MODIFIED BIOPHYSICAL PROFILE AS AN ANTEPARTUM SURVEILLANCE TEST IN HIGH RISK PREGNANCY: A PROSPECTIVE COMPARATIVE STUDY WITH CONVENTIONAL BIOPHYSICAL PROFILE

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ABSTRACT

Assessment of foetal wellbeing is important to arrive at a timely diagnosis of foetal compromise and management to achieve optimal perinatal outcome. By biophysical profile five different parameters are there to assess foetal well being. To achieve the same goal by modification with only two parameters like amniotic fluid index to assess the long-term adequacy of placental function and non-stress test to look into the immediate foetal status.

OBJECTIVES

Is to detect and determine the severity of acute and chronic asphyxia, by using bio physical and modified biophysical profiles as antepartum tests in high-risk pregnancies. We want to compare perinatal outcome with the test results obtained from both profiles.

MATERIAL AND METHODS

We at our hospital have undertaken a prospective clinical study in 200 high-risk pregnant patients. The two tests, biophysical profile and modified biophysical profile were compared in terms of test results, obstetric management based on test results and perinatal outcome.

DISCUSSION

On analysis of above parameters, when both profiles were compared in terms of thick meconium, morbidity and Apgar score, biophysical profile has higher diagnostic value and accuracy compared to modified biophysical profile.

CONCLUSION

This study has given us an insight to use this modified biophysical profile as a routine for antepartum foetal surveillance and reserve the standard biophysical profile as a confirmatory test when the modified biophysical profile reveals poor results.

KEYWORDS

Biophysical Profile (BPP), Modified Biophysical Profile (MBPP), Non-Stress Test (NST), Amniotic Fluid Index (AFI), Foetal Heart Rate (FHR), Amniotic Fluid Volume (AFV).


INTRODUCTION

The process of birth is the most dangerous journey an individual undertakes.1 In India alone, about 890,000 perinatal deaths occur annually.2 A healthy newborn is the goal of every expectant mother and her physician. It is estimated that 7.3 million perinatal deaths occur annually in the world and most of these in the developing countries, especially in Asia. For every 1000 births, the perinatal mortality in India is about 37.7 but varies from state to state. It is higher in rural 54.4 than urban 32.4 areas. The desire to prevent such occurrences has prompted the clinician to develop various methods of assessing the foetal condition in utero both antepartum and intrapartum. Obstetricians have long searched methods of antepartum foetal evaluation that would be non-invasive, accurate and yield results that were immediately available.

Ideally, the test should be simple, safe, reproducible, reliable incurring minimum expense and inconvenience to mother and child. In the 19th century, foetal assessment consisted of auscultation of foetal heart sounds and subjective recording of foetal movements. During the course of 20th century, these techniques have been augmented by electronic foetal heart rate (FHR) monitoring and ultrasonographic (USG) evaluation of foetal activity and amniotic fluid volume (AFV). Foetal testing involves serial, systematic foetal assessment aimed at identifying foetuses in jeopardy so that appropriate steps can be undertaken to prevent damage or death. Antepartum detection of the foetus at risk for damage or death in utero remains a major challenge in modern obstetrics. Methods for foetal risk determination have shifted from less specific biochemical methods (e.g. maternal estriol determination) to more specific biophysical testing.

The goal of antepartum foetal surveillance is to decrease the incidence of perinatal morbidity and mortality. Primarily used in pregnancies those have been identified as high-risk for various foetal or maternal reasons. These testing protocols usually include, either alone or in same combination, for example, electronic foetal heart rate monitoring, USG assessment of amniotic fluid volume and observation of various foetal biophysical parameters (BPP). BPP described...
by Manning assesses five different foetal parameters to assess foetal wellbeing, but it is time consuming and requires expertise. Vintzileous have attempted to achieve the same goal with only two parameters like amniotic fluid index (AFI) and non-stress test (NST).

