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An Application for Monitoring Pregnant Women Using IOT

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Abstract: ***Pregnancy is a special condition in which women go through various health complications throughout the period of gestation. It is not feasible to predict those complications in an absolute manner. Delays in diagnosis or in the initiation of treatment contribute to a large portion of pregnancy related deaths. The System is capable of distinguishing abnormal readings of patient as a known medical complication specific to pregnancy which is available to end user.***
Keywords: IOT, Blynk, Health monitoring, Monitoring of pregnant women.

I. INTRODUCTION

Women and foetus can be at serious risk during pregnancy. According to WHO, 5 women dies every hour in India from complications that developed during pregnancy. Nearly 45,000 mothers dies due to causes related to childbirth every year in India which accounts for 17% of such deaths globally. . Most maternal deaths can be prevented if births are attended by skilled health personnel doctors, nurses or midwives who are regularly supervised have the proper equipment and supplies and can refer women in a timely manner to emergency obstetric care when complications are diagnosed. While the patient is in the ambulance before arriving to the hospital doctor can view the patient monitoring screen via the android application even being away from the patient and can analyse the condition of patient, which helps in guiding the staff with patient appropriately. The baby's movement and response to muscles contraction can be known an also the delivery time can be predicted. If there is a drop in B.P, there is a chance of faint to the patient. As soon as the abnormality in waves founded the system sends alert notification to the doctor and nurses. So, it helps in avoid delays in treatment.

"The majority of deaths of both mother and babies occur around the time of birth due to preventable causes". Delays in diagnosis or in the initiation of treatment contribute to a large portion of pregnancy related death. So, it is important and necessary to continuously monitor. Therefore, we propose a system which is capable of continuously monitoring the health condition of an expected mother. By using the sensors, we can collect the data (readings of SpO2, heart rate, ECG, temperature) and it transfers the collective information to the mobile application with the help of IOT technology, where the respective doctors can view the patient monitoring screen via application without being physically present and detect any anomalies.

II. RELATED WORK

A. Iot Based Health Monitoring System

K.Subbiah Kumar,P.Subashraja,V.Vasanth,M.Venkatesh, N.B.Prakash,International Journal of Recent Technology and Engineering (IJRTE) In the present busy days constant monitoring of the patient's body parameters such as temperature and heart beat rate etc., becomes difficult. In our day-to-day life health has prime importance. Maintaining the health is a daily work. Hence to remove the burden of monitoring patient's health from doctor's head. This project presents the methodology for monitoring patients remotely using GSM and embedded technology.

B. Iot Based Pregnant Women Health Monitoring System

Gayathri Setal,International Journal of Recent Technology and Engineering (IJRTE), In the Beginning of 2020, most of the countries were affected by COVID-19, especially India. Our government announced lockdown, this situation became worse to many people mainly pregnancy women who needed monthly health check-ups. Our solution for this problem is using IOT Based Pregnancy Woman Health Monitoring System which helps woman in monitoring the health and getting reports just sitting in home. The selected study issue presents an effective Monitoring System for increasing the confidentially of pregnancy women health or otherwise, since it is an essential emotional and psychological event a crucial component in the life of a married lady. This paper gives the survey about the difference we bring from various health monitoring systems developed in recent years.

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C. Smart Health Monitoring System for Pregnant Women.

Saniya Ansari, M.B. Ansari, International Journal of Engineering and Advanced Technology, For pregnant ladies, various health parameters like ECG, blood pressure, SPO2 (stamina), respiration rate, blood glucose level, body temperature, etc. need to be monitored regularly and must be in a normal level.

If the mother' health become critical then definitely it will affect the baby. Hence it is recommended by physicians to do routine checkups at primary stages of pregnancy.

The presented paper summarizes, the available system and their strength and weakness and challenges in health monitoring of pregnant women. The proposed system is used to analyse various pregnancy biological factors like heart rate of pregnant women & Foetus changes in blood pressure, blood glucose level, temperature and weight.

D. Hospital Health Care Monitoring System using Wireless Sensors Network

Naji HR Aminian M., International Journal of Advance Foundation and Research in Computer. In this paper there is continuous observation of the patient's physiological parameters such as blood pressure of patient as well as heart rate.

This system is mainly useful for pregnant women to measure the various parameters like blood pressure, heart beat and fatal movement to control the health issue.

