinivasan [5] used transfer learning to spot PCOS from ultrasound images, Amin et al. [6] applied an attention-enhanced DenseNet model to ovarian cancer MRI scans, and Makrariya et al. [7] studied hormone-linked thermal changes. Recent IEEE work also covers wearable ovulation prediction, blood-sample PCOS screening, infertility prediction, follicle detection, and related image-based and hormonal models [8]-[20]. Most of this work tackles one piece at a time, prediction accuracy, wearable sensing, ultrasound diagnosis, or hormonal modeling, rather than all of it together. Few systems combine cycle awareness, symptom logging, privacy-aware storage, chatbot guidance, and TENS pain relief. That's the gap this project tries to close.

3. Problem Statement

Most people don’t keep an organized, ongoing record of period dates, ovulation symptoms, pain intensity, mood, eating habits, sleep, and clinical concerns. Once that data is missing or scattered across memory and random notes, it’s hard to know fertile days, spot irregular cycle patterns, or notice symptoms that keep recurring. That gap can also delay someone from recognizing a real problem and seeking medical advice when symptoms get serious. This project sets out to build something simple, affordable, and secure: an ovulation-tracking platform that also handles menstrual pain relief. It needs registration and login, a straightforward way to collect cycle and clinical details, low- and high-chance fertility date calculations, pain and mood logging during periods, lifestyle tips, chatbot guidance, and control over a smart TENS module for safe pain-relief sessions.

4. Objectives

- Build a mobile app that records period date, cycle regularity, pain score, mood changes, food habits, and clinical health details.
- Calculate the likely ovulation date and fertile window from a user's own cycle inputs, and show it through a calendar.
- Design a compact smart TENS unit that talks to the app over Bluetooth Low Energy and runs controlled pain-relief sessions.
- Securely store cycle history, symptom records, and TENS session details so they're useful for long-term tracking.
- Offer personalized health tips and chatbot support to build better menstrual awareness and steadier cycle management.

5. Proposed System

There are basically two parts to our system, the mobile app and the wearable TENS hardware. The app side is where the user does everything. They register, login, and then fill out a health questionnaire, this asks for things like last menstrual period date, average cycle length, how regular the cycle is, pain level, mood, food habits, and if they've had any menstrual or ovarian health problems before. Once this is filled, the app uses these answers to estimate ovulation and mark the fertility dates on a calendar. On the hardware side, the TENS unit has a BLE enabled microcontroller, a pulse generation circuit, current control for safety, a power source, and electrode pads. From the app itself, the user picks a safe intensity, pulse mode and how long the session should run, and this gets sent to the microcontroller which actually drives the output circuit. Once the session is done, the app saves the date, duration, the settings that were used, and how the user felt afterward. This way there is a record of past sessions

International Research Journal on Advanced Engineering Hub (IRJAEH)
e ISSN: 2584-2137
Vol. 04 Issue: 07 July 2026
Page No: 4684-4689
https://irjaeh.com
https://doi.org/10.47392/IRJAEH.2026.0615

to look back at. We also built in a tips module that checks this logged data and gives out basic suggestions, drink enough water, eat balanced meals, sleep properly, get some exercise, and if symptoms keep being abnormal, it tells the user to go see a doctor Shown in Figure 1.

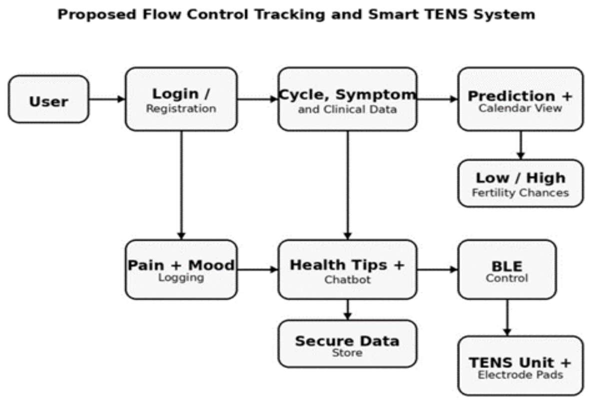

Figure 1 Architecture of the proposed ovulatory phase tracking and smart TENS control system

6. Methodology

6.1.User Data Collection

Once an account exists, users enter their cycle details: last menstrual period, cycle length, regularity, and expected period info. The app also asks about symptoms, pain level, cramps, mood, flow pattern, food habits, sleep quality, and any clinical concerns. All of this builds the profile the system uses to estimate ovulation and generate health tips.

