Risk Prediction Techniques In Antenatal Care: A Review

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Abstract—Antenatal or Prenatal care is the care provided by the health care professionals during the gestation period in women. This phase being a sensational period comprises of many complications and risks. The prediction of these risk factors at an earlier stage or even before its onset, by the physicians is highly mandatory and the need of the hour. With the advent and growth of technology and automation, we require a diagnosis almost immediately and without delay. The machine learning algorithms and the image processing techniques have satisfied the need and are successful in predicting the risks with a higher accuracy rate. In this paper, we have reviewed about the different types of risk factors during the pregnancy period along with the methods of predicting these risks using machine learning algorithms and image processing techniques. The Machine learning algorithms, in which the machine learns from experience by getting trained with large volumes of data, predict the risks more efficiently. The image processing techniques predict the abnormalities from scanned ultrasound images using the different segmentation techniques, the accuracies and limitations predicted for each of the algorithms are discussed. By combining both machine learning and imaging techniques, we can effectively provide a decision assistive system to the medical practitioners in making decisions in this crucial period for the well-being of the mother and child.


1 INTRODUCTION
The phase of pregnancy or gestation is tied up with many emotions for the mother and is one of crucial phase for the mother and the fetus. The advancement in medicine and the knowledge about computer applications has guaranteed a safe and risk less pregnancy for the mother and the fetus. It is essential to continuously monitor the 40 weeks of gestation to avoid the complications in this phase and to have a safe travel throughout the gestation period. The computer aided healthcare services provide a way to predict the complications in pregnancies that can be treated by physicians. Statistics say that, 800 women around the world die each day due to the preventable causes of pregnancy and childbirth complications. In India about 44000 women die every year due the complications in pregnancy, Though the Maternal Mortality Ratio (MMR) has reduced with the continuous treatment and diagnosis, still deaths occur. Each year 6.4 lakh neonatal deaths occur worldwide and in India it is about 25.4 deaths per 1000 live births, which is the 12th largest among the 52 middle east countries. To reduce and prevent these maternal and neonatal mortality rate, it is highly essential to monitor the gestation period and identify the complications at the exact time and thereby, avoiding the adverse pregnancy outcomes.

The artificial intelligence techniques assist in decision making of large volumes of data benefitting the patient and also assisting the physician. It strives to continuously learn and improve the current trends in treatment and to enhance the effectiveness of diagnosis, accessibility and cost- care. Machine learning and Deep learning techniques, which are a subgroup of AI techniques, can act as a good predictor for identifying the complications in pregnancy period. In this paper, the risks and its complications during the pregnancy period and the ways in which they are predicted using machine learning prediction algorithms along with image processing techniques have been discussed.

2 BACKGROUND
The human pregnancy is characterized over 40 weeks gestation period and it is divided into three trimesters which are approximately 3 months long. The first trimester starts from week 1 and ends in week 13, then the second trimester starts from week 14 and ends in week 27 and the last and third trimester ranges from week 28 to week 40. Generally, the first trimester is the most crucial period of the gestation period as most of the development of fetus such as, development of body organs and structure occurs during this period. Miscarriages and birth defects are prone to occur in this period. The defects or damages occurring to the fetus in this phase will be almost permanent and has a serious effect on the mother and baby. The typical complications of the gestation period for the mother are listed as follows 1) The age of the mother – women under age 17 and above age 35 who are pregnant face high risks and complications in pregnancy than the women of age between 18 to 35. The risk of miscarriage and genetic disorders occur if the women if of above 35 years of age 2) Ectopic pregnancy – pregnancy outside the uterus 3) Loss of pregnancy/ miscarriage 4) Preterm Labor – delivery before 37 weeks of gestation 5) High blood Pressure – maternal hypertension 6) Gestational Diabetes 7) Preeclampsia – high blood pressure in third trimester and increases output of protein in urine 8) Anemia – iron deficiency 9) Infections. The fetal problems that occur during the gestation period are 1) Low birth weight – due to high blood pressure or preeclampsia 2) Still birth 3) Placental disorders such as Placental Insufficiency, Placental abruption, Placenta Previa and Infarcts in Placenta all these cause low nutrition and oxygen to baby causing death of the baby. Intrauterine growth restrictions and genetic disorders occur due to the morphological changes in the placenta and also due to the complications of the mother. The complications of the mother and fetus are entwined with each other. Table 1.1 lists the risks involved for mother and fetus and the type of prediction technique available.
Table 1.1 The List of Risks involved for Mother and Fetus with the Existing Techniques discussed in the paper

