Prediction Based Women Health Monitoring

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Abstract-*During pregnancy period women undergo several physiological parameter changes such as a change in heart rate, blood pressure, gestational diabetes and body mass index. These changes can cause major problems to the pregnant women. When such problems are neglected it may result in mortality or complications in the health of mother and fetus. Therefore, pregnant women must be protected from these complications arising in the period of pregnancy. If women suffer from some serious problems this may create emergency, so it is required to monitor these physiological parameters frequently and proper actions must be taken accordingly. Proposed approach uses an android based system that monitors such changes with the help of sensor. Sensor takes readings of heart rate and blood pressure. Decision Tree Classifier is used for the pregnancy data classification. From the result of classification, it predicts woman's health condition during pregnancy. Sensor readings are verified with standard medical equipment readings. On the basis of woman's health condition, system recommends some precautions, yoga poses and diet plan for pregnant women. This system may help in reducing the rate of mortality of mother and fetus.*

Keywords-Gestation, Health monitoring, Machine learning classification algorithm, C4.5 Decision Tree, Risk Prediction etc.

I. INTRODUCTION

Pregnancy period is a turning point in women life. Pregnancy complications lead to increases rate in mortality of mother and fetus. During pregnancy period, women under go several physiological parameter changes that lead to complications. If changes are ignored or unnoticed, it will increase the level of complications. Pregnancy induces changes in women body both externally and internally. Some changes are so dangerous that it may result in losing a mother and fetus lives. According to a gynecologists, every trimester is defined to be around 14 weeks, adding up to around 42 weeks of pregnancy. The most common reasons for complications and deaths during the period of pregnancy include anemia, urinary tract infection, hypertension, gestational diabetes, bleeding, obesity, high blood pressure, heart rate increases, and weight gain or loss. Such problems may affect baby's health like preterm birth, birth defect, fetus growth problem and low birth weight. At the time of pregnancy high blood pressure developed is called gestational hypertension. High blood pressure can harm the mother's kidneys and other organs, it can cause low birth weight baby and early delivery. Pregnant woman who is overweight or obese may suffer from baby's premature condition. Monthly check up is mandatory to monitor the physiological changes. If women suffer some serious problem then they are required to take daily check up and proper actions must be taken accordingly. The main goal is to predict and detect early complications during pregnancy that will save lives of mother and fetus. It reduces the rate of mortality. An android system is proposed to monitor such changes using sensors. Real time data is recorded using a sensor of heart rate and blood pressure. Using this system, we can find complications during pregnancy and protect pregnant women by providing them certain precautions. Proposed model has used Decision Tree Classifier for classifying woman's health condition, normal or risky. Physiological parameters like heart rate and blood pressure are recorded using the sensor. Other parameters like medical history and personal details of woman's. Parameters are input to decision tree classifier. Based on parameters, classifier finds decision path to woman's condition. As per woman's health condition, the system recommends some diet plan, yoga poses and precautions.

II. RELATED WORK

2.1 Predict Condition Using Classifier

Aparna Gorthi, et al. [1] The goal of routine antenatal consultations is to predict and detect early complications of pregnancy allowing better management and save both the mother and fetus lives. High risk pregnancies include women with history of complicated pregnancies and deliveries, diseases such as diabetes, hypertension, immunologic disorders, and pregnancies presenting with anomalies like malnutrition, obesity, intrauterine growth restriction. Such cases require more frequent monitoring and specialist care. Use the machine learning classification algorithm is decision tree-based learning most closely captures the domain experts process of evaluation of a clinical case and predict woman's health condition. V.Srinivasan, et al. [2] In this paper proposed the Fast Classification Algorithm (FCA), We have hybrid the advantages of ID3 and the SVM, for classification accuracy