6.2.Ovulatory Phase Estimation

The first version runs on a personalized calendar-based calculation. Taking CL as average cycle length and LMP as last menstrual period date, the estimated ovulation day works out to:

Ovulation Date = LMP + (CL - 14)

Fertile Window = Ovulation Date - 5 days to Ovulation Date + 1 day

That fertile window shows up as higher-chance days, with everything else marked lower-chance. If a user reports irregular cycles, the system dials back its confidence in the prediction and pushes them to keep logging cycles and talk to a doctor if the irregularity doesn't settle down.

6.3.Pain, Mood, and Lifestyle Logging

While the period is active, the app prompts users to log pain level, cramps, tiredness, mood swings, eating pattern, and general comfort. These entries roll up into simple trend summaries. A run of high pain entries, for instance, can trigger a suggestion to see a doctor, and it can also be cross-checked against past TENS session feedback.

6.4.TENS Control and Session Tracking

The app talks to the TENS unit over Bluetooth Low Energy, and users only ever choose from predefined safe options for intensity, pulse pattern, and duration. Those values go to the microcontroller, which drives the TENS circuit accordingly. When the session ends, the app records the date, duration, intensity used, and how much relief the user reported.

6.5.Privacy and Security

Because menstrual and clinical data is sensitive, the design treats privacy as a first-class concern. Only the data actually needed for predictions and suggestions gets used, and everything else stays stored securely. Following the direction set by the parent paper [1], a later version could bring in federated learning, letting the model improve without raw personal health data ever leaving the device for a central server.

7. Algorithm Design

The working steps of our app can be explained like this:

- First the user opens the app and logs in so the system can verify them.
- Then the period date, cycle length, regularity, symptoms, mood, pain level, food habits and clinical inputs are logged.
- The app works out the average cycle length using past logs, or if not available, it just uses the latest value the user entered.
- The probable ovulation date is calculated as LMP + (cycle length - 14).
- From this, the fertile window is built, starting five days before ovulation and ending one day after.
- The calendar then shows labels for low, medium and high chance days.
- During the period phase, the app collects the pain score and mood info as well.
- If the user wants pain relief, the app connects

to the TENS device and starts a controlled session.

- All of this, cycle history, symptom details and TENS feedback, is saved securely.
- Finally, health tips and chatbot responses are generated based on whatever the user has entered.

8. Implementation Requirements

8.1.Hardware Requirements

On the hardware side, the build needs an ESP32 or another BLE-capable microcontroller, Bluetooth Low Energy support, a TENS pulse-output circuit, current-limiting safety circuitry, electrode pads, and a rechargeable Li-ion battery. It needs to stay small, energy-efficient, and comfortable enough to actually wear.

8.2.Software Requirements

The app itself can be built in Android Studio with Java or Kotlin, or with a cross-platform framework like Flutter or React Native. The embedded firmware would run on Arduino IDE or a comparable microcontroller environment. For storage, user profiles, cycle logs, symptom history, and session data can sit in Firebase, MySQL, or an encrypted local database, depending on what fits the deployment.

8.3.Main Application Modules

- User registration and login
- Health questionnaire with clinical data entry
- Ovulation prediction and calendar display
- Pain, cramps, and mood tracking
- BLE-based TENS control
- Healthy tips and chatbot assistance
- Session history and report viewing

9. Expected Results and Discussion

The final goal of this project is to have a working prototype that handles both menstrual awareness and pain management together. The user should be able to enter their cycle details, see the predicted ovulation dates, easily tell apart low and high chance fertility days, track their pain and mood, and get tips that feel personalized instead of just generic advice. Also the TENS module should let the user run controlled sessions from the app itself and keep a record of how the previous sessions went and how much relief they gave. If we compare this with a normal calendar app, our system takes in a lot more user specific details and gives broader support through symptom tracking, clinical inputs, chatbot help and pain relief control. And if we compare it with the parent research paper [1], our implementation is a lot simpler because we did not use radar, LiDAR, PPG sensors or a full federated learning setup like they did. But we still kept the privacy first idea from that paper, and later on this can be expanded further with sensor based prediction models. There are some limitations too which we want to be honest about. The calendar based ovulation estimate is not something that can be taken as a medical diagnosis, especially for people with irregular cycles. The TENS device needs to be used only within safe intensity levels and the instructions for it should be clear to the user. Also our app is only meant to be a support tool, not a replacement for actual medical advice, so if someone has severe pain, irregular bleeding, signs of PCOS or any other ovarian health concern, they should still go and consult a qualified doctor.