<table>
<thead>
<tr>
<th>RISKS INVOLVED FOR MOTHER AND THEIR EXISTING PREDICTION TECHNIQUES</th>
<th>Prediction Techniques Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ectopic Pregnancy</td>
<td>Transvaginal Sonography</td>
</tr>
<tr>
<td></td>
<td>Magnetic Resonance Imaging Images</td>
</tr>
<tr>
<td>Preterm Labour</td>
<td>Artificial Neural Network Prediction Model</td>
</tr>
<tr>
<td></td>
<td>Random Forest Classifier Technique</td>
</tr>
<tr>
<td>General Prediction of Risks Based on GDM, BP, Weight Gain, Present State and Trimester</td>
<td>A C 4.5 Decision Tree Model</td>
</tr>
<tr>
<td>Severe Maternal Morbidity</td>
<td>Logistic Regression</td>
</tr>
<tr>
<td>Complications occurrence based on Pre- Pregnancy data</td>
<td>Multiple Neural Network Model</td>
</tr>
<tr>
<td>Preeclampsia (PE)</td>
<td>Bayesian Networks</td>
</tr>
<tr>
<td></td>
<td>Fuzzy Approach</td>
</tr>
<tr>
<td></td>
<td>Random Forest Classifier</td>
</tr>
<tr>
<td></td>
<td>Random Forest Classifier with Decision Tree</td>
</tr>
<tr>
<td>Gestational Diabetes (GDM)</td>
<td>Association Rule Mining</td>
</tr>
<tr>
<td></td>
<td>ML Algorithms- SVM, ANN, DT</td>
</tr>
<tr>
<td></td>
<td>Azure AI Services</td>
</tr>
<tr>
<td>Placental Growth Analysis</td>
<td>With Preeclampsia – Stereological Methods</td>
</tr>
<tr>
<td></td>
<td>With GDM – Placental tissue examination under Light Microscopy and Transmission Electron Microscopy</td>
</tr>
<tr>
<td></td>
<td>Based on Measuring Placental Growth Factor (PIGF)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RISKS INVOLVED FOR THE FETUS AND THEIR PREDICTION TECHNIQUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chromosomal Abnormalities</td>
</tr>
<tr>
<td>Fetal Health Status</td>
</tr>
<tr>
<td>Anomaly Prediction</td>
</tr>
</tbody>
</table>

Any complications in mother will directly or indirectly affect the child and vice versa. The continuous monitoring of the mother’s health and the growth of the fetus according to the respective week is highly mandatory. Any complications must be predicted at the earliest and treated properly to have a healthy pregnancy. In this paper, we have discussed the different predictors available in Machine Learning techniques and image processing techniques for predicting the complications in both mother and baby.

3 ARTIFICIAL INTELLIGENCE IN HEALTH CARE

Artificial Intelligence the recent buzzword of the computer field has contributed to the field of health care tremendously. Machine Learning, the sub branch of Artificial Intelligence, in which the machine learns from experience, has contributed to the prediction of risk factors during pregnancy and has improvised the decision-making process of the physicians. Though it is safe to have manual processing in the field of medicine, this method of machine learning has proved its efficiency and has provided better information to doctors at the point of patient care. The greatest achievement of machine learning is to process huge datasets which are out of scope for humans, process them, train them and learn from them and thereby predict reliable outcomes that can assist the physicians in making decisions. Machine learning can also be trained on images, they can identify the abnormalities and point to areas of attention precisely. Thus, machine learning has tremendously increased the reliability, efficiency and accuracy of predictions in the medical diagnostics. The huger the data are, the more efficient the algorithms predictions work. To predict each complication in mother or fetus many ML techniques have been proposed and used by the physicians. The research towards these predictions are listed in the next session.