MATERIAL AND METHODS

Our aims and objectives of the study was to detect and determine the severity of acute and chronic asphyxia using biophysical profile and modified biophysical profile as antepartum testing in high-risk pregnancy. To compare perinatal outcome with the test results obtained from both biophysical profile and modified biophysical profile. It is a prospective study of 200 pregnant patients of more than 32 weeks with high-risk factors for foetal hypoxia attending the antenatal outpatient clinic or admitted to the wards, because of high-risk factors during a period of one year was considered as the “test group”.

Methods - In the test group, patient’s detailed history was taken. The risk factor for which the patient was included in the test group was noted. A thorough clinical examination was made at booking and on admission, blood pressure, pulse rate; presence of pallor, oedema and icterus was noted. A detailed systemic and obstetric examination was carried out. All preliminary investigations made are outlined in the proforma. The patients were evaluated with the modified biophysical profile (MBPP) consisting of NST recording for a period of 20 minute followed by AFI measurement using four quadrant technique of Phelan (Figure 1).

The complete BPP was performed by USG. The NST was recorded by means of a cardiotocogram and other four variables were recorded by means of a linear array real time USG with a 3.5 MHz transducer. The test was repeated weekly or biweekly till the patient delivers. Risk factor included in the study were pre-eclampsia toxaemia, anaemia, pregnancy beyond 40 weeks, bad obstetric history (BOH), intra uterine growth retardation (IUGR), patients diabetics or gestational diabetics (DM/GDM). We also included patients with decreased foetal movements, heart disease complicating pregnancy or patients with uncertain dates.

We have excluded foetuses with congenital anomalies, low risk pregnancy (normal pregnancy), high risk pregnancy less than 32 weeks gestation pregnancies. Test results were documented and were followed. The NST was performed with cardiotocogram (Corometrics model-116, GE Medical Systems Company) in Semi-Fowlers position. Recording of foetal heart rate (FHR), foetal movements and uterine contractions was done. The trace was designated reactive if more than 2 foetal movements with acceleration of more than or equal to 15 beats per minute lasting for more than or equal to 15 seconds, with good beat-to-beat variability and no decelerations. If the reactive pattern was not recorded within 20 minutes period, the foetus was stimulated with Vibro-coustic stimulation test (VAST) or administration of a glucose containing beverage and the test continued for another 20 minutes period. If there is no reactivity in this extended period, the trace was deemed non-reactive.

USG was performed and general survey of foetus was done and presentation noted. The AFV was measured according to the four quadrant technique. With the patient in supine position, uterus was divided into four equal quadrants by two imaginary lines. The vertical line corresponding to linea alba and a transverse line equidistant from pubic symphysis to the top of the fundus. The transducer was held vertically along the maternal longitudinal axis. An AFI was obtained by summing up the depths of largest vertical pockets, which is cord free in all the four quadrants. An AFI of more than five was considered normal and less than or equal to five was considered as abnormal. By USG complete BPP was done, observation was continued as long as it took to identify the variables or upto a maximum of 30 minutes.

![Fig. 1: NST graph](image1)

![Fig. 2: a, b USG evaluation normal amniotic fluid index](image2)
Each variable was coded as normal or abnormal according to Manning’s criteria. Each of the variables was scored 2 if normal or 0, if abnormal. Patient’s management was based on gestational age, other risk factors, BPP and MBPP scores. The last observation of MBPP and BPP before 1 week of delivery was compared with outcome of pregnancy. Points to assess outcome of pregnancy was seen as evidence of foetal distress in labour as meconium stained liquor, 5 minute Apgar score less than 7 was considered as abnormal, or if evidence of perinatal morbidity or mortality.

Interpretation of MBPP and action taken were – (1) If both tests are normal – weekly foetal surveillance with MBPP. (2) If both tests are abnormal – management depends on gestational age like if gestational age more than 36 weeks delivery was performed and if gestational age less than 36 weeks management was individualized. If NST is reactive, but AFI is decreased then we have to evaluate for chronic foetal conditions particularly congenital abnormalities and perform MBPP twice weekly. If we found AFI is normal and NST is non-reactive, further testing with a full BPP is indicated. We followed statistical methods Chi-square and Fisher Exact test have been used to find the significance of proportion of NST, AFI and BPP in relation to the outcome variables.