This system has to monitoring more than one patient at a time and easily able to sense the blood pressure (BP) and heart rate of the patients. This system can detect the abnormal conditions of the patient, raise an alarm to the patient and sends a SMS/Email to the doctor for treatment. The main advantage of this system is to increase the freedom for enhancing patient's quality of life.

III. OBJECTIVES

The main purpose of this proposed work is to draw attention to specific patients who may warrant additional evaluation with a customized tiered visual and alerting system by building an android application capable of diagnosing pregnancy related health complications during child birth monitoring the heart rate parameter of pregnant women by live streaming the doppler.

This describes an electronic maternal surveillance system that is designed to:

1) Access patient vital sign monitoring and other clinical data. Present clinical status in a visual format for each individual patient
2) Present clinical summaries as a visual "patient census view" for the entire labor and delivery unit
3) Alert staff of clinical deterioration

So, that they receive the required medical treatment at right time.

IV. PROBLEM STATEMENT

The majority of deaths of both mother and baby occur around the time of birth due to preventable causes.

It is impossible either for a doctor or nurse to be physically present with each and every patient at a time. Unfortunately, in present situation the patient could not be monitored continuously without any human help.

These complications lead to risks such as severe injuries, blood loss or even maternal death can occur without any warning at any time during pregnancy and childbirth.

V. PROPOSED SYSTEM

The surveillance system is designed to draw attention to specific patients who may warrant additional evaluation with a customizable tiered visual and paging altering system.

A system is proposed which is capable of continuously monitoring the health condition of an expecting mother by monitoring the spO2, ECG, heartrate, temperature of mother, where the respective doctors can view the patient parameters reading screen via application without being physically present and detecting any anomalies in their parameters leading to complications.

Heart Rate Variability (HRV), SpO2, ECG, temperature parameters are calculated and matched with the suggested normal range. The system is capable of distinguishing abnormal readings as a known medical complication specific to pregnancy.

The doctor can get to know the patient condition even without being physically present. "Flashing red" alert occurs, an automated page is generated to the patient's bedside nurse, physician services on the unit via an android app with a request to verify the abnormal vital sign. Once, the alert message is sent to all the respected clinicians , the clinicians themselves are able to draw attention to specific person.

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VI. METHODOLOGY

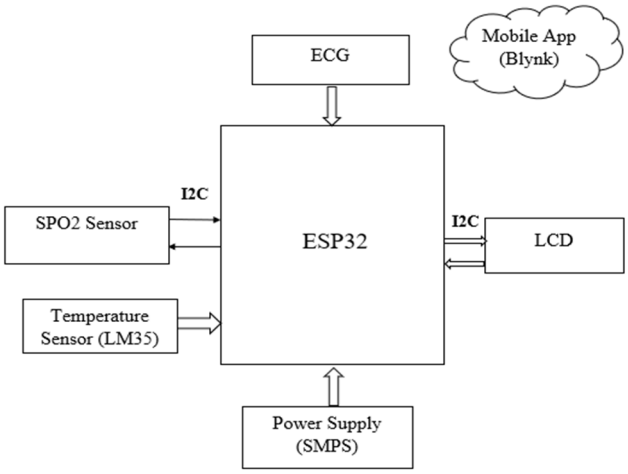


Fig.1: System Architecture

In proposed system, some vital parameters of pregnant women like blood temperature, heartbeat rate, ECG, SPO2, blood pressure are measured to achieve the real time health monitoring of pregnant lady. This architecture of proposed system is shown in figure 3 It consists of various sensor units like heart rate detector, temperature sensor, oximeter, blood pressure. The AD8232 sensor is used to measure the ECG for specific interval of time. The MAX30100 sensor is used to measure the heartbeat and spo2 of the patient. It is usually clipped onto a fingertip to get count of heart beat. It gives the approximate amount of blood oxygen. Pulse oximetry works on the absorption characteristics of red and IR light of oxygenated and deoxygenated hemoglobin. Blood oxygen concentration can be calculated from the ratio between the absorption red light and IR light by the hemoglobin. The change of blood volume is used to detect the Heart rate by the amount of light that passes through the finger. The sensor LM35 is used to measure Human Body Temperature. It converts temperature measurements to digital form using analog-to-digital converter (ADC). During prenatal visits and during labor, fetus heart rate can be observed using Doppler device to listen to and record baby's heartbeat through patient's belly (abdomen). In another way, the ultrasound probe (transducer) is fixed firmly to patient's belly which sends the sounds of baby's heart to a computer. The ESP32 module continuously tries to establish a connection over internet to transfer the data from heart rate sensor, blood pressure, temperature sensor and supports the data to be visible on the phone screen via Blynk and the data is uploaded on server. Then the data is uploaded on server which can be monitored from any corner of the world.