4 PREDICTION TECHNIQUES

4.1 Prediction of Risks in Mother

Pregnancy being a very sentimental phase for the mother, any small disorders or complications in mother has a direct effect on her. The changes in the mother directly affects the child and has adverse effects. This is the main concern to continuously monitor and predict the health of the mother. The existing available techniques for predicting the maternal complications are listed in the below section.

4.1.1 Prediction of Ectopic Pregnancy

Ectopic pregnancy is a condition which occurs when the ovum gets implanted in the fallopian tube instead of the uterus. This must be identified at the very early stage as it is a very critical problem and costs the life of the mother if not predicted. This can occur in 0.3% to 0.8% of population and in women who have undergone assisted artificial pregnancy. John R. Crochet et al (2013) reviewed the methods of predicting the ectopic pregnancy. The presence of ectopic pregnancy can be identified best with the help of Transvaginal sonography, which examines the internal pelvic organs. A transducer is machine which when pressed against the skin sends small pulses of high-frequency sound waves into the body. When the waves bounce off the internal organs, fluids and tissues, the receiver of the transducer starts recording the changes in sound’s pitch and direction which is measured and displayed by the computer [1]. The images captured by the computer has to be pre-processed for diagnosis. The images can be enhanced with their resolution, contrast and their spectral parameters are analyzed by a combination of clinical data and statistical classifiers to generate images that indicate ectopic pregnancy [2]. It can be also predicted using the Patient history; levels of serum hCG, progesterone, and activin levels in blood using the classification techniques. The best diagnostic tool for evaluating suspected ectopic pregnancy is the transvaginal sonography. This can accurately view the presence and position of the ovum and also non-viable fetuses [1]. All the clinical complications and predictions for the mother and fetus can be predicted in an ultrasound. The drawback lies in the quality of the images obtained for prediction and also the technician involved [2]. The image quality if enhanced further it leads to better predictions.

Ross Varma et al (2019) came out with an approach that the ectopic pregnancy can be identified with the Magnetic Resonance Imaging Images when the transvaginal ultrasonography fails. To produce detailed images of the organs and tissues within the body, MRI makes use of radio waves and strong magnetic field. The signals were obtained from the adnexal masses from the ovaries which could not be tracked in an ultrasound. The image processing techniques were employed to identify the gestational sac among the hemorrhages. The T1 and T2 imaging of MRI images
confirmed the presence of gestational sac [3]. MRI characterizes the presence and position of the ovum from other potential adnexal masses as it creates high quality images with good resolution. This technique is rarely used by physicians when the ultrasound fails to identify the exact position of the ovum.

4.1.2 Prediction of Preterm Labor
Pre-Term Labor refers to the birth of the baby before 37 weeks. If the baby is born before 37 weeks it will suffer from low birth weight, improper lung maturity and some significant birth defects. So, it is highly important to predict preterm labor and try to prevent it at the earliest.

Paul Fergus et al (2013) modelled a prediction system for preterm deliveries which is the major complication in pregnancy. The electrohysterography (EHG) signals recorded between 22nd to 25th week of pregnancy was available in an open source dataset of Term-Preterm EHG Database, containing 300 records. A supervised classification method in machine learning is employed to classify the dataset into term and pre-term records. The method of documenting the electrical activity of the uterus in time domain is called electrohysterography (EHG). Feature extraction from the electrical signals were done by finding root mean square, entropy, peak and median frequency values. Then, the Artificial Neural Networks (ANN) was used to classify term and preterm by increasing the sensitivity rates and also classify as labor and non-labor events [4]. These networks have a greater accuracy with good precision and recall. The drawbacks of this method is that, a regression analysis was not done and also, many parameters were not tuned to have higher accuracy of classification.

