

# CARE IN A CUP- A SOLUTION TO TEND TO THE MENSTRUAL HEALTH NEEDS OF DIFFERENTLY ABLED WOMEN

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**College** : *Global Academy of Technology, Bengaluru*  
**Branch** : *Department of Computer Science and Engineering*  
**Guide(s)** : *Ms. Snigdha Sen*  
**Student(S)** : *Ms. Namratha S Khasnis*  
*Ms. P. Ramya*  
*Ms. Pooja R*

## **Keywords:**

Menstrual hygiene, Menstrual cup, Women, Menstrual health, Mobile application, Internet of Things, Intelligent Devices

## **Introduction:**

Menstrual hygiene is often an overlooked subject in India, owing to the air of malaise that is predominant in the Indian society. Approximately 1 in 500 or 0.20% or more than 2,160,000 people in India are autistic. There are 9.3 million differently abled women in India. Caregivers seldom tend to the menstrual needs of these women. In a scenario where a sanitary-napkin change is required due to overflow, inconvenience in conveying such matter to the caretaker is usually a big problem faced by these women.

Reuse of napkins account for millions of infection cases among women in India. Whether abled or disabled, not all women find it easy to communicate such personal matters with caregivers.

Poor menstrual hygiene is the fifth biggest killer of women in the world. Common outcomes of unhealthy menstruation management can be dermatitis, urinary tract infections (UTIs), which can be fatal if the kidney is damaged, genital tract infection, alteration in the pH balance of vaginal secretions and bacterial vaginosis, all leading to increased susceptibility to cervical cancer.

This project provides evidence of a method that is effective in enhancing the menstrual health not only of autistic and impaired women, but also of women who are too preoccupied with other aspects of their lives to devote sufficient attention to their own menstrual health.

## **Scope of the Project:**

1. To tend to the menstrual hygiene needs of differently abled and autistic women of India
2. Common outcomes of unhealthy menstruation management can be dermatitis, urinary tract infections (UTIs), which can be fatal if the kidney is damaged, genital tract infection, alteration in the pH balance of vaginal secretions, bacterial vaginosis, all leading to increased susceptibility to cervical cancer. It is the need of the hour to address the problem statement of menstrual hygiene.

3. Women who are autistic or differently abled are assigned caretakers who assist them in changing their menstrual cups. When a caregiver of an autistic center has many patients to attend to, especially female patients, she may be unaware that one of her patients' needs a change. This ignorance may result in the patient experiencing leakage of flow. This unsanitary practice often results in infections. Care in a Cup enables caregivers to register all their patients on the app so that when a patient's cup becomes full, the caregiver is promptly notified that the patient requires a change.

### Objectives:

1. To create an intelligent menstrual cup called CareInACup that monitors the blood flow in the menstrual cup and alerts the user or a caregiver when the cup is full and requires a change
2. To embed micro sensors into the device to track flow and measure density of the fluid
3. To develop an app that integrates with CareInACup device to accumulate the sensor readings and performs Data Analysis on the acquired data to provide useful insights about Menstrual Hygiene
4. To add features to app according to achieve the following objectives-
  - A separate login for the caregiver to register all their patients on the CareInACup app
  - Send a notification to the caregiver's app if any of the patient's menstrual cup is full
  - A tracker feature on the app that tracks the menstrual cycle of each of the caregiver's patient
  - A dashboard on the CareInACup app to provide a chart indicating menstrual regularity of each of the patient
  - Feature to read the density of blood flow to ensure a healthy blood viscosity during menses
  - Alert the caregiver if any irregularity is noted in any of the readings of the sensors, indicating a poor menstrual health
  - Provide a login for individual user to tend to personal menstrual care by monitoring regularity of the cycle, fluid viscosity health.
5. To promote the app among the autistic care centers of India and increase the awareness about menstrual hygiene.

### Methodology:

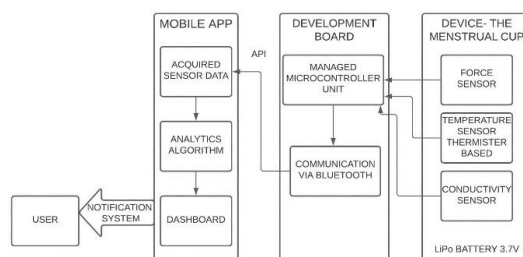


Fig. 1. System Design - The Architecture of CareInACup

Figure 1 illustrates the system design, layout and architecture of CareInACup when laid out. Note that there are three (3) major components that make-up the CareInACup smart device. These components include the mobile app, development board and the device itself – the menstrual cup. The device consists of four (4) components that are all embedded within the device. It is also made up of three (3) different types of sensors each for a specific purpose and a LiPo battery to power these sensors. These sensors include a force sensor, temperature sensor, and conductivity sensor. Force sensor and temperature sensor detect when the menstrual cup is filled. On the other hand, the conductivity sensor is used to measure the density of the liquid that flows inside the device. These sensors together are connected to a microcontroller unit that is located in the development board of our architecture. The development board component operates with two internal units, that is, the managed microcontroller unit and the communication unit.

A development board is a circuit board containing the microprocessor and it also has some support logic needed to support the microprocessor. As outlined in the requirements specified above, CareInACup uses an ESP 32 development board. ESP 32 development board has an interface through which it communicates the data collected to the mobile application. The mechanism is just like the mechanism followed by Fitbit or any other wearable devices where the device sends the data to the app. CareInACup smart device also follows the same logic. The mobile app component has three (3) internal modules which include the data collection module, analytics module and the dashboard. The first module is for data collection and its main focus is to accumulate all the readings collected from the sensors.