The SMPS power supply is used in which 230v is given as input and 5v as output and that power supply is given to PCB board then 5v power supply is sent to all hardware, except Spo2 sensor and ECG sensor where it runs on 5.3V. LM35 temperature sensor and LCD runs over 5V. Here, LCD and Spo2 are connected to ESP32 using I2C technology. The parameters reading of the patient can be seen on clinicians phone via Blynk application. Also, this alerts the clinicians if any abnormal reading is found in case of emergency.

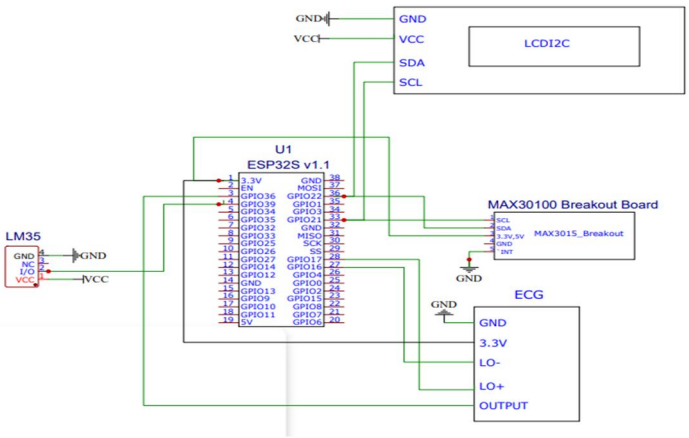


Fig .2: Circuit diagram

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1) The switch mode power supply converts 230V AC to 12V DC and this is passed to ESP32 and is supplied to all the sensors as needed.
2) All the sensors, LCD, PCB board is connected to the esp32.
3) The Spo2 sensor (MOX30100) is used to measure the saturation of oxygen in the blood. The heartbeat for specific interval of time and beats per minute. It is connected to esp32 using I2C connection.
4) LM35 sensor is used to measure the temperature, which is connected to ESP32.
5) LCD is connected to ESP32 using I2C connection to display the parameters reading.
6) The ESP32 model has the built-in Wi-Fi model, it continuously try to establish a connection between internet to transfer the data from SpO2, ECG, heartrate, temperature sensors proposed.
7) The parameters reading of the patient can be seen on clinicians phone via Blynk application. Also, this alerts the clinicians if any abnormal reading is found in case of emergency.

VII. EXPERIMENT RESULTS

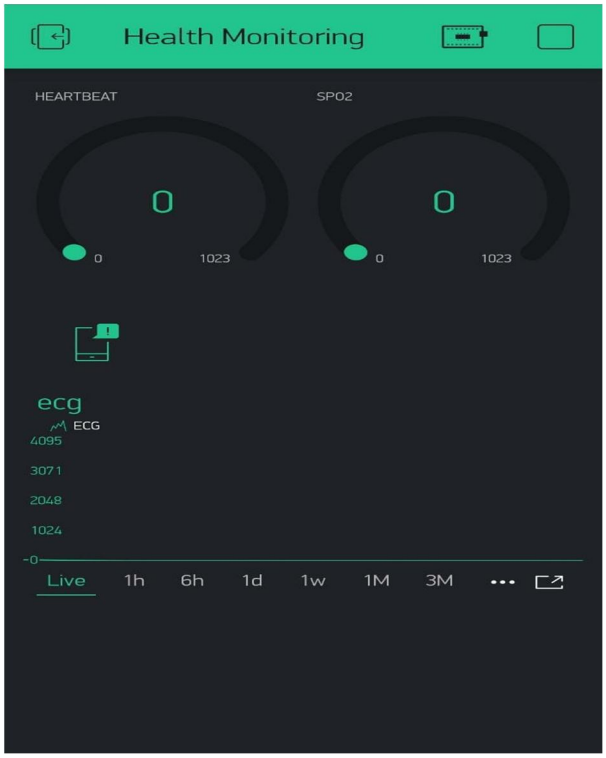


Fig.3: Parameters Display In Blynk Application

Above fig is the display of heartbeat, spo2,temperature parameters of a patient in the Smart phone via the Blynk application.