Danica Despotovic et al (2018) extended the above work by using different types of ML algorithms. The electrohysterogram (EHG) signals were collected between 22nd to 25th week of pregnancy and the features were extracted from recordings of EHG signals after decomposing them. A public dataset of EHG database was used for prediction using different ML algorithms such as the k nearest neighbor (k-NN), Random Forest (RF) and Support Vector Machines (SVM). kNN, though it has good success rate and low complexity could not have better performance on finite datasets. RF classifier had random splitting at each node. The SVM for polynomial curve was also analyzed [5]. Among the three, the RF classifier with the artificial sampling approach and 10-fold cross-validation test on 322 samples gave better performance and reliable results with 99.23% accuracy, 98.40% sensitivity and ROC 99% [5].

4.1.3 General Risk Prediction
The risks in pregnancy phase are multiple. The major risks are high blood pressure, physiological status of women which vary time to time, the outcomes of pregnancy which can also vary at any instant. A careful monitoring is hence needed to predict the adverse effects.

Lakshmi. B.N et al (2015) proposed a classification algorithm with decision tree classifier to predict the severe health complications based on physiological parameters collected from pregnant women who visited the hospital at that time. The parameters considered are blood pressure, weight gain, trimester, gestational diabetes, present state and the month of delivery. First the data was transformed based on the interdependencies among the parameters, then a C4.5 Decision tree classifier was constructed and the rules were extracted formulated from the root to leaves. Then the rules were standardized and a ruleset was generated by the experts for prediction. The accuracy of predicting the pregnancy data instances based on the standardized rules was 99% [6]. This method is purely based on verbal responses of 600 women. So, the responses have a tendency to vary and the responses cannot be validated. Based on the physiological parameters the risks were assessed [6].

Eugenia Arrieta et al (2016) proposed a system to predict the risk of Severe Maternal Morbidity (SMM) in pregnancy phase. A logistic regression model with L2 regularization was used as classifier to predict the maternal morbidity rate. Features to predict SMM were obtained from the pregnant women who had come for checkup to the hospital and dataset was collated. An ANOVA (Analysis of Variance) technique was used to analyze the variance on the dataset and a logistic regression model was used to classify the dataset into SMM and non-SMM with an accuracy of 85% - 95% Confidence levels at each trimester [7]. Though this method provided individual attention to each patient, the model fails when the dataset becomes non-linear.

Yu Mu et al (2018) developed a deep learning framework for finding the pregnancy outcomes with the parameters obtained before getting pregnant. A TensorFlow model of multi-layer neural network with 75542 couples’ multidimensional pre-pregnancy data was used to predict the risks and its complications that might occur. The dataset had 308 features such as historical data of the patient, history of pregnancies, lifestyle and the environment of survival of both husband and wife. This framework outperformed the other models with an accuracy of 89.2% with recall 0.668 and F1 score 0.670. The different classes of pregnancy such as preterm birth or normal delivery, birth defect, spontaneous abortions were predicted. Optimization and interpretability of the model must still be increased for wide spread usage [8].

4.1.4 Prediction of Preeclampsia
Preeclampsia is a severe complication of pregnancy in which the women suffers from high blood pressure ranging greater than 140mm/ 90 mm associated with the release of protein in greater than or equal to 0.3gms in 24 hours urine sample. This condition directly affects the placenta and reduces the channel size of placenta.

Mario W.L.Moreira et al (2016) proposed an intelligent decision model of Bayesian network model to diagnose preeclampsia in patients with uncertainty. Hypertension being the worst complication in pregnancy is a case of uncertainty. A Bayesian network was constructed with the 3 major nodes, Risk factors, Physiological mechanisms and Symptoms and their corresponding symptoms. The prediction accuracy of this network model is 66.7% for chronic hypertension with preeclampsia. This method needed more clinical data to improve its accuracy but if the dataset becomes voluminous this model can become infeasible to predict knowledge from it [9].

Macarena Espinilla et al (2017) proposed a wearable application prototype which had a fuzzy linguistic approach embedded on it. The wearable device collected the blood pressure values and then a linguistic transformation was applied to the dataset and the required knowledge was inferred from decision trees without pruning. A fuzzy set of rules were applied based on linguistic rules and the member...
function known to health experts; preeclampsia was diagnosed [10]. This method provided monitoring the blood pressure values in real time and with the help of decision tree rules the model gave an accuracy of 75.03% [10]. The volume of the linguistic rules generated from many different datasets become large and hence maintainability becomes an issue. The model with fuzzy system is highly flexible so the accuracy may vary in each situation.

