Biological Change of Womenhood

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Abstract-An presents intimate wear that caters to menstrual cramps and rash problems and provides a stain-free menstrual cycle. It is a garment with added functionalities like a heat pad pocket and sanitary pad wing-shaped pocket. We have provided range control of the heating pad to our users through an app that links to the control module through Bluetooth. A few participants tried menstrual, and it was really appreciated for the multiple comfort features and the easy heat therapy it provides during menstruation. IoT integrated smart, functional intimate wear for women that would help women comfort during menstruation by catering to issues of menstrual cramps, rashes, leakage and stains, malodor, etc. The proposed methodology has been implemented by referring to the online survey conducted from Indian women (17- 58 years old). menstrual can provide comfort during the menstruation cycle with IoT integrated Heat-Pad and functional alterations in the garment for a rash-free, anti-odor, and leak-proof period.

INTRODUCTION

Most women experience a regular menstrual cycle, but the fact that a large section of women faces multiple irregularities and issues during menstruation cannot be contradicted. Many adolescent girls have to deal with multiple cramps at an early age and are in constant fear of stains during their cycle. These are the symptoms of a menstrual irregularity known as Dysmenorrhea. Dysmenorrhea is a medical terminology referring to painful menstruation or menstrual cramps. It can be categorized into Primary and Secondary dysmenorrhea. Primary dysmenorrhea is the most commonly experienced recurrent menstrual cramps by women. The cramps and pain mostly start two to three days before the bleeding and can last up to the first three to four days of the cycle. The pain might range from mild to severe ache, mostly in the lower abdominal region. Recurring cramps and fatigue can also be felt in the lower back, hip, and thigh regions. Secondary dysmenorrhea could be an outcome of multiple problems with the reproductive organs, including Endometriosis, Pelvic inflammatory disease(PID), Adenomyosis, Fibroids

Digital health applications, or 'apps', have become a popular method of tracking important health indicators for clinical and personal use [1]. Apps can be useful tools for tracking and accomplishing health goals [1, 2]. A segment of these health apps is used to track menstrual cycles. Menstrual cycle tacking apps (MCTAs) assist users in observing their menstrual cycle and related signs and symptoms, as well as managing their fertility [3]. MCTAs give users more control over their own personal health [3]. MCTAs have features that can increase users' knowledge about the menstrual cycle in general and the act of tracking cycles can help users learn the patterns of their own bodies [4]. This makes a sample of women using an MCTA a useful source of data for menstrual cycle research.

Healthcare is one of the most important aspects focused on an individual and smart healthcare technology is advancing. The Healthcare industry is focusing on developments that can benefit the people with the integration of latest technology based solutions. Being a woman surrounds you with multiple responsibilities and thus it becomes highly important to take care of health and as people become more and more tech savvy, it is important for women's healthcare services to be able to cater their needs with implementation of technology.

If we talk about the changes that healthcare industry has worked significantly upon post the world got hit by the latest Covid-19 pandemic it made them realize the potential technology holds in providing the much needed improvement as well as help the traditional healthcare be revised with the new technology era of developments. Today the healthcare services are continuously developing themselves to suit the rapidly changing dynamics and demands and are relying on technology like never before to help the business sustain as well as succeed.

MCTAs are a valuable potential tool for epidemiologic research [1]. With MCTAs, menstrual cycle study samples can expand from hundreds of participants to thousands or more. For some MCTAs, all users agree to share their data anonymously, which avoids the need for study "recruitment" and may decrease volunteer bias [5–9]. Some MCTAs facilitate tracking of ovulation, providing researchers with access to population-level data on ovulation timing, which has never been available. The use of apps is increasing as mobile users switch from web browsing to app use and smart phone use continues to grow worldwide. Three quarters of smartphone subscription growth came from Africa and Asia in the first quarter of 2015 [10]. This suggests that apps are globally available, increasing the feasibility of including a diverse group of users in menstrual cycle research[10]. Use of data from MCTAs could improve our understanding of the menstrual cycle[11].