Fig. 4: Result Output On Lcd Display

Above figure is the outcome of the heartrate, spo2, temperature readings on the lcd screen/display. It displays the output in the digital format.

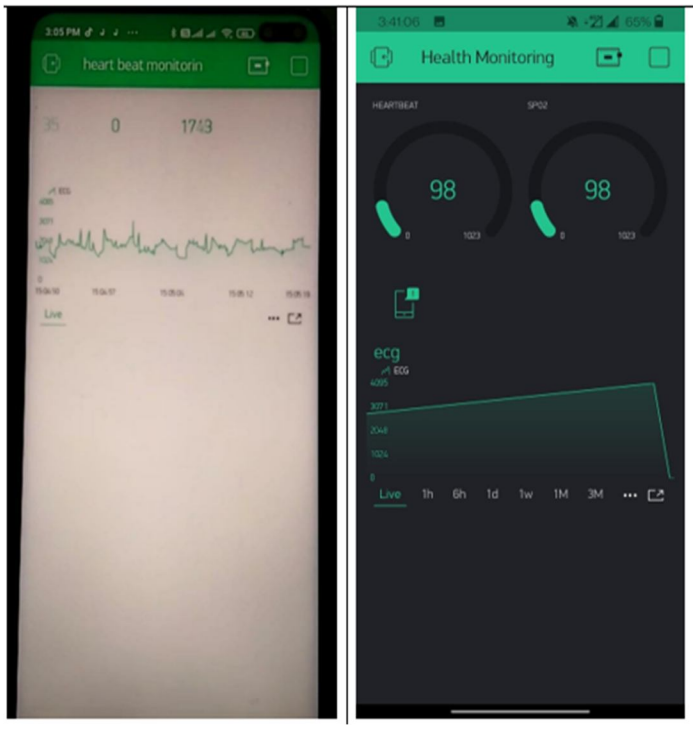


Fig.5: Results of proposed system parameters on app.

Above figure shows the output of patient's parameters readings of heartrate, spo2, temperature and vital signs of ECG are displayed.