Conclusion

This paper has laid out Flow Control, a privacy-centric Android-based system for ovulation prediction, symptom analysis, and personalized cycle feedback. It brings together calendar-based cycle math, a fertility calendar view, physical symptom, vital and mood logging, phase-specific health tips, a conversational chatbot, and secure local storage. By design, it's offline-first, which keeps menstrual tracking private, and it turns the underlying cycle-tracking math into something people can actually use on their phone. The hoped-for payoff is better cycle awareness, more reliable symptom logging, and private self-care without any risk of cloud-side data exposure.

Future Scope

In future, this project can be extended further by adding contactless physiological sensing, wearable temperature monitoring, federated learning, a multilingual chatbot, an option to book doctor consultations, and integration with properly approved medical datasets. We also think it would be good to add confidence scores for irregular cycles and generate detailed reports that users can carry with them when they go for a clinical consultation. These are things we could not fit into this version but would like to add later.

References

[1]. M. Rajesh, "AI-powered menstrual cycle tracking with contactless biosensing and federated learning for privacy-preserving ovulation prediction," IEEE Internet of Things Journal, vol. 12, no. 21, pp. 45753-45761, Nov. 2025, doi: 10.1109/JIOT.2025.3600457.

[2]. S. Suman, S. Mukherjee, M. P. Selvan, V. A. Mary, S. Jancy, and S. P. Shyry, "Menstrual cycle tracking using deep learning," in Proc. 3rd Int. Conf. Pervasive Computing and Social Networking (ICPCSN), 2023, doi: 10.1109/ICPCSN58827.2023.00030.

[3]. L. Symul and S. Holmes, "Labeling self-tracked menstrual health records with hidden semi-Markov models," IEEE Journal of Biomedical and Health Informatics, vol. 26, no. 3, pp. 1297-1308, Mar. 2022, doi: 10.1109/JBHI.2021.3110716.

[4]. Y. Murayama, Z. Tang, K. Saito, T. Nakano, and M. Mitsui, "Monitoring basal body temperature rhythm: Abdominal skin temperature measurements taken during sleep as simpler alternative," IEEE Access, vol. 12, pp. 182374-182385, 2024, doi: 10.1109/ACCESS.2024.3511341.

[5]. A. Ghosh and K. Srinivasan, "EffiDenseGenOp: Ensemble transfer learning with hyperparameter tuning using genetic algorithm optimization for PCOS detection from ultrasound sonography images," IEEE Access, vol. 13, pp. 54285-54312, 2025, doi: 10.1109/ACCESS.2025.3553895.

[6]. M. Amin et al., "GAM-attention enhanced DenseNet121 with Bayesian optimization for accurate ovarian cancer diagnosis in MRI images," IEEE Access, vol. 13, pp. 157317-157335, 2025, doi: 10.1109/ACCESS.2025.3606260.

[7]. A. Makrariya et al., "Mathematical simulation of behavior of female breast consisting malignant tumor during hormonal changes," IEEE Access, vol. 10, pp. 91346-91355, 2022, doi: 10.1109/ACCESS.2022.3202630.

[8]. R. Kim, Y. K. Kim, C.-B. Song, G. C. Kim, H. S. Song, J. Cho, Y. Choi, S. Cho, and J. H. Lee, "Consistent Ovulation Window Prediction based on Physiological Temporal Variability Patterns from Wearable Devices," in 2025 47th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), 2025, doi: 10.1109/EMBC58623.2025.11253520.