Mario W. L. Moreira et al (2017) proposed a tree based Random Forest (RF) classifier to predict the disorders in hypertension from the 20th week of gestation. Chronic hypertension, a major issue in pregnancy, occurs when the blood pressure value is higher than 140/90mmHg before pregnancy or before 20 weeks gestation, and/or after 12 weeks postpartum. High BP is very dangerous and it leads to preeclampsia or eclampsia and also maternal mortality in few cases. The RF classifier, an ensemble learning technique, showed a better result when compared to other classification algorithms. It is based on the classification rule: condition "→ "Rule". A random forest is constructed for the dataset with a set of decision trees and classification is done based on majority votes of all the trees [11]. This approach reduces the variance of the model and is robust to outliers. It takes a larger time for training when the number of trees increases and the complexity can also increase parallelly.

Antonieta Martínez-Velasco et al (2018) proposed a random forest classifier with decision tree classifier to predict the risks associated with preeclampsia to improve the diagnosis of the disease and to assist the physicians. The dataset of 1634 records and 25 features was preprocessed and the features were extracted using Leave One Out Cross Validation Technique. Then the dataset was analyzed by the Random forest classifier with decision tree with all the 25 features. The random forest algorithm classified the samples and the decision tree classifier formed a tree structure based on features of importance and formed a hierarchy. It represented the likelihood of the female being affected with preeclampsia [12]. The study helped to understand the likelihood of the disease among the people of different ethnicities and different region. This paper helps us to find the individual likely to be affected by the factors of preeclampsia.

4.1.5 Prediction of Gestational Diabetes
Machine learning algorithms have a vital role in diabetic research. Numerous algorithms have been exploits in prediction of Type – 2 diabetes. This is a metabolic disorder caused by the improper secretion of insulin. This problem when occurs in pregnant ladies is termed as Gestational Diabetes (GDM). This causes severe complications in the gestation phase and also post- pregnancy phase. A woman with diabetes during gestation will get type-II diabetes in her later life. The ML algorithms are used to predict the GDM and also the adverse neonatal outcomes and also help in early prediction of gestational diabetes to prevent complications in mother and fetus.

M. Thiyagarajan et al (2017) proposed a set of association rules to predict Gestational Diabetes, which is a datamining technique. Association rules with if/then statements, uncover the relationships in a relational database. Gestational Diabetes is predicted with the help of these if/then rules from the dataset. The association rules were created with the advice of the experts and with the clinical data of the patients who were affected by the same [13]. Though this technique is easy to implement, the association rules created are very flexible and have a huge number of rules. This causes an issue in maintenance and validation of rules. So, the accuracy of classification may vary.

Ioannis Kavakiotis et al (2017) conducted a test on predicting diabetes mellitus and its complications with of machine learning and datamining tools. He tested both supervised and unsupervised algorithms and found that SVM had given better results. The ML algorithms can handle large volumes of datasets whereas the DM methods cannot. Almost all ML algorithms have given more than 80% accuracy in different situations. The supervised algorithms like SVM, ANN and DT algorithms were tested and compared [14]. This study tested and evaluated the clinical datasets in different situations with ML algorithms. The supervised algorithms had given more reliable and accurate results than the unsupervised algorithms. Yashi Srivastava et al (2019) used the Microsoft Azure AI Machine Learning Studio to predict GDM in the early stages of pregnancy. Using this service, a two-class logistic regression algorithm and a two-class boosted decision tree algorithm were compared on the Pima Indian Dataset obtained from UCI repository. The Logistic regression had better ROC than the boosted decision Tree. It gave an accuracy of 77.8% on a 768-sample dataset [15]. These azure services had made the task to ML algorithms very easy and time efficient. The data must be managed efficiently and it needs expertise to handle the tool and its services.

