ABSTRACT
This paper has been inspired by the need to find an efficient method for diagnosis of Preeclampsia at an earlier stage. Preeclampsia or Pre-eclampsia is a condition that affects some pregnant women usually during the second half of pregnancy (from around 20 weeks). Preeclampsia is a major cause of maternal and perinatal mortality, morbidity worldwide, particularly in developing countries. Although it is a heterogeneous disease, it is believed to result from impaired placentation. The human placenta is a fetus’s lifeline during gestation, providing nutrients and antibodies, while eliminating waste products via the mother’s blood supply. The relatively new field of placenta analysis within the field of prenatal pathology investigates the possibility of learning important health information about the fetus from placenta. Current literatures suggest that preeclampsia requires the interaction between placental abnormalities and genetically determined maternal factors that are modified by pregnancy specific changes. As there is no effective treatment for this complication, the identification of women who are at risk of developing preeclampsia would be of great value.[1] Clinicians could then identify women who require closer antenatal surveillance and allow early referral for timely delivery, when signs or symptoms occur. Although, numerous tests have been proposed for prediction of preeclampsia, their results have been inconsistent. The objective of this work is to predict preeclampsia which affects the pregnant woman after 20 weeks of gestation, at an earlier stage by determining placental volume and area. This early prediction results in reduction of fetal and maternal mortality and morbidity worldwide.

INTRODUCTION
The increase in population correspondingly increases the number of diseases among people. Early diagnosis is of great importance, which is a major challenge faced by the medical experts. Preeclampsia is a condition that affects some pregnant women usually during the second half of pregnancy (from around 20 weeks). Preeclampsia is closely related with placental dysfunction. Preeclampsia can develop anytime after 20 weeks of gestation. It is most common of the dangerous pregnancy complications. It is a major cause of both maternal and fetal mortality and morbidity worldwide. Preeclampsia can be diagnosed by measuring PSG (Pregnancy Specific Glycoprotein) 5, 9 and the placental volume. This work presents a method to develop an algorithm to diagnose the preeclampsia in pregnant woman with the help of two dimensional ultrasound images by measuring placental volume in it. The increase in population correspondingly increases the number of diseases among people. Early diagnosis is of great importance, which is a major challenge faced by the medical experts. Preeclampsia is a condition that affects some pregnant women usually during the second half of pregnancy (from around 20 weeks). Preeclampsia is closely related with placental dysfunction. Preeclampsia can develop anytime after 20 weeks of gestation. It is a major cause of both maternal and fetal mortality and morbidity worldwide. Preeclampsia can be diagnosed by measuring PSG (Pregnancy Specific Glycoprotein) 5, 9 and the placental volume. This work presents a method to develop an algorithm to diagnose the preeclampsia in pregnant woman with the help of two dimensional ultrasound images by measuring placental volume in it. The increase in population correspondingly increases the number of diseases among people. Early diagnosis is of great importance, which is a major challenge faced by the medical experts. Preeclampsia is a condition that affects some pregnant women usually during the second half of pregnancy (from around 20 weeks). Preeclampsia is closely related with placental dysfunction. Preeclampsia can develop anytime after 20 weeks of gestation. It is a major cause of both maternal and fetal mortality and morbidity worldwide. Preeclampsia can be diagnosed by measuring PSG (Pregnancy Specific Glycoprotein) 5, 9 and the placental volume. This work presents a method to develop an algorithm to diagnose the preeclampsia in pregnant woman with the help of two dimensional ultrasound images by measuring placental volume in it.

Figure 1. Analysis of Preeclampsia
The goal of de-noising is to remove the noise while retaining as much as possible the important features of an image. Ultrasonic imaging is a widely used medical imaging procedure because it is economical, comparatively safe, transferable and adaptable. Though, one of its main shortcomings is the poor quality of images, which are affected by speckle noise, a multiplicative noise. An appropriate method for speckle noise reduction is one which enhances the signal-to-noise ratio (SNR) while conserving the edges and lines in the image. Wiener filter is not adequate as it is designed for additive noise suppression. Speckle noise is a high frequency component of the image and appears in wavelet coefficients. One widespread method exploited for speckle reduction is wavelet shrinkage. Segmentation is defined as partitioning portions of an image. Segmentation is a vital aspect of medical imaging. It aids in the visualization of medical data and diagnostics of various diseases. There are various segmentation methods available such as watershed, K-means clustering, level set method etc. In this work placenta is segmented from the ultrasound image using level set active contour method, then

MATERIALS AND METHODS
Study subjects. This measurement study was conducted by taking real time images from scan centre at Chennai. The method developed for early diagnosis of preeclampsia is shown in the Figure 1. The image analysis process can be broken into three primary stages which are pre-processing, data reduction and feature analysis. Removal of noise from an image is one of the important tasks in image processing.
edges are detected properly by using slope magnitude method.[2]

RESULTS
The original image is shown in the Figure 2.

