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RESEARCH ARTICLE

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HEALTHCARE SYSTEM FOR REAL-TIME MATERNAL STRESS

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Manuscript Info

Key words:-
IoMT, Mortality Rate, Artificial Intelligence, IoT, Health, WIFI, Network

Abstract

Work pressure and stress are the major issues which effects human health, mainly in case of pregnant women. The main purpose of this article is how Internet of things (IoT) and Artificial intelligence can help us to control the mortality rate.IoT allows healthcare professionals to be more attentive and to communicate proactively with patients. Now a days many people using various smart devices/IoT devices for constant health monitoring for infants. The findings are viewed via the IoT on the smart phone. The Internet of Medical Things (IoMT) – network of interconnected medical devices - is an application of IoT for medical and health related uses, collection of data, processing for testing and monitoring. This IoMT devices are rapidly changing healthcare delivery. Medical devices provide to send data over a shared network via WIFI.

Introduction:-

Preventing early infant mortality is one of the key goals of the global health community. Reducing child mortality requires a wide variety of interventions that improve health care prior to pregnancy and healthy environment to whole family.Throughout pregnancy, the mother's health, environment, experiences of the mother influence the growth of her fetus and the course of pregnancy[1].Adverse environmental consequences of pregnancy may include congenital defects, increased risk of miscarriage, preterm birth, restriction of intrauterine growth[2].Some air pollution, pesticide exposure are examples of correlation between environmental health and infant mortality[3].By using this smart IOT devices – it offers reliable and timely health assistance to both fetuses and women.It ensures safe and efficient care of pregnant women, since smart, small devices such as RF-Tags, sensors are attached to pregnant women and all behaviors of pregnant women can be monitored from anywhere and at any time by skilled medical staff[4].Artificial intelligence (AI) in medical management is the use ofsoftware to simulate human cognition in the analysis of complex medical data. This system continuously read fetal and maternal moments, blood pressure, heart rate and breathing patterns and identify crucial individual patterns of physiology, behavior of fetuses.So, we're going to explore how data collected from your device is sent to the cloud and processed to analyzed and visualized remotely on your application[5].

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IOT Sensors

Here IOT technology based PWHCS (Pregnant Woman Health Care System) is used to monitor the condition of the pregnant women inside hospital and outside and make decisions timely by the clinicians, especially for rural underserved populations, device have advantage of being able to synthesize specific pregnant women data, do multiple evaluations, and send results to gynecologists, physician speedily anytime anywhere.The program will help to enhance the tracking of the current status of pregnant women; it can create alerts to ensure that the scheduled activities are not completed[6].

Different types of sensors are developed from this IOT these allows the development of a new generation of constant health monitoring for infants and mother. We use sensors like wearable sensors, wireless communication and power supply technology, Temperature sensors, Heartrate sensors, Accelerometer.Healthcare information sent through wireless sensors with Bluetooth to the pregnant women device (Gateway).Wearable apps are already widening the capabilities of clinical safety surveillance and have a major potential to enhance early detection of pregnancy complications[7]. Some of the wearable sensors, mobile health innovations are present exciting new opportunities to enhance the clinical monitoring, diagnosis and management of pregnancy health outside of traditional care as shown in figure 1.

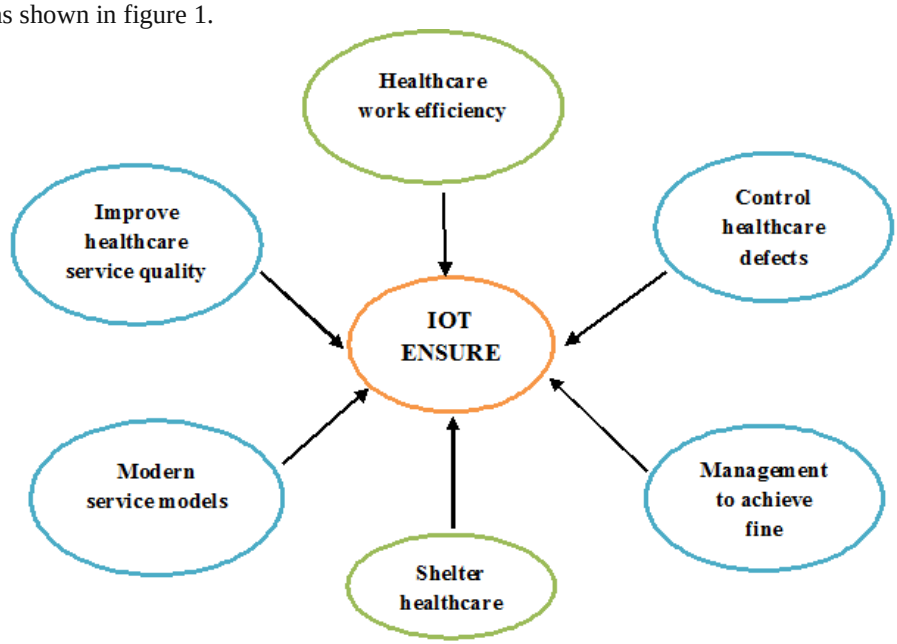

Figure 1:-Applications of IoT ensure for enhancing clinical practices.