RESULTS AND OBSERVATIONS
It is a prospective clinical study consisting of 200 high-risk pregnant women excluding foetal anomaly is taken up for comparing the results and efficacy of two investigatory modalities BPP and MBPP to assess the foetal status. Majority of the patients belong to age group 21-25 years (48%) followed by the age groups 26-30 (26%) and 16-20 (20.5%). Only 5.5% of patients were above 30 years of age. Majority of the cases were tested between 39-41 weeks of gestation 62% with mean gestation age of 39.38 ± 1.54 and only 1% of cases were between 33-35 weeks of gestation. Around 50% of the cases are primigravida and grandmulti group were only 1.5%. Postdated pregnancies 45.5%, pregnancy induced hypertension (PIH) 23.5% and decreased foetal movement in 21% are the commonest risk factors found in the study. Majority of the cases 81.5% delivered within 24 hours of testing time and only 4.5% of cases were delivered after 2 days of the test.

Our 44% of patients had normal vaginal delivery, caesarean rate was 51% in them. Majority 44.9% had emergency section and only 7% had planned elective section. The number of lower segment caesarean section (LSCS) done for foetal distress is 30.1% which was the commonest indication in the study group [Figure-5]. Around 80% of the babies were born with weight more than 2.5 kg, 2% were less than 1.5 kg and 3.5% of more than 3.5 kg. In 85% of the cases both MBPP parameters were normal, both were abnormal in 5% of the cases and either one was abnormal in 10.5% of the cases [Figure- 6]. In 86.5% of the cases the BPP score was about 8/10, which was considered normal. In 13.5% of cases, the BPP score was about 6, which was considered as abnormal [Figure-7].

The NST results are compared with mode of delivery, meconium staining of liquor, Apgar score, birth weight and morbidity, neonatal intensive care unit (NICU) admission and need for resuscitation. When NST was reactive, 45.9% had vaginal delivery, when NST was non-reactive, 69.2% had LSCS. When NST was non-reactive, the incidence of thick meconium
stained liquor, Apgar score at 5th minute less than 7 and NICU admissions were high 69.2% in the study group. LSCS, thick meconium, abnormal Apgar and perinatal morbidity is positively related with non-reactive NST patterns [Table-1]. AFI is a chronic marker of foetal status and is compared with other parameters. When AFI was less than 5, the incidence of caesarean section was seen in 69.2% of the cases, thick meconium stained liquor in 42.3%, Apgar score at 5th minute less than 7 in 69.2%, and perinatal morbidity in 65.4% when compared to normal AFI parameters.

This suggests that LSCS, thin and thick meconium, abnormal Apgar and perinatal morbidity is positively related with abnormal AFI less than 5 [Table-2]. The incidence of operative delivery is increased when both the parameters of the MBPP test were abnormal 77.8%. When individual parameters of MBPP test i.e. both NST and AFI were abnormal, the situation was the same [Table-3]. Majority of cases had thick meconium stained liquor in 88.9% when both parameters were abnormal. The incidence of thick meconium stained liquor, which is an indicator of intrauterine foetal hypoxia with respect to last MBPP result [Table-4]. The results of foetal Apgar at 5th minute, which is another parameter of foetal wellbeing at birth with respect to last test results. The Apgar score of more than 7, which is considered normal is seen in 93.5% of cases when both parameters are normal.

Values of less than 7, which is considered abnormal were mostly seen when test parameters were showing abnormality 100%. There was single foetal mortality in the study group when both parameters were abnormal [Table-5]. Interpretation of operating room (OR) registry, OR=5.19 indicating that, high-risk pregnancies with morbidity are 5.19 times more likely to have abnormal BPP. OR=0.19, indicating that, high-risk pregnancies with morbidity are 0.19 times less likely to have abnormal BPP [Table-6]. When BPP score was abnormal in 27 cases, emergency LSCS was done in 77.8% i.e. 21 cases, thick meconium stained liquor was seen in 48.17% of cases, birth weight of 1.5 kg in 14.8%, Apgar score at 5th minute less than 7 seen in 66.7% and perinatal morbidity in 74.1% of cases. LSCS is positively related with abnormal AFI. Thin & thick meconium, abnormal Apgar and perinatal morbidity are positively related with abnormal BPP [Table-6].