and to obtain fast result. The disadvantage of id3 not suited for the large database. Advantage of SVM of fast classification classifier and the SVM stand poor in accuracy classification of selecting random members. Thus by taking their advantage into consideration and removing the draw backs form the both algorithm we framed the FCA with upper and lower approximation to show algorithm solves the problem of fast and accurate classification JostinahLam, et al. [3] High risk pregnancy can lead both mother and fetus to death. Proper antenatal care before and during pregnancy may decrease the risk of complications. Clinical decision support system (CDSS) is one of health information systems for assisting health providers in decision making that can improve the quality of prenatal care. ontology include seven criteria risk factors, health issues, pregnancy status, preventive measures, management, and health promotion. Evaluation had been done by general practitioners and specialists, through six criteria assessment understandability, completeness, correctness, exibility, simplicity, and integrity. Overall, the quality of ontology developed is good, but not excellent enough. The ontology should be integrated into CDSS and tested out its usability and accuracy of the system. Lakshmi.B.N, et al. [4] Pregnancy is a delicate stage in women life monitoring during pregnancy period can control ,manage maintain and prevent abnormalities induced in physiological parameters, In paper performance of the rule-set generated from C4.5 provides great, precise, reliable and accurate prediction and an accuracy percentage of 98%. Hence, hybrid approach involving data transformation, C4.5 classier application, rule extraction and range replacement gives better performance, accurate risk prediction, valid set of rules for further implementation and reliable solution to the complications faced by pregnant women during pregnancy. Nandini Ravi, et al. [5] Two classifiers C4.5 and Naïve Bayes are considered for solving this problem due to their powerfulness, popularity and efficiency. The results of analysis on test dataset from that C4.5 decision tree classier has greater potential in accuracy for predicting pregnancy risk levels. Indumathi.T.S, et al. [6] Reducing the mortality or complications arising in period of gestation. Use C4.5 decision tree classification. The main goal of compare the results obtained from C4.5 classier on both unstandardized and standardized dataset and analyze the performance of the C4.5 algorithm in terms of its prediction accuracy when applied on the created database from collected and standardized pregnancy data. As The accuracy percentage for unstandardized dataset and standardized dataset accounts to 66.087% and 71.3043% respectively and error percentages are 33.913% and 28.6957% respectively.

2.2 Sensor Based System

Juline Pendres, et al. [14] Wearable sensors are used to control the life style related pregnancy complications. The proper focused on four lifestyle behavior physical activity, sleep, stress and diet and weight management Iman Morsi, et al. [15] Microcontrollers Atmega 16 is used to measure a heart rate and blood pressure. Salomi S. Thomas et al. [16] Mainly arduino is used because it can sense the environment by receiving input from variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators. The microcontroller on the board is programmed using the Arduino programming language. Heart beat sensor was used for sensing heart rate. This device will allow one to measure their mean arterial pressure (MAP) in about one minute and the accurate body temperature will be displayed on the Android.

III. PROPOSED METHODOLOGY

3.1 PREDICTION MODEL

Prediction is used to discover the relationship between dependent and independent variable and also analyze the data what will happened. It shows unknown and missing value. Prediction model predict woman's health condition during pregnancy, that are of two kinds:

- Prediction Categories:
  - Normal
  - Risky

3.2 ARCHITECTURAL DESIGN

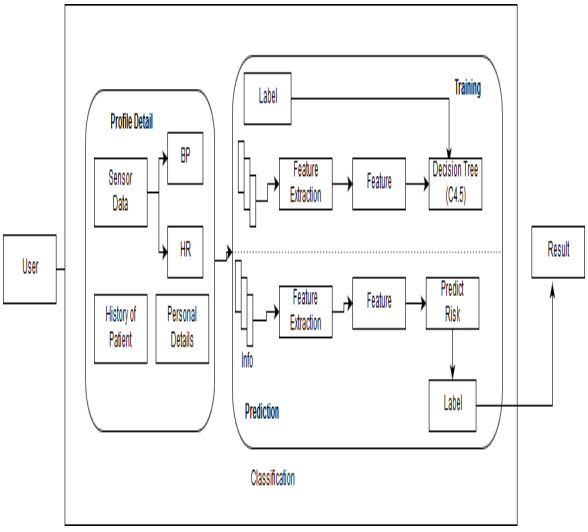

Figure 3.1: Proposed System Architecture

- **Database System:**

The data base system is used to store test record. Test record consists history of women, personal details and medical information is heart rate, blood pressure using the sensor.

- **Android System :**

It is developed to monitor physiological changes. Using this system, we can find complication during pregnancy and protect pregnant woman.

- **Classifier :**

Decision tree model is flow tree like structure. It flows a divide and conquers method. A decision tree is a structure that includes a root node, branches, and leaf nodes. Each internal node denotes a test on an attribute, each branch denotes the outcome of a test, and each leaf node holds a class label. The topmost node in the tree is the root node. Decision tree classifier classifies the woman's health conditions in normal or risky. Medical information, personal details, and history of woman's are considered as an input to the decision tree classifier.