Wearable Sensor

Wearable sensor technologies produce large scale, multi-dimensional datasets that can be used to classify lifestyle, environmental and behavioral risk factors in the sub-clinical process of adverse pregnancy outcomes. Here we are providing a health care solution that combines web app and CC3200 techniques in a wireless sensor network to monitor the health condition of pregnant women[8]. A specialist who stays nearby can examine and observe the health condition of the pregnant women and can react with effective health care services to save the lives of both the women and infant in an emergency. The sensors incorporated measures the body temperature, pressure, pulse rate which is transferred to micro controller CC3200,which has an inbuilt WIFI and ADC module, so that the patients' health condition can be monitored by the doctors from anywhere at any part of time with the help of IP address link generated by the cloud data. At any point of emergency an alarm will be generated both to the doctor and the patient relation who can react and help to save the life of pregnant women as shown in table 1.

Fetal movement can currently only be quantified using ultrasound or MRI scanning. So, for this accelerometer is implemented. The accelerometer sensor is placed in abdominal wall (limb) of fetus and athreshold signaling processing method to identify the acceleration and fetal movements. The use of the (ADXL335) accelerometer sensor on the mother's abdominal wall is an important development in the automated non-invasive detection of fetal movements. This system is highly sensitive even for small movements and light weight. This is a preferable home monitoring device.

Fetal hypoxia can be measured using this accelerometer as it counts the fetal movements (kicking) and estimate the situation of the infant in the womb. Regular monitoring of fetus and women in rural area, eventually the infant mortality gets reduced[9].

Table 1:- Wearable sensor classification.

Duration hours	No of fetal movement Normal	No of fetal movement Abnormal
1 hour	3 or more	2 or fewer
2 hours	6 or more	Less than 6
12 hours	Greater than 10	Less than 10

Allomom And Allobaby

Jewelry is that every woman loves to wear, then how about monitoring the health of a person using it? As shown in figure 2, Save Mom is a conceptualized portable kit that constantly monitors and tracks the health of a pregnant women. Jewelry such as bracelets or necklaces contains colorful beads with loT enabled sensors which tracks and analysis the condition of the pregnant women and record every data including calories burn, heart rate etc. Based on the observation it collects the data and sends to the device and remedies the women about the parental care to be taken. All the data is transformed to cloud using women's phone via Bluetooth[10].

Figure 2:-Save Mom is a conceptualized portable kit that constantly monitors and tracks the health of a pregnant women.

Artificial Intelligence

ArtificialIntelligence (AI) is a field of computer science in which device learn to perform composite tasks and adjust their output based on past experiences. But the artificial intelligence is still in developing phase so we cannot trust fully the AI as the outcome can be unresolved sometimes. This AI generally achieved by algorithms and designed with abilities to discover relationships with the large amount of data. AI is a powerful appliance for humans to use to customize the way they give treatment to infants.AI has the power to assist clinicians in decision-making, diagnose and develop case management[11].In AI we use device learning – Neural networks and learning device mechanism, machine learning is a technique for fitting models in to data and learn by training models into data. Machine learning is one of the fastest growing services of the cloud. Machine learning focus on the development of computer programs that can provide the details and use it learn from themselves. We are going to use deep learning techniques call Artificial neural networks, convolutional neural networks, Raspberry pi. It helps to decrease the accuracy and operative time. It provides better imaging before and during the surgery[12].

Convolutional Neural Network (CNN)

The termCNN is one of the methods from neural networks used in AI. Where this CNN is deep learning algorithm and able to successfully capture the spatial and temporal dependencies in an image by the application of similar filters[13]. This conventional network main role is to decrease the images into an order which is simple to process, without losing property which are analytical for getting a good prediction. The CNN has recently been applied to obstetrics for the categorization of electromyography, fetal heart rate and electrocardiogram signals.A competitive neural, recurrent neural (RNN) and convolution neural (CNN) network was tested for image recognition and segmentation without additional extraction and selection of elements.

Artificial Neural Networks (ANN)

ANN is an interconnected cluster of nodes inspired by biological neural networks as shown in figure 3. It is a computational model that involves various processing components that receives inputs and send outputs based on predetermined action of functions.It consists of dependable mathematical system that can explain multifactorial data. In many situations' woman don't know that she is being pregnant, this is one of the reasons for miscarriage. There are several early pregnancy disorders that are pre-eclampsia, eclampsia and ectopic pregnancy.By using this ANN, we avoid the pregnancy disorders early. ANN used for hypertensive, normal and preeclamptic pregnancy identification using the heart rate variability (HRV). This ANN used to interpret fetal heart rate (FHR) and cardiotocography (CTG) to aim in the detection of pregnancy problems.It also developed to predict the risk for congenital heart disease in pregnant woman[14].