BPP have higher diagnostic value compared to MBPP in terms of accuracy and Kappa as such diagnostic value of BPP is comparatively better than MBPP [Figure-8]. Both NST and AFI have similar diagnostic value compared to BPP in terms of Accuracy and Kappa [Table-7]. BPP has higher diagnostic value compared to MBPP in terms of Accuracy and Kappa as such diagnostic value of BPP is comparatively better than MBPP. BPP has a higher sensitivity of 58.8%, specificity of 85.78%, positive and negative predictive value of about 74.07% and 91.9% compared to NST and AFI [Table-8].

Overall outcome is defined as abnormal outcomes if at least one of the factors namely meconium, Apgar score, birth weight and perinatal morbidity is abnormal. BPP has a higher sensitivity of 58.82%, positive predictive value of 74.07% and negative predictive of 91.9%. The Accuracy of BPP is high i.e. 89.5% and Kappa of 0.59 compared to NST and AFI in terms of overall outcome [Table-9].
Study Outcomes | NST Reactive (n=187) | NST Non-Reactive (n=13) | p value | OR (Non-Reactive)
--- | --- | --- | --- | ---
**Mode of Delivery**
Vaginal | 86 (45.9) | 2 (15.4) | 0.032* | 0.21
Instrumental | 9 (4.8) | - | - | -
LSCS-elective | 12 (6.4) | 2 (15.4) | 0.228 | 2.65
LSCS-emergency | 80 (42.8) | 9 (69.2) | 0.064* | 3.01
**Color of Liquor**
Clear liquor | 148 (79.1) | 3 (23.1) | 0.000** | 0.08
Thin meconium | 31 (16.6) | 1 (7.7) | 0.697 | 0.42
Thick meconium | 8 (4.3) | 9 (69.2%) | 0.000** | 50.34
**Birth Weight in kgs**
≤ 1.5 | - | 4 (30.8) | 0.000** | -
1.5-2.5 | 38 (20.3) | - | - | -
2.5-3.5 | 142 (75.9) | 9 (69.2) | 0.525 | 0.71
>3.5 | 7 (3.7) | - | - | -
**Apgar at 5 Minute**
Normal (>7) | 167 (89.3) | 4 (30.8) | 0.000** | 0.05
Abnormal (<7) | 20 (10.7) | 9 (69.2) | 0.000** | 18.79
**Morbidity**
Absent | 162 (86.6) | 4 (30.8) | 0.000** | 0.07
Present | 25 (13.4) | 9 (69.2) | 0.000** | 14.58

Table 1: Association of Non-stress test with study outcomes

| Study Outcomes | AFI (>5) Normal (n=174) | AFI (<5) Abnormal (n=26) | p value | OR (Abnormal)
--- | --- | --- | --- | ---
**Mode of delivery**
Vaginal | 83 (47.7) | 5 (19.2) | 0.006** | 0.26
Instrumental | 8 (4.6) | 1 (3.8) | p>0.05 | 0.83
LSCS-elective | 12 (6.9) | 2 (7.7) | p>0.05 | 1.13
LSCS-emergency | 71 (40.8) | 18 (69.2) | 0.077* | 3.26
**Color of Liquor**
Clear liquor | 142 (81.6) | 9 (34.6) | 0.000** | 0.12
Thin meconium | 26 (14.9) | 6 (23.1) | 0.291 | 1.71
Thick meconium | 6 (3.4) | 11 (42.3) | 0.000** | 20.53
**Birth weight in kgs**
≤ 1.5 | - | 4 (15.4) | 0.000** | -
1.5-2.5 | 33 (18.9) | 5 (19.2) | p>0.05 | 1.02
2.5-3.5 | 135 (77.6) | 16 (61.5) | 0.076* | 0.46
>3.5 | 6 (3.4) | 1 (3.8) | p>0.05 | 1.12
**Apgar at 5 minute**
Normal (>7) | 163 (93.7) | 8 (30.8) | 0.000** | 0.03
Abnormal (<7) | 11 (6.3) | 18 (69.2) | 0.000** | 33.33
**Morbidity**
Absent | 157 (90.2) | 9 (34.6) | 0.000** | 0.06
Present | 17 (9.8) | 17 (65.4) | 0.000** | 17.44