While the promise of MCTAs for epidemiologic research is exciting, there are potential limitations to these data. As of yet, it is not clear how representative or accurate MCTAs are, or how susceptible they are to missing data and loss to follow up. The purpose of this literature review was to synthesize published literature on MCTAs with respect to their utility for epidemiologic research. For this review, we examined all published studies that included MCTA-collected data and extracted from those studies information related to several primary areas of interest, chosen for their relevance for epidemiologic research. These areas were 1) selection: who uses MCTAs and why, 2) misclassification: is MCTA-collected data accurate, and 3) overall, what is the potential for using MCTAs in epidemiologic research.

RELATED WORKS

Period Pants have been launched by different brands to provide women a pad-free period whereas, in the case of Indian women, the majority of women of menstrual age use sanitary pads only [10] [11]. The working aims at achieving the high absorption capacity of multiple pads/ tampons secured with a leak-proof outer layer. From our survey, we found out that very few people are using period pants, and most of the research is not oriented toward the Indian market. The current research is being done for women/girls starting from the age of 12, considering the starting age for Menstrual cycles, but in the current scenario, girls have started to get their first menstrual cycle before the age of 12 also. [12] There are

multiple products and works to solve these problems individually, as shown in Table III but there is a grey area identified in the development of a product with all-round features.

In her entire lifetime on purchasing menstrual aids and this switch to reusable period pants would save a lot, they are open to this option gladly, though the use in practicality is comparatively very low than the other sanitary aids [13]. There is quite a lot of motivation and awareness about period pants, but preferability is a lot less. A qualitative study outlines the values the surveyees place on the importance of proper sanitary infrastructure and menstrual hygiene education while in a refugee camp, it was a challenge to manage menstruation. Access to menstrual aids and their disposal is a major struggle. So, the dual use of reusable period pants and normal underwear was found to be very popularly preferable.

While we discuss different options of menstrual aids and talk about menstrual hygiene on multiple forums, there are still many rural households where women are not fortunate enough to be able to afford a pack of sanitary pads during menstruation, there are people who still use cloth pieces and have no option but to compromise their menstrual hygiene.

Menstruation is a very critical and complex mechanism in a woman's body that depends not just on reproductive organs but multiple hormones like oestrogen & progesterone, food habits, emotional and physical well-being, heredity, and a lot more. It is the removal of the endometrium lining of the uterus through the vagina. The menstrual fluid consists of blood, cells from the uterus endometrium lining, and mucus. The average length of menstruation is usually between three to seven days but it can be of a one-day length to as long as eight days normally in a female. Pain-free menstruation and a regular menstrual cycle would require a perfect synchronization of all these factors. [3]. Table II shows the solutions we are working on in MENSTRUAL to resolve the issues faced during menstruation

Girls around the age of 12 years usually hit puberty and attain Menarche, which refers to their first menstrual cycle. The Menarche marks the development of sexual characteristics. Ideally, the appropriate age to attain Menarche is expected to be from 12- 14 years of age yet now we can see significant deviations and multiple factors responsible for catalyzing the very early puberty, especially in girls of age 8-10 years. Several factors like intake of genetically engineered fruits and vegetables, presence of pesticides in food, increased poultry diet, etc.,

induce early puberty in kids. The sedentary lifestyle of children can lead to obesity and sometimes brings in a very stressful environment for themselves, which in turn triggers early puberty for girls.

Early onset of menarche makes it difficult for adolescents to deal with severe cramps, sudden changes in their bodies, and terrible mood swings for more than a week. It is tough to deal with it and manage the school. Even for an adult, multiple cramps (both mild and severe pain), body aches, and headaches, along with fear of stains & leakage, make it very tough for them to deal with. Researchers claim that around 84.1% of women experience severe cramps during every menstruation resulting in absenteeism from the workplace and school [5]. During menstruation, one out of many problems the women face is menstruation malodor which makes them really conscious and worried at times. It is also a cause for discomfort due to which women prefer to be indoors during this time. The odor is an abnormal fishy smell caused due to the presence of bacteria Gardnerella vaginalis in vaginal mucous along with the menstrual blood. The phenomenon is known as Bacterial vaginosis