[9]. P. Chitra, M. Sumathi, K. Srilatha, F. V. Jayasudha, and S. Amudha, "Review of Artificial Intelligent based Algorithm for Prediction of Polycystic Ovary Syndrome(PCOS) from Blood Samples," in 2022 4th International Conference on Inventive Research in Computing Applications (ICIRCA), Coimbatore, India, 2022, pp. 1172-1176, doi: 10.1109/ICIRCA54612.2022.9985699.

[10]. T. Sarath and K. Brindha, "Infertility Prediction using Long Short-Term Memory Algorithm with PCOS Electronic Healthcare Data," in 2025 4th OPJU International Technology Conference (OTCON) on Smart Computing for Innovation and Advancement in Industry 5.0, 2025, doi: 10.1109/OTCON65728.2025.11071074.

[11]. V. Srinithi and R. Rekha, "Machine learning for diagnosis of polycystic ovarian syndrome (PCOS/PCOD)," in 2023 International Conference on Intelligent Systems for Communication, IoT and Security (ICISCoIS), Coimbatore, India, 2023, pp. 19-24, doi: 10.1109/ICISCoIS56541.2023.10100490.

[12]. P. Soni, C. Sharma, and N. Kaur, "FusionNet-PCOS: Hybrid Texture Features with Shallow CNN for Ultrasound-Based PCOS Classification," in 2025 International Conference on Intelligent & Innovative Practices in Engineering & Management (IIPEM), 2025, doi: 10.1109/IIPEM65914.2025.11548485.

[13]. K. Mahajan and P. Mane, "Follicle Detection of Polycystic Ovarian Syndrome (PCOS) Using YOLO," in 2023 9th International Conference on Advanced Computing and

Communication Systems (ICACCS), Coimbatore, India, 2023, pp. 1550-1553, doi: 10.1109/ICACCS57279.2023.10112821.

[14]. N. Kaur, G. Gupta, and P. Kaur, "Transfer-Based Deep Learning Technique for PCOS Detection Using Ultrasound Images," in 2023 International Conference on Network, Multimedia and Information Technology (NMITCON), Bengaluru, India, 2023, pp. 1-6, doi: 10.1109/NMITCON58196.2023.10276245.

[15]. N. Jan, A. Makhdoomi, P. Handa, and N. Goel, "Machine learning approaches in medical image analysis of PCOS," in 2022 International Conference on Machine Learning, Computer Systems and Security (MLCSS), Bhubaneswar, India, 2022, pp. 48-52, doi: 10.1109/MLCSS57186.2022.00017.

[16]. S. Gollapalli, P. Kanchanamala, S. Muppidi, B. Ankitha, Ch. Srikanth, and V. Rachapudi, "Enhancing the Detection of PCOS using Deep Learning," in 2024 2nd International Conference on Self Sustainable Artificial Intelligence Systems (ICSSAS), Erode, India, 2024, pp. 736-740, doi: 10.1109/ICSSAS64001.2024.10760643.

[17]. G. Puthilibai, Devatarika V, Gokul V, P. Chinnaraj, V. Hariram, and A. Lazha, "Impact of Polycystic Ovary Syndrome (PCOS) on Fertility and Pregnancy Outcomes," in 2023 Intelligent Computing and Control for Engineering and Business Systems (ICCEBS), Chennai, India, 2023, doi: 10.1109/ICCEBS58601.2023.10448962.

[18]. M. Tasnim, S. Das, S. S. Tonoy, and T. M. S. Sazzad, "Follicle Detection in Polycystic Ovary Syndrome Using Ovarian Ultrasound Images," in 2025 International Conference on Electrical, Computer and Communication Engineering (ECCE), 2025, doi: 10.1109/ECCE64574.2025.11013906.

[19]. V. H. Mónica, K. Rodríguez-Vázquez, and M. Melgar Gallardo, "Estimation of variations in progesterone in a woman across the menstrual cycle," in 2023 20th International Conference on Electrical Engineering, Computing Science and Automatic Control (CCE), 2023, doi: 10.1109/CCE60043.2023.10332913.

[20]. J. Gulati, D. Chila, S. Bhamare, S. Nadkarni, M. Retharekar, and S. Chila, "Menstrual Health Monitoring and Prediction System Using Machine Learning," in 2026 Twelfth International Conference on Bio Signals, Images, and Instrumentation (ICBSII), 2026, doi: 10.1109/ICBSII69710.2026.11479233.