Table 2: Association of Amniotic fluid index with study outcomes

a: Near significant * Significant at 5% ** Significant at 1%

| MBPP | Both Normal | Both Abnormal | NST-Normal: AFI-Abnormal | NST-Abnormal: AFI-Normal | Total (n=200)
--- | --- | --- | --- | --- | ---
Vaginal | 82 (48.2) | 1 (11.1) | 4 (23.5) | 1 (25.0) | 170 (100.0)
Instrumental | 8 (4.7) | - | 1 (5.9) | - | 9 (100.0)
LSCS-elective | 11 (6.5) | 1 (11.1) | 1 (5.9) | 1 (25.0) | 69 (40.6)
LSCS-emergency | 69 (40.6) | 7 (77.8) | 11 (64.7) | 2 (50.0) | 17 (100.0)
Inference | Cases with both MBPP parameters abnormal are 4.65 times significantly more likely to have emergency LSCS with p=0.040.

Table 3: MBPP with mode of delivery

Majority of cases were delivered by LSCS when both parameters were abnormal.
Table 4: MBPP with Color of liquor

<table>
<thead>
<tr>
<th>MBPP</th>
<th>Clear</th>
<th>Thin</th>
<th>Thick</th>
<th>Total (n=200)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both Normal</td>
<td>139 (81.8)</td>
<td>26 (15.3)</td>
<td>5 (2.9)</td>
<td>170 (100.0)</td>
</tr>
<tr>
<td>Both Abnormal</td>
<td>-</td>
<td>1 (11.1)</td>
<td>8 (88.9)</td>
<td>9 (100.0)</td>
</tr>
<tr>
<td>NST-Normal: AFI-Abnormal</td>
<td>9 (52.9)</td>
<td>5 (29.4)</td>
<td>3 (17.6)</td>
<td>17 (100.0)</td>
</tr>
<tr>
<td>NST-Abnormal: AFI-Normal</td>
<td>3 (75.0)</td>
<td>-</td>
<td>1 (25.0)</td>
<td>4 (100.0)</td>
</tr>
</tbody>
</table>

Inference

Significantly higher proportion of thick meconium in cases when both MBPP parameters were abnormal (p<0.001).

Table 5: MBPP with Color of liquor

<table>
<thead>
<tr>
<th>MBPP</th>
<th>Apgar Score at 5 minute</th>
<th>Morbidity</th>
<th>Total (n=200)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both Normal</td>
<td>Normal (&gt;7)</td>
<td>Abnormal (&lt;7)</td>
<td>Absent</td>
</tr>
<tr>
<td>Both Abnormal</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>NST-Normal: AFI-Abnormal</td>
<td>8 (47.1)</td>
<td>9 (52.9)</td>
<td>9 (52.9)</td>
</tr>
<tr>
<td>NST-Abnormal: AFI-Normal</td>
<td>4 (100.0)</td>
<td>-</td>
<td>4 (100.0)</td>
</tr>
</tbody>
</table>

Inference

Significantly higher proportion of low Apgar score and perinatal morbidity in cases when both MBPP parameters were abnormal (p<0.001).

Table 6: Association of BPP with study outcomes

<table>
<thead>
<tr>
<th>Study Outcomes</th>
<th>BPP (≥8) Normal (n=173)</th>
<th>BPP (≤6) Abnormal (n=27)</th>
<th>p value</th>
<th>OR (Abnormal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode of Delivery</td>
<td>Vaginal</td>
<td>Instrumental</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaginal</td>
<td>85 (49.1)</td>
<td>8 (4.6)</td>
<td></td>
<td>0.000**</td>
</tr>
<tr>
<td>Instrumental</td>
<td>12 (6.9)</td>
<td>2 (7.4)</td>
<td></td>
<td>p&gt;0.05</td>
</tr>
<tr>
<td>LSCS-elective</td>
<td>68 (39.3)</td>
<td>21 (77.8)</td>
<td></td>
<td>0.000**</td>
</tr>
<tr>
<td>LSCS-emergency</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Color of Liquor