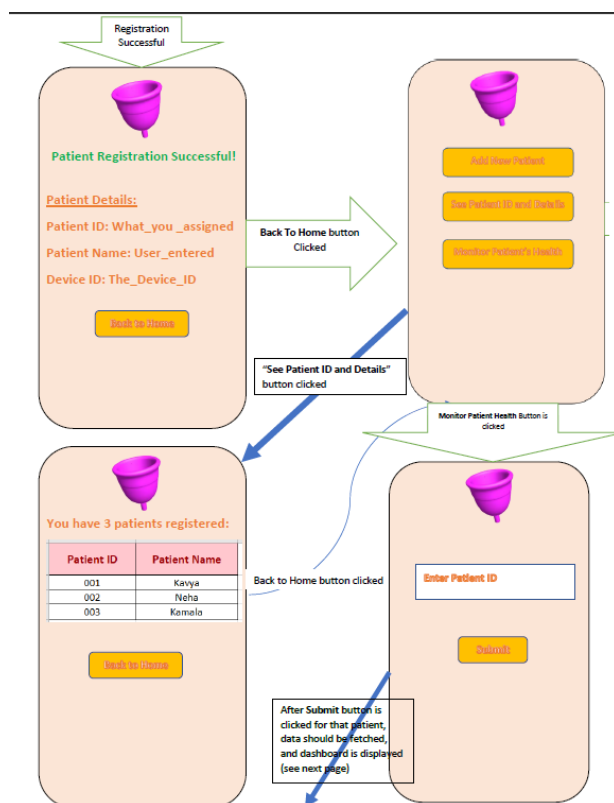
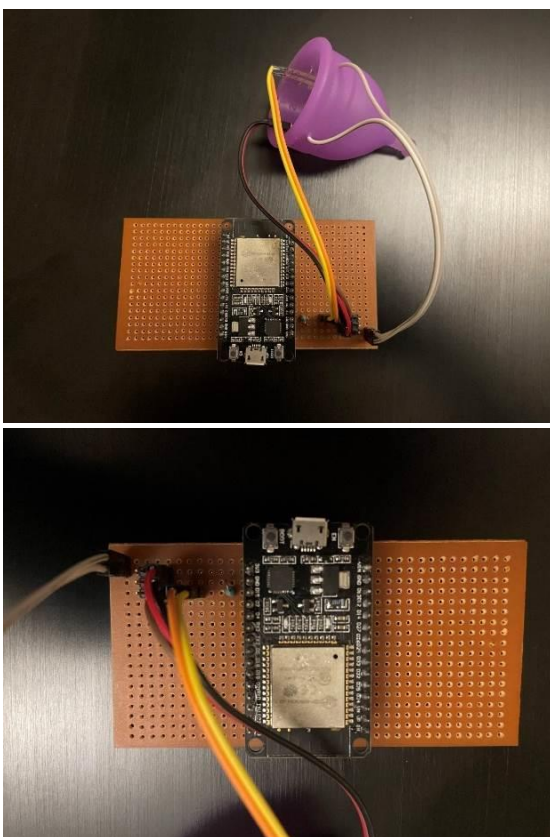
After collection of data from the sensors, the data module collecting passes the information to the analytics component which makes use of this data to produce various analytical results. Finally, this information is displayed on the dashboard where user gets to see all the details of her menstrual cycle. The main component of the device is a notification system which informs the user that the cup is filled or if there are any emergency alerts regarding the menstrual health. Since android programming has a built-in notification module, making use of the functions within this module simplifies the task of sending notifications. This is a high-level overview of the project architecture.

## **Conclusion:**

This research is intended to propose a solution that bridges the gaps in menstrual health of autistic and differently abled women. CareInACup is an efficient, reliable and cost-effective solution that when implemented would serve thousands of affected women with their menstrual needs. There are more than 2,160,000 autistic people in India, and 9.3 million women who are differently abled, who will benefit from this project. While there are many kinds of sanitary products used to dispose-off their menstrual blood, a novel approach is suggested and implemented in this research. Menstrual blood is not simply waste that should be disposed. It can provide great value in the form of critical health information. This project aims to successfully develop a practical way to measure menstrual blood. The device “CareInACup” menstrual cup shall be manufactured with an optimal procedure, with microsensors embedded in it to achieve a sleek design. An app

called “CareInACup” shall be designed for pairing with the smart menstrual cup and would be installed on the user or caregiver’s phone as per requirement.

The caregiver will be able to monitor the menstrual hygiene of all her patients using a single app. The app and the device would be promoted within the care centres of India to preserve the menstrual hygiene of women patients. CareInACup can also be used by the healthy, working women to tend to their personal needs and establish a healthy menstrual routine amongst their busy schedules. This research will explore correlations between menstrual blood conditions and gynecologic disorders. CareInACup will support users so that continuously use the device without any hassle and contribute to women’s health. In some societies, menstruation is still misunderstood and may even be shunned. We aspire to build the opinion that menstruation is as natural as breathing. CareInACup can be used to monitor health safely and easily.



### Scope for future work:

Future enhancements would be to:

1. Convert the sensors used to silicone human wearable sensors for safe implant into women
2. Convert sensors to micro versions of it
3. Convert ESP 32 board to a microchip
4. Piezoelectric rechargeable battery to power the microchip
5. Manufacture in bulk to reduce the product cost
6. Get Food and Drug Administration (FDA) approval to enhance the credibility of the device