Tree create on the basis of entropy or information gain in which calculate info(D) for each attribute. If info(D) is a maximum of the attribute it becomes a root attribute of the tree and generates decision path of woman's health conditions.

IV. RESULT

SENSOR READING COMPARE WITH MEDICAL STANDARD EQUIPMENT READING.

The graph show the comparison of sensor reading and medical standard equipment reading. X-axis show the number of women. Y-axis show the systolic blood pressure, diastolic blood pressure and heart rate.

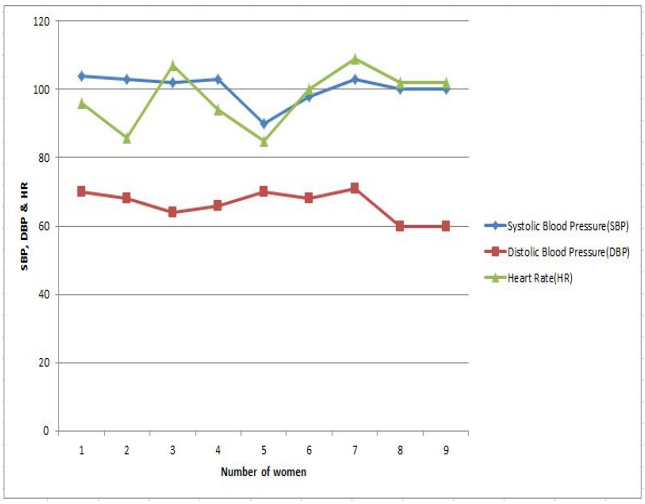

Figure 4.1: Using Sensor

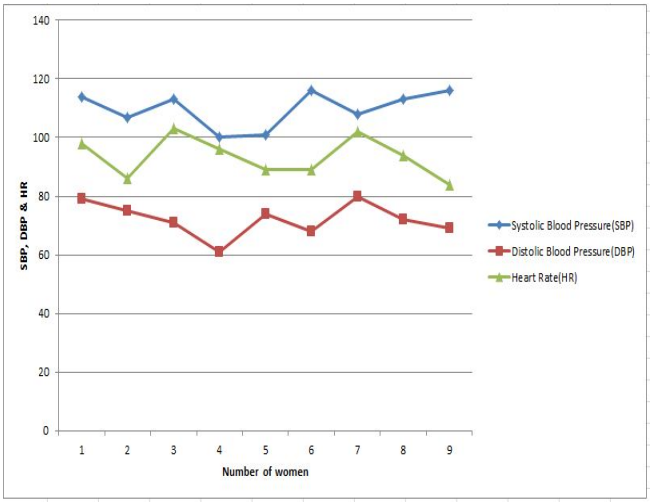

Figure 4.2: Using Medical Standard Equipment

Figure 4.1 shows the sensor readings of 9 pregnant woman's systolic blood pressure in mmHg, diastolic blood pressure in mmHg and heart rate in bpm. The sensors readings are compared with the medical standard equipment readings in Figure 4.2. It shows that the average difference of systolic blood pressure is 8 mmHg, diastolic blood pressure is 7.44 mmHg and heart rate is 5.55 bpm.

V. CONCLUSION

Woman undergo several physiological changes in her body during pregnancy like blood pressure, heart rate, weight, and glucose level. Such parameters may lead to complications in the pregnancy. If we do not take care of these problems at an earlier stage, it may lead to mortality of mother and/or fetus. This system is proposed and developed to predict pregnant woman's health condition normal or critical. Woman can monitor her health condition by using sensors which record blood pressure and heart rate. Proposed model uses decision tree classifier. It finds decision path after analyzing

medical information, personal details and history of woman's health. Decision path gives pregnant woman's health condition and suggests some precautions, yoga poses and diet plan. Sensor reading is compared with medical standard equipment reading, it has been observed that average difference between reading in systolic blood pressure is 8mmHg, diastolic blood pressure is 7.74mmHg and heart rate is 5.55 bpm. This system may help in reducing the rate of mortality of mother and/or fetus by taking appropriate action at an early stage.

FUTURE ENHANCEMENTS

The research can be extended for use of stress sensor to calculate depression and anxiety level as well as a smoke sensor detects environmental harmful gases. Using these sensors record, real time data will be generated that will help to predict complications during pregnancy and get more accurate results.

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