<table>
<thead>
<tr>
<th>Birth Weight in kgs</th>
<th>Normal (&gt;7)</th>
<th>Abnormal (&lt;7)</th>
<th>p value</th>
<th>OR (Abnormal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 1.5</td>
<td>162 (93.6)</td>
<td>9 (33.3)</td>
<td>0.000**</td>
<td>0.03</td>
</tr>
<tr>
<td>1.5-2.5</td>
<td>33 (19.1)</td>
<td>5 (18.5)</td>
<td>p&gt;0.05</td>
<td>0.96</td>
</tr>
<tr>
<td>2.5-3.5</td>
<td>135 (78.0)</td>
<td>16 (59.3)</td>
<td>0.035*</td>
<td>0.41</td>
</tr>
<tr>
<td>&gt;3.5</td>
<td>5 (2.9)</td>
<td>2 (7.4)</td>
<td>0.240</td>
<td>2.68</td>
</tr>
</tbody>
</table>

Apgar at 5 Minute

<table>
<thead>
<tr>
<th>Morbidity</th>
<th>Absent</th>
<th>Present</th>
<th>p value</th>
<th>OR (Abnormal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absent</td>
<td>159 (91.9)</td>
<td>7 (25.9)</td>
<td>0.001**</td>
<td>0.03</td>
</tr>
<tr>
<td>Present</td>
<td>14 (8.1)</td>
<td>20 (74.1)</td>
<td>0.001**</td>
<td>32.45</td>
</tr>
</tbody>
</table>

Table 7: Comparison of NST, AFI and BPP with Apgar score at 5 minute

<table>
<thead>
<tr>
<th>Appar at 5 Minute</th>
<th>Non-Stress Test</th>
<th>Amniotic Fluid Index</th>
<th>BPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>31.03</td>
<td>62.30</td>
<td>62.07</td>
</tr>
<tr>
<td>Specificity</td>
<td>97.66</td>
<td>95.20</td>
<td>94.74</td>
</tr>
<tr>
<td>PPV</td>
<td>69.23</td>
<td>69.10</td>
<td>66.67</td>
</tr>
<tr>
<td>NPV</td>
<td>89.30</td>
<td>94.00</td>
<td>93.64</td>
</tr>
<tr>
<td>Accuracy</td>
<td>88.00</td>
<td>91.00</td>
<td>90.00</td>
</tr>
<tr>
<td>Kappa</td>
<td>0.37</td>
<td>0.59</td>
<td>0.59</td>
</tr>
</tbody>
</table>

Table 8: Comparison of NST, AFI and BPP with Morbidity

<table>
<thead>
<tr>
<th>Overall Outcome</th>
<th>Non-Stress Test</th>
<th>Amniotic Fluid Index</th>
<th>BPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>15.63</td>
<td>32.81</td>
<td>58.82</td>
</tr>
<tr>
<td>Specificity</td>
<td>97.77</td>
<td>96.32</td>
<td>95.78</td>
</tr>
<tr>
<td>PPV</td>
<td>76.92</td>
<td>80.77</td>
<td>74.07</td>
</tr>
<tr>
<td>NPV</td>
<td>71.12</td>
<td>75.29</td>
<td>91.91</td>
</tr>
<tr>
<td>Accuracy</td>
<td>71.50</td>
<td>76.00</td>
<td>89.50</td>
</tr>
<tr>
<td>Kappa</td>
<td>0.17</td>
<td>0.35</td>
<td>0.59</td>
</tr>
</tbody>
</table>