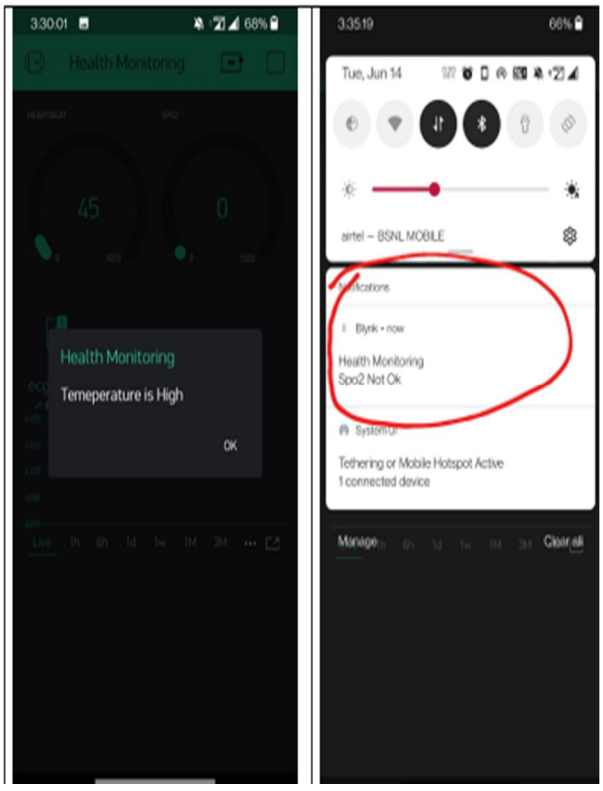


Fig.6 : Notifications of Abnormal Reading in Mobile

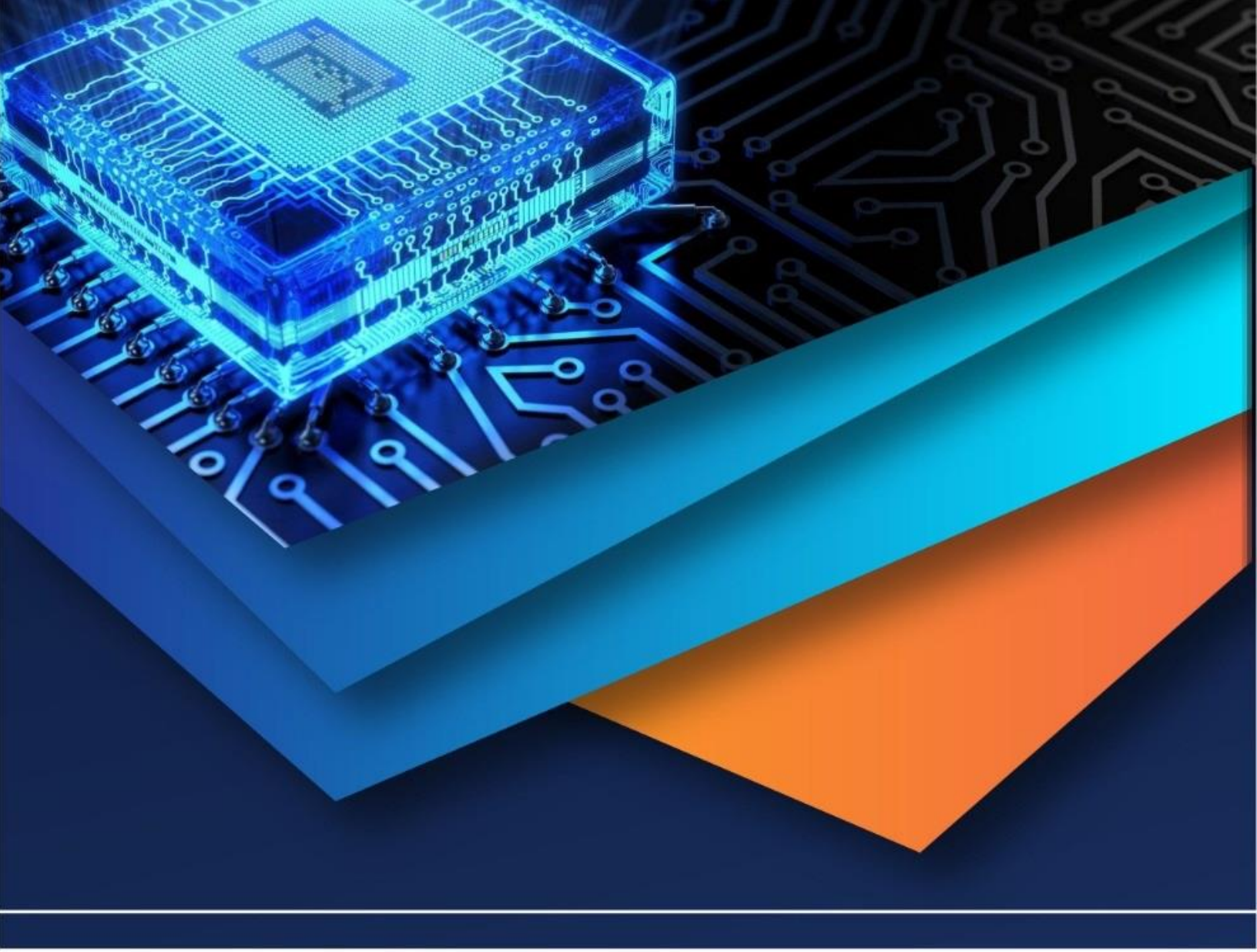
It's the display of an "alert notifications" to respective clinicians via the Blynk applications when any abnormal readings are found.

VIII. CONCLUSION AND FUTURE WORK

The proposed system measures various parameters using sensory platform, then it sends the data to doctor which is intended to perform continuous health monitoring of pregnant women even without being physically present. This proposed system is compact in nature, when the patient's data is received, doctor analyses it and provides suitable treatment. The clinicians can view the patient's parameters reading via the phone and analyse the patient health condition. Also, if any abnormal readings are found, it sends alert notification to respective clinicians indicating the emergency. It will be helpful to pregnant ladies to avoid miscarriage, blood loss, maternal death etc.

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