4.1.6 Placental Dysfunction
The placenta plays a very important and vital role in gestation. The placenta being the life chord between the baby and the mother has to be good, healthy and must grow appropriately in each stage of gestation. The placental growth gets affected for the mother who gets affected by Preeclampsia and Gestational Diabetes. This leads to growth restriction in fetus and also endangers the life of the fetus. The following authors tell about the various growth factors of the placenta.

Mayhew et al. (2007) found that if a patient was affected by preeclampsia then the placenta was directly affected causing changes in the surface of the placenta and the villous tissue of the placenta also gets damaged. These lead to fetal intrauterine growth restriction (IUGR). In this study, placentas of IUGR patients diagnosed with Preeclampsia, Preeclampsia affected fetus and from normal pregnancies were examined under a microscopy. Stereological methods with random systematic sampling provide unbiased and quantitative data about the structure and surface areas of the villous tissue and its fetal capillaries. The arithmetic and harmonic mean thickness of the villous membrane were measured and was found to differ from typical placentas [16]. With image analytics the membrane thickness was found to be varying and the oxygen supply to the fetus was also found to be minimum and thereby affecting the growth of the fetus [16]. Qian Meng et al (2015) has studied the growth effects of placenta in the case of patient with gestational diabetes. The morphological changes of placenta of 10 women being affected with GDM and of normal women were examined under two microscopies, transmission electron microscopy (TEM) and light microscopy (LM). The placental tissues consist of three portions, the maternal, middle and fetal parts with the middle part consisting of a homogeneous villous tissue. The villous tissue was cleaned and segmented into double four 1 × 1 × 1 cm fragments for LM and TEM
examinations, respectively. The LM examination showed morphological changes in villous tissue of the placenta with GDM. The TEM examination showed degeneration of terminal villi tissue of placenta affected with GDM. That is the channel of the placental tissue gets enlarged and avoids nutrition's from entering the fetus. The changes in the placenta are detected by the image processing and segmentation techniques [17]. The study showed that the placenta gets morphologically affected for the patients with GDM. The structural changes directly lead to adverse complications to the maternal-fetus interface. The sample size used in this technique is very small and so the technique must be implemented on larger samples [17].

Samantha J. Benton et al (2016) proposed a work by examining the various factors of the placenta. The placenta when affected causes growth restrictions in the fetus. PIGF (Placental Growth factor) was analyzed in women who were suspected with fetal growth restriction. The placental tissue was examined for lesions indicating placental dysfunction. The lesions were measured based on pre-specified severity criteria. The ultrasound images were subjected to region-based image segmentation technique of image analysis and the regions were separated into three. Region 1 with severity grade (0-10%) indicating normal placenta, Region 2 (10-35%) moderately damaged placenta and Region 3(>35%) severely affected placenta. The higher the placental dysfunction the greater was the growth restriction.

Jaime A. Gutierrez et al (2019) proposed that the preeclampsia factor can lead to placental angiogenesis. He proves that it can repair the walls of the placenta thereby causing reduced blood flow to the uterus and hence the fetus gets affected [19]. Thus, the placental growth factor (PIGF) gets affected in case of preeclampsia and causes adverse effects for both mother and fetus. The placenta which is the bonding between the mother and the fetus gets damaged in case of complications of the mother. The placenta if affected directly results in failure of the fetus and causes severe permanent damage. The risks in mother must be diagnosed earlier and treated for the well-being of the mother and baby.

5 Prediction of Complications in Fetus

The fetal anomalies such as genetic disorders, chromosomal abnormalities, disorders due to placental disorders can also be diagnosed with machine learning algorithms. Andreas C et al (2016) found the chromosomal abnormalities in fetus with the algorithms artificial neural network (ANN), Support Vector Machine and k-nearest neighbor, at 11–13 weeks of gestation (1st trimester). The parameters such as maternal age, previous pregnancy with T21, fetal crown-rump length, serum free β-hCG in multiples of the median (MoM), pregnancy-associated plasma protein-A in MoM, nuchal translucency thickness, were collected by indirect methods and evaluated. A training set evaluation showed that ANN algorithm can predict the fetal abnormalities with an accuracy of 96.1% [20]. ANNs have the ability to learn and model non-linear and complex relationships with large number of inputs and infer knowledge, which is important for real-time datasets. But the ANNs can have high computational costs.