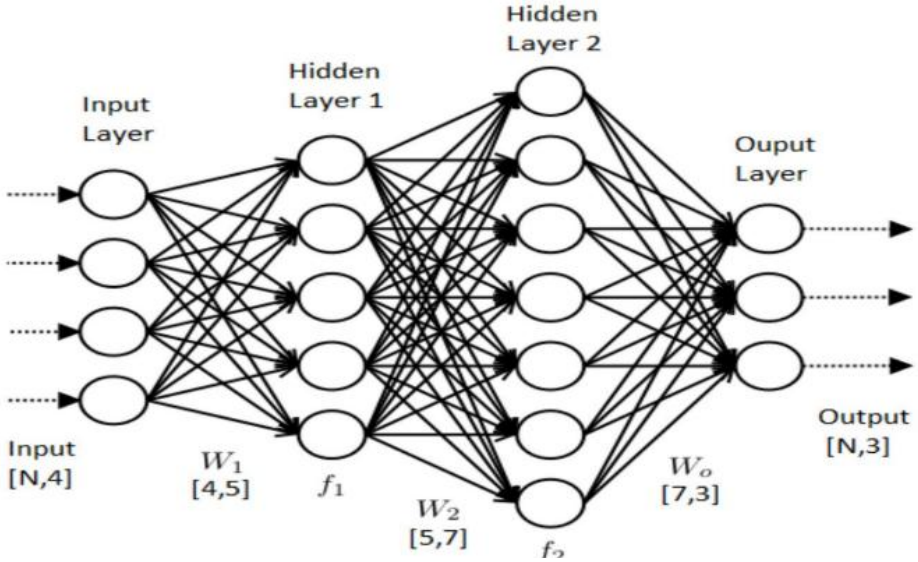

Figure 3:-Biological neural networks that can explain multifactorial data.

Raspberry pi

It is a series of tiny single-board computer. Where this is used as a gateway to send data to cloud. This is a wireless communication network. It sends the analyzed data to the data receiver. It eventually reduces the number of computations that need to be completed in the cloud. It's a Bluetooth digital pregnancy test that sends data to the Raspberry Pi which, in effect, sends a tweet of the result to monitors or any digitalized device as shown in figure 4. Measured parameters are passed via the IoT. It offers reliable and timely health assistance to both fetuses and women. The findings are viewed via the IoT on the cell phone[15]. ADXL345 accelerometer detects the change in motion of the system and raspberry pi to know sensor instruction data and transfer it to the web service internet of things (IOT).

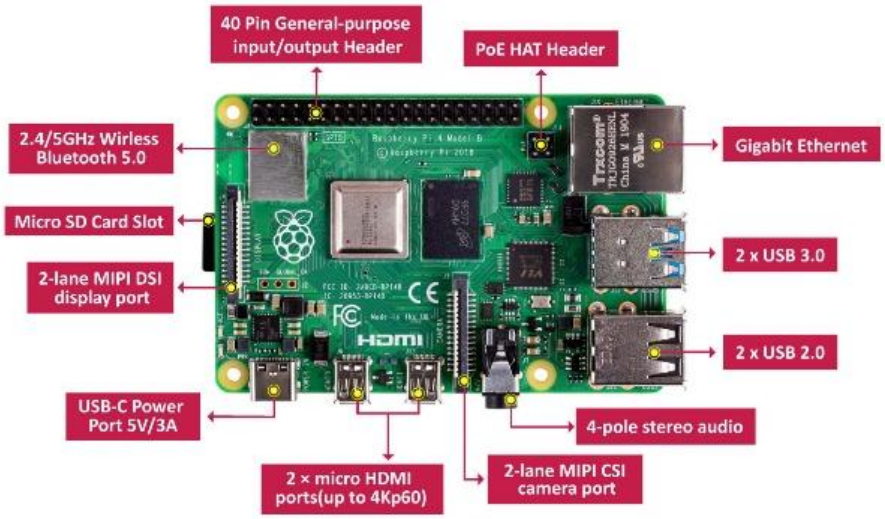

Figure 4: Raspberry pi to know sensor instruction data and transfer it to the web service internet of things.

Conclusion:-

Artificial Intelligence is becoming a big part of almost every sector and Obstetrics/Gynecology is no exception. AI serving major roles form automating drudgery and tasks in medical practice to manage patients and medical resources. This AI provides the outputs immediately but cannot completely depend on the decision of the artificial intelligence, human interaction is necessary. It sure does as environment around mom is good, so it leads to better health of both mom and child. The importance of health care during pregnancy is emphasized because proper health care increases the probability of a successful pregnancy, a successful infant. Maintain healthy environment, regular monitoring of the vital parameters of fetus and women, that should eventually decrease the mortality rate.

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