Table 9: Comparison of NST, AFI and BPP with overall outcome
DISCUSSION

It was Winkel in 1893 that empirically set the limits of normal foetal heart rates of 120-160 beats per minute. Phillippe-le-Goust first described the foetal heart by hearing it in 1950.[1] In 1966 Gadd demonstrated amniotic fluid fluctuations during pregnancy utilizing amniocentesis and dilution studies.[2] Hon and Quilligan in 1967 noted characteristic foetal heart rate patterns correlated with neonatal outcome.[3] Sadovsky and Waffe in 1973 quantitated foetal activity on patients at risk of uteroplacental insufficiency.[4] Lee in 1976 suggested that FHR acceleration in response to movements i.e. non-stress test could be relied upon as prediction.[5] In 1980, Manning described a multiparameter approach to foetal assessment. In addition to non-stress test, the biophysical profile utilized real time ultrasound to assess four variables - foetal movement, tone, breathing and non-stress test.[6] In 1983 Vintzileous used mid-trimester measurement of biophysical profile by combining two variables non-stress test and amniotic fluid index.[7]

In 1994, Chamberlain has told about outcome of pregnancy by measuring AFV.[8] It was Phelan who in 1987 used a semi-quantitative assessment of amniotic fluid and called amniotic fluid index (AFI).[9] For the first time abbreviated biophysical profile (BPP) as their first line antepartum test by Clark 1989.[10] David A. Miller in 1996 worked on MBPP and it was well accepted by everyone.[11] One of the major goals of antepartum foetal surveillance is the appropriate and timely identification of the compromised foetus. There are various methods of antepartum foetal surveillance. The best method is the one, which aims at identifying the foetus, which is at risk, but still in an uncompromised state and requires immediate intervention. At the same time avoiding unnecessary intervention which is going to be risky and costly for both the mother and the foetus. The distribution of MBPP test score results in this study indicates that the vast majority of the tests were normal in 85%, both parameters abnormal in 4.5% and either any one parameter was normal in 10.5% respectively.

This compares well with the results of other workers.[12] MBPP variables are good in picking up cases of abnormal outcomes. The non-reactive (NST) was associated with abnormal outcome in 69.2% of 13 cases. The abnormal AFI <5 was associated with abnormal outcome in 23% of thin and 42.3% of thick meconium. In the present study both NST and AFI are better predictor of foetal outcome p<0.008. When NST is abnormal and AFI is normal in such situation when we look into individual parameters of MBPP, there were 4 cases which is taken as 100%. Two cases i.e. 50% out of 4 underwent emergency caesarean section. Among them one case i.e. 25% had thick meconium stained liquor. This was booked outside case with gestational age of 41 weeks; induced with two doses of Cerviprime gel went into caesarean section for failed induction, delivered a live male baby with good Apgar score.

The baby had tachypnoea settled after 2 hours of observation. When NST normal and AFI abnormal cases were totally 17 i.e. 100%, among them 64% i.e. 11 cases went for emergency caesarean section. Among these 17.6% i.e. 3 cases had thick meconium stained and 29.4% i.e. 5 had thin meconium stained liquor. Apgar score at 5 minute less than 7 was seen in 52.9% of cases.[12] The patients had 2 or more risk factors like BOH with IUGR, prematurity with PIH, IUGR. Even though thick meconium stained liquor was seen only in 3 cases, 8 cases went for NICU care. The causes being preterm management 2 cases, hypoglycaemia 1 case, hyperbilirubinemia 2 cases, resuscitation 2 cases and tachypnoea 1 case. In our study, majority of the MBPPs were performed with post-dated pregnancy. This was comparable with other studies.[12, 15] Out of 170 both MBPP parameters normal, 69 patients underwent emergency caesarean section. The indications being CPD, BOH, failed induction, scar tenderness, breech.