METHODS

The Internet of Things (IoT) is a system of interrelated computing devices with unique identifiers and the ability to transfer data over a network without human-to-human or human-to-computer interaction. Perhaps the best known example of IoT is the concept of the 'smart home' which includes a number of devices supporting a common ecosystem controlled by associated devices such as smart phones. Of course, a major concern with systems such as IoT surrounds privacy and security, and this must be addressed before widespread use can occur. Notwithstanding this concern, the third wave of digital health care comprises personalizing medical applications, with increasing awareness of the consumer. It enables the intermingled synergy of software, mobile platforms and big data in order to facilitate earlier intervention in disease processes and also to predict health issues before they occur. Apart from the clear consumer benefits, the service providers will transform technological solutions into better health-care delivery, extracting valuable small data from the big data. The ultimate goal will be improvement of the health of populations, experience of care, and reduction of the per capita costs of health care1.
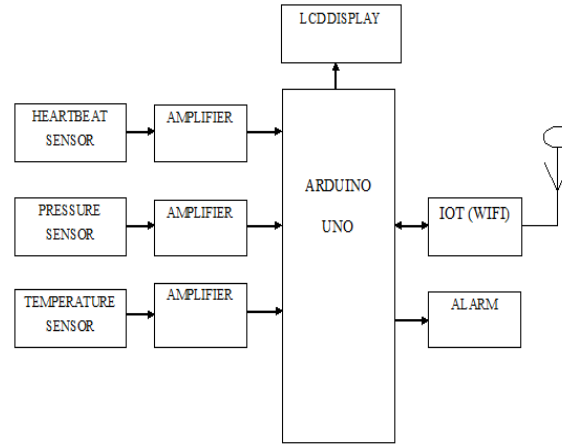

Fig 1: PROPOSED SYSTEM BLOCK DIAGRAM

IOT menstrual tracker and health monitoring has different sensors. They are temperature sensor, Heartbeat sensor and Pressure sensor. This project is very useful since the doctor can monitor period women health parameters just by visiting android app. And nowadays many IOT apps are also being developed. So now the doctor or family members can monitor or track the patient health through the Android application.

Wearable and nearable technologies complete this third wave of digital medicine. Wristbands, smart contact lens and the smart bra are some wearables in use. Small wireless devices equipped with sensors that work as transmitters of data are the nearables. These will overcome the intricate and ineffectual institution-based care and substitute the current unyielding delivery processes with self-directed personalized medicine, when required. Implantables, which are invisible biomedical sensors/biosensors, will integrate with mobile devices and provider systems. They will encourage timely provider–patient dialogue and intervention before an expensive, invasive treatment is needed. Smart pills that wirelessly transmit biomedical data to the provider, chips that permit continuous monitoring of vital signs, a bionic eye that allows the blind to see, a cardioverter-defibrillator that treats sudden heart attacks are only some of the examples1.

Health care will become better connected, minimally invasive, and increasingly commoditized. Technology will change behaviors, create new treatments, and build an in-depth provider–patient relationship. Wearable technologies replenish consumer self-awareness, and advance 'actionable' dialogues with care providers, family and friends. Currently wearable technologies have become more clinically focused – for chronic disease

monitoring and for data integration with health-care systems. Wearable devices offer richer, actionable data that extend beyond body diagnostics since various aspects of a patient's health are measured in real time. The advancement of mobile and Cloud platforms will allow increased mobile device integration with the electronic health records, personal health records, office systems and patient portals. This integration between wearable devices and an improved expanded and secure Cloud will provide a common platform to store and retrieve information, to interlace devices and systems and to improve diagnostic accuracy and patient engagement1. Midlife women wish to participate more in their health issues. Research has found that they find wearable devices comfortable, convenient, affordable and effective. The customer segments of wearable devices are widening, including women with chronic illness, care-providers and aging seniors. New business models will be adopted where clinical approaches incorporating wearable solutions will engage the patients. The objective is shared accountability, earlier intervention, and better health outcomes.