Hammad Qureshi et al (2017) proposed a k-NN classifier to predict perinatal death. This paper considers the relationship between weight gain before and during the pregnancy phase and the body mass index (BMI) value to find out fetal failure. It predicts that a good weight gain for the mother had a good chance of successful pregnancy. The K Nearest Neighbor (K-NN) algorithm automatically predict the successful and failed pregnancies with an accuracy of 95%. The study showed that the computer aided diagnostics can support the gynecologist in predicting pregnancy outcomes [21]. The technique becomes complex when trained with larger number of training samples. If the k value changes the predicted result may also change.

Akhan Akbulut et al (2018) developed a prediction system for e-assistance of pregnant women and for the medical practitioners with assistive e-Health applications. With the development of smart devices this e-assistance technique was found to be greatly beneficial for the pregnant women. Fetal health status was predicted by the clinical data collected from the mother and the mobile features were incorporated in cloud and the pregnant women were able to view the data in their mobile devices. The web application was used as an interface for the clinicians and the Microsoft Azure provided an interface for the clinicians and the Microsoft Azure provided an interface for evaluating the dataset and implementing the ML algorithms. Different two-class binary classification algorithms were employed and the Decision Forest Algorithm had provided best result accuracy 89.5%, precision 0.750, recall 0.750, F1 score 0.750, AUC 0.958 [22]. The algorithms classify whether the fetus holds any anomalies based on a certain threshold as 0 or 1. It also provides a recommendation of exercises for pregnant woman, which is beneficial at that phase. The system must be made more reliable and the size of the dataset must be increased to achieve more accuracy in real time data [22].

6. Discussion

The prediction techniques for each of the problems during the pregnancy phase have been discussed in this paper. The Machine Learning techniques though they have exploited to identify each of the complications and for analysis are very rarely put to practical usage. All the techniques are used for analysis and prediction purposes and for future studies. The machine learning techniques plays a vital role in the health care domain and can be used for good understanding and analysis of the complications. With the recent boom with smart devices many of the techniques have been incorporated in them and which provides recommendations and suggestions in first hand to the pregnant ladies. The results of the ML techniques are being used by the physicians to study its effects and they try to find a solution for the complications and thereby avoiding maternal/prenatal mortality and morbidity.

7 Proposed Work

Our goal is to predict the complications in pregnancy phase in mother and fetus at the earliest by using machine learning and deep learning techniques along with image analytics. The advancement in AI has made everything possible in the recent technology. Both ML and DL can provide further enhancement in accuracy of predictions and we can prevent the maternal/prenatal mortality and morbidity at a higher rate. From the literature review we understand the various complications in pregnancy and their prediction techniques. The major complications being Preterm birth, GDM, PE, Ectopic pregnancies has adverse effects in mother and fetus. Our goal is to predict GDM and PE at an early stage from the blood sample reports collected at real time from the pregnant mothers and diagnose them to avoid their complications. Predicting them early and treating them directly prevents preterm deliveries. Also, from the review we have understood...
that the mother diagnosed with GDM or PE will be affected with placental dysfunction. The placenta which is connecting link between the mother and child gets damaged and disintegrated due to preeclampsia and gestational diabetes. The placental images can be collected from the affected mothers and studied using image segmentation techniques or it can be trained the deep learning algorithms to predict the test images for complications. The placental dysfunction analysis is very important because it has direct impact on the fetus and adverse impact on the mother. Also, we try to predict fetal growth anomalies using the ML techniques. The fetal anomaly prediction will help in preventing growth restricted babies and will produce healthy babies.

8 Conclusion
Thus, in this paper we have reviewed the various prediction techniques to predict the hazards and complications in the pregnancy phase. The ML Techniques have provided a good accuracy for each of the problems identified in pregnancy, though there were certain drawbacks. The image analytics and deep learning techniques when employed with the prediction of complications can make antenatal care a highly safe period for woman. These predictions help to prevent all complications and can provide a better insight to the physician. Thus, the framework can serve as a Decision Support System for the medical practitioners.

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