As far as NST results are concerned reactive NSTs were more in all the studies. In our study when NST was reactive, 42.9% of the patients underwent emergency caesarean section, all these cases were booked outside referred for NICU care. As majority of the cases were postdated pregnancy, hence thick meconium stained liquor was seen in 4.3% of cases and thin meconium in 6.6% of cases.[12,13] Similarly our results hold good for AFI more than 5 seen in 87% of cases which is well correlated with other workers.[16,17] In our study, the incidence of caesarean section for foetal distress was very high 30.1% compared to other studies.[12,16] Booked outside cases were more and majority of the cases were referred because of good NICU facilities. When studied with respect to the last MBPP, it showed that whenever the test results were abnormal, we had 88.0% i.e. 8 out of 9 cases showing thick meconium. When the test results were abnormal with respect to one parameters 20.8% i.e 4 out of 21 had thick meconium. Hence from the above results, it is seen that the incidence of perinatal morbidity with respect to meconium is increased when both MBPP parameters were abnormal, and more so when AFI abnormal compared to NST abnormal when individual parameters were considered. The Apgar less than 7 was seen in 14.5% in our MBPP group. The MBPP group when both parameters abnormal had 9 i.e. 100% cases with Apgar less than 7 whereas, when NST-normal and AFI-abnormal, Apgar less than 7 was seen in 9 i.e. 52.9% cases, more so significant when AFI abnormal compared with NST abnormal. In our study, we had 1 perinatal death, which was preterm of birth weight 1.4 kg at 34 weeks.

The baby died of respiratory distress syndrome 19 hours after delivery. The patient was booked outside with 34 weeks of gestation with severe PIH with IUGR, emergency caesarean section was done. BPP was 4/10. Our results were not as good as other workers.[12, 14] From the above discussion, we can conclude that a reduced perinatal mortality and morbidity has been achieved in this study using MBPP as the primary antepartum foetal surveillance test in high-risk patients. This has been achieved also by avoiding unnecessary intervention with its attendant risks and costs for both foetus and mother. MBPP, a combination of AFI + NST, seems to be adequate for evaluating foetal wellbeing in high-risk pregnancies.

Biophysical profile - The foetal BPP is a test of foetal wellbeing with high predictive value, the present study supports this stand.[18] The distribution of BPP test score results in the study indicated that the vast majority of tests were normal i.e. 87.5%. With equivocal and abnormal scores observed in 9% and 3.5% respectively, it compares well with the results by other workers.[18] BPP variables are good in picking of abnormal outcome. The BPP score, when normal, a score of 8 or 10, is a reliable and accurate measure of normal tissue oxygenation, whereas an abnormal score of less than or equal to 6 of 10 heightens the probability of tissue hypoxia. BPP has moderate sensitivity of 62.04% and better specificity of 94.7%, which is well comparable in over study with others.
When MBPP and BPP results are abnormal, only 8% had poor Apgar and neonatal admissions in 7%.

Majority 93% of the neonates fared well. Most of the neonatal admissions were due to hyperbilirubinaemia, hypoglycaemia and for observation. This shows that we require an additional test to confirm foetal jeopardy before we take decision on induction or caesarean section. The value of BPP is an excellent predictor of perinatal outcome. False negative test results is defined as foetal death that occurs in structurally normal foetus within 7 days of last normal test results with score of 8 or 10. There was no false negative result in this study. Thus, the high proportion of normal test results recorded with the foetal BPP may be attributable to high negative predictive value.

There was only one neonatal death in the present study giving a gross perinatal mortality rate of 5/1000 live births. Baby was premature and died due to respiratory distress syndrome. The corrected perinatal mortality rate was 0/1000 live births. When MBPP is normal, BPP is also normal in 97.6% of cases. When MBPP is abnormal, BPP is normal in 69.6% of cases. It could be a false alarm in 69.6% of cases. Hence, when we have abnormal MBPP results, it requires reconfirmation of poor foetal status with conventional BPP. When BPP is normal, MBPP is also normal in 94.5% of cases. When BPP is abnormal, MBPP is abnormal in 93.4% of cases.

CONCLUSION

MBPP is easier, less time consuming, cost effective and patient compliant test. It gives reassurance that the foetal status is good with good perinatal outcome, when the test results are normal. NST is the cute marker of foetal status and AFI is chronic marker of placental function. The same do not hold true when we have abnormal results, it could be a false alarm and requires reconfirmation of poor foetal status with conventional BPP. BPP is better in anticipating foetal jeopardy, because a combination of tests produces improved predictive value for both normal and abnormal test results. MBPP can be used as a primary foetal surveillance and use BPP for confirmation of abnormal results. To bring down caesarean section rate, we require more accurate diagnostic tools like foetal scalp blood pH estimation during intrapartum periods.

REFERENCES