Figure.2 Fetus Ultrasound image
The filter outputs after denoising is shown in the Figure 3, 4 and 5.

Figure. 4 Denoised image using wiener filter
The segmentation result and detection result is illustrated in the Figure 6 and 7.

Table 1 Comparison of different denoising filters for fetus ultrasound sample image corrupted by speckle noise

<table>
<thead>
<tr>
<th>Filter</th>
<th>RMSE</th>
<th>MSE</th>
<th>PSNR</th>
<th>ENTROPY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wiener</td>
<td>4.0098</td>
<td>16.0785</td>
<td>36.1023</td>
<td>6.6919</td>
</tr>
<tr>
<td>Median</td>
<td>3.7595</td>
<td>14.1340</td>
<td>36.6622</td>
<td>6.6241</td>
</tr>
<tr>
<td>Wavelet</td>
<td>2.9008</td>
<td>8.4148</td>
<td>38.9143</td>
<td>7.2552</td>
</tr>
</tbody>
</table>

Thus, Wavelet transform enhances the PSNR (Peak Signal to Noise Ratio) which is comparatively very high for an image than median and wiener filter.[3]

The segmentation result and detection result is illustrated in the Figure 6 and 7.

Figure. 6 Result of level set method
Figure. 7 Result of Slope Magnitude method
Thus, Slope magnitude method is suitable for detecting the edges and determining the shape features, which would be useful for medical analysis.

STATISTICAL MEASUREMENT
The statistical measures often give characteristic parameters on the interested image. The complications in placenta that occur during pregnancy show some variations in size of the placenta. With the help of measured statistical values, it is possible to delineate the normal and abnormal placenta complicated by Preeclampsia. The limitation in the ultrasound scanning prevents monitoring the growth of placenta. Placental volume and area assessment are uncommon in routine obstetric practice, a lack that prevents obstetricians from identifying their patients with extremely small or large placentas.

1. Area and Volume Measurement
In this work, a model is proposed to determine the volume and area of the two dimensional ultrasound placentas. The area of the placenta is measured by determining the distance between the major and minor area of an image.

<table>
<thead>
<tr>
<th>IMAGE</th>
<th>RMSE</th>
<th>MSE</th>
<th>PSNR</th>
<th>AREA</th>
<th>VOLUME</th>
<th>CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.4332</td>
<td>11.7872</td>
<td>37.4507</td>
<td>4.2474</td>
<td>0.6143</td>
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<tr>
<td>2</td>
<td>3.0067</td>
<td>9.041</td>
<td>38.6031</td>
<td>6.6562</td>
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<tr>
<td>3</td>
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<td>37.7684</td>
<td>7.9673</td>
<td>0.5943</td>
<td>Normal</td>
</tr>
<tr>
<td>4</td>
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<td>8.4148</td>
<td>38.9143</td>
<td>7.9321</td>
<td>0.6416</td>
<td>Normal</td>
</tr>
<tr>
<td>5</td>
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<td>3.9477</td>
<td>42.2013</td>
<td>8.3794</td>
<td>0.6033</td>
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</tr>
<tr>
<td>6</td>
<td>3.5376</td>
<td>12.5143</td>
<td>37.1907</td>
<td>12.0289</td>
<td>0.6180</td>
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<td>7</td>
<td>3.2994</td>
<td>10.8860</td>
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<td>10.7239</td>
<td>0.5939</td>
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<tr>
<td>8</td>
<td>3.3761</td>
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<td>37.5964</td>
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<tr>
<td>9</td>
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<td>10.23</td>
<td>0.6772</td>
<td>Abnormal</td>
</tr>
</tbody>
</table>

Thus, Placental area and volume for pregnant woman affected by preeclampsia is larger than normal pregnant woman.[4] Hence, placental area and volume proves to be a driving tool for early diagnosis of preeclampsia.

COMPARATIVE ANALYSIS
Backpropagation Neural Network (BPNN), an abbreviation for "backward propagation of errors", is the most popular type of artificial neural networks for applications such as classification or function
approximation.[5] It is a supervised learning method. In this work, it is used for classifying normal and abnormal placenta images. Figure 8 shows the classifier output.

CONCLUSION
In this work, experimental results are tabulated for various filtering techniques for speckle noise reduction like median, wiener and wavelet and concluded that the wavelet transform is best suitable for speckle noise reduction as it maximizes the Signal to Noise Ratio (SNR). Next, placenta is segmented from an ultrasound image using a simple and intuitive level set method and edges are properly detected using Slope magnitude method. This work also suggests that the evaluation of the volume of placenta during the routine ultrasound screening after twenty weeks of gestation can identify the influence of Preeclampsia which otherwise can lead to the several risk of fetal demise. Finally, BPNN classifier is used to make comparative analysis between a normal and abnormal placenta.

FUTURE WORK
The segmentation method can be improved by using automatic seed selection method. More classifiers can be used to have best results.

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REFERENCES