RESULT ANALYSIS

Application of IoT, where devices 'talk' to each other and to humans has been tried in some areas of women's health. A proper approach to solve the challenges in IoT systems is to enhance sensor nodes and apply an extra layer named 'Fog' between gateways and Cloud servers. The Fog layer is run on top of smart gateways to provide advanced services such as saving network bandwidth between gateways and Cloud servers by processing and compressing data, reducing the burdens of Cloud servers by pre-processing data at smart gateways, providing distributed local storage for temporarily storing data, and creating a convergent network of interconnected and intercommunicated gateways, thereby helping to overcome service interruption. It also facilitates many other advanced services including system fault detection, database synchronization, interoperability, and mobility-awareness. Electronic-health signals such as glucose, ECG, body temperature and contextual data such as room temperature, humidity, and air quality can be monitored remotely in real-time, by using wearables. This Fog-assisted IoT system allows easier monitoring of diabetic patients with cardiovascular disease.

An IoT-based predictive system based on machine learning to successfully diagnose people with breast cancer and healthy people has been proposed. The dataset 'Wisconsin Diagnostic Breast Cancer' has been used in this research to test the predictive modeling. The experimental results showed high classification accuracy (99%), specificity (99%), and sensitivity (98%). Even though the proposed system performance was excellent due to the selection of more appropriate features, general utilization in clinical practice warrants real-life scenarios rather than recorded patient datasets.

Another application of IoT is the prediction of falls. A multi-parametric score based on standardized fall risk assessment tests, as well as on sleep quality, medication, patient history, motor skills, and environmental factors has been studied. The resulting total fall risk score would consequently be used for fall-preventing interventions. Similarly, traditional measures of gait and/or signal-based features extracted from raw data collected from a hip-worn, triaxial accelerometer during walking have been proposed to predict fall risk. For this to work, data from patterns of walking under free-living conditions as well as data collected in laboratory and clinical settings will need to be combined for accelerometer-based assessments of fall risk[2].

Wearable devices track steps taken, distance traveled, physical activity intensity and heart rate. Some even estimate repetitions during resistance training exercises – important in cases of sarcopenia. Many applications provide exercise programs, including progressive resistance training and balance exercises. The wearables and applications may be the prescribed for postmenopausal women to prevent sarcopenia. Another opportunity for midlife women may be the development of specific apps to calculate daily allowances of protein and other nutrients relevant to the health of muscles and the body overall, and to prevent against sarcopenia[3].

Regarding the menopausal complaints, a suit of sensor-based smart clothing used for home-based and ambulatory health monitoring has been proposed. The smart clothing monitoring system could effectively measure the skin temperature and relative humidity in different body areas for individuals. Information on the frequency, duration, and intensity of a hot flush could be retrieved and physiological quantification of vasomotor symptoms achieved[4]. A recent study on the use of sensor-based smart clothing for menopausal women showed the most frequently reported complaints were hot flushes (65%), tiredness (62.5%), sleep disturbances (60%) and night sweating (52%).

Sleep disturbance, a common problem amongst postmenopausal women, has also been studied. Sleep quantity was measured using a Fitbit® tracker and a sleep diary, whilst sleep quality was measured using the Pittsburgh Sleep Quality Index and the NIH Patient-Reported Outcomes Measurement Information System (PROMIS) sleep disturbance short form.

CONCLUSION

Data collection regarding the style preference of intimate wear on regular days as well as during the menstruation cycle gave us a clear idea that hipster is the most preferred style in both cases. So, our base pattern selected for pattern development is a basic hipster pattern on which we have made required alterations referring to the other requirements of our sample size. Works mainly concentrate on improvising the all around user experience from garment comfort to application, so we are working on building a lighter, more compact, and detachable control module with easy connectivity and cost effective. We want to contribute to the expanded scope by developing a product with similar features for the age group of 9+ years as we infer that there is an early onset of menarche among girls, and their needs are not specifically catered to.

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