Original Research Article

Association of biophysical profile with neonatal outcome: an observational study

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ABSTRACT

Background: Perinatal asphyxia is a common cause of neonatal mortality and morbidity in India. Antenatal surveillance prevents foetal injury and death and improves long term neurological outcome through optimal timing of delivery while avoiding unnecessary interventions such as caesarean delivery or preterm delivery.

Methods: After thorough history and physical examination, all patients underwent BPP assessment with USG and electronic foetal heart rate tracing and association between BPP score and various parameters were studied.

Results: Low BPP scores were associated with low Apgar score, increased rate of neonatal admissions and increased neonatal deaths. For BPP score of 6 there were 5 deaths constituting 71.4% of the total cases.

Conclusions: BPP score was found to be significantly associated with Apgar score and neonatal outcomes.

Keywords: Apgar score, Biophysical profile, Foetal hypoxia, Neonatal outcome

INTRODUCTION

Perinatal period is the most vulnerable period in the life of an individual and the rate of death during this period is higher than any other period of life. Preterm births, infection, hypertensive disease and intrapartum asphyxia are cited as most important contributors for perinatal mortality.¹ Almost 2/3rd of perinatal deaths occur due to obstetrical factors, perinatal hypoxia and infection, which are preventable causes. To address this problem various antenatal foetal surveillance methods have been devised in the past few decades and the search for best is still ongoing. Antepartum foetal testing is a compilation of methods devised to differentiate normal from compromised foetuses prior to onset of labour. The main techniques for foetal assessment are non-stress test (NST), contraction stress test (CST), biophysical profile, foetal movement count and modified biophysical profile and umbilical artery Doppler velocimetry.² The NST and CST were two primary methods available for foetal surveillance but are poor predictors of an asphyxiated infant.

Biophysical profile is the combination of NST and dynamic real-time B mode ultra-sonographic assessment of certain foetal parameters. It is a clinical tool that integrates level of dynamic biophysical activities into a usable standard.³ It includes both acute markers of foetal status and some chronic markers of foetal and intrauterine condition. Biophysical profile predicts neonatal acidosis at delivery better than Apgar score and thus the risk of foetal death.⁴ In a compromised foetus measures can be taken to intervene before progressive metabolic acidosis leads to foetal death.⁵⁻⁸

Advantage of using BPP in assessing foetal wellbeing is its wide acceptability, non-invasive nature, less time consumption and providing complete information about foetal anatomy and parameters reflecting acute and chronic response to asphyxia.⁹ It evaluates neuro behaviour of foetus and status of placenta.¹⁰ The BPP
score and Doppler sonography effectively stratify intrauterine growth restricted (IUGR) fetuses into risk categories.\(^{11}\)

Parameters included in BPP are NST, ultra-sonographic measurement of the Amniotic fluid volume, presence or absence of foetal breathing movements, gross body movements and foetal tone.\(^{12}\) The NST included reactive foetal heart rate, foetal breathing movements, foetal activity / gross body movements, foetal muscle tone and qualitative amniotic fluid volume/ amniotic fluid index. The BPS ≤6 has significant association with early neonatal morbidity.\(^{13}\) Thus, this study was conducted to record the BPP in pregnancy at ≥ 36 weeks period of gestation and correlation of BPP with neonatal outcome was evaluated.

**METHODS**

It was a prospective observational study conducted at paediatrics department in collaboration with department of obstetrics at SGRDIMSR, Amritsar, India. Total 200 pregnant women at >36 weeks gestation were enrolled in the study. Women with impending eclampsia/pre-eclampsia, growth restricted fetuses, uncontrolled gestational diabetes mellitus, heart diseases, anaemia, with antepartum haemorrhage and with gross congenital anomalies in the foetus were excluded from the study. A detailed history and thorough clinical examination (systemic and obstetrics) was done on all subjects. All patients underwent BPP assessment with USG and electronic foetal heart rate tracing with assessment of: Foetal breathing movements, gross body movements, foetal tone, NST using cardiotopograph in Semi Fowler position, AFI measurement using four quadrant technique. Perinatal outcome was measured by Apgar score at 1 and 5 minutes, need for NICU admissions, perinatal morbidity and mortality.

Data so obtained was statistically analysed by Microsoft SPSS, Version 17.0. Chi square test was applied to the data.

**RESULTS**

Amongst the 200 subjects, 20 were lost to follow up and perinatal outcome was studied in 180 neonates. 159 cases (79.5%) had BPP score of more than 8 after 36 weeks of gestation while only 7 (3.5%) cases had BPP score of 6 and remaining 34 cases (17%) had a score of 10. At 1 min, 166 neonates (92.2%) had Apgar score of >7 and 14 neonates (7.8%) had <7 Apgar score. At 5 min, 177 neonates (98.3%) had Apgar score of >7 and 3 (1.7%) had Apgar score of <7.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Biophysical Score</th>
<th>Profile Score</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases</td>
<td>200</td>
<td>6 (3.5%)</td>
<td>159 (79.5%)</td>
</tr>
<tr>
<td>Apgar score at 1 min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;7</td>
<td>166</td>
<td>1 (14.3%)</td>
<td>133 (94.3%)</td>
</tr>
<tr>
<td>&lt;7</td>
<td>14</td>
<td>6 (85.7%)</td>
<td>8 (5.7%)</td>
</tr>
<tr>
<td>Apgar score at 5 min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;7</td>
<td>177</td>
<td>4 (57.1%)</td>
<td>141 (100%)</td>
</tr>
<tr>
<td>&lt;7</td>
<td>3</td>
<td>3 (42.9%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Neonatal admissions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Admissions</td>
<td>39</td>
<td>6 (85.7%)</td>
<td>30 (21.3%)</td>
</tr>
<tr>
<td>Not admitted</td>
<td>141</td>
<td>1 (14.3%)</td>
<td>111 (78.7%)</td>
</tr>
<tr>
<td>Neonatal outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharge</td>
<td>141</td>
<td>0 (0%)</td>
<td>112 (79.4%)</td>
</tr>
<tr>
<td>Discharge after treatment</td>
<td>30</td>
<td>1 (14.3%)</td>
<td>26 (18.4%)</td>
</tr>
<tr>
<td>Death</td>
<td>7</td>
<td>5 (71.4%)</td>
<td>2 (1.4%)</td>
</tr>
<tr>
<td>LAMA</td>
<td>2</td>
<td>1 (14.3%)</td>
<td>1 (0.7%)</td>
</tr>
</tbody>
</table>

Out of all the cases with BPP score of 6 there were 5 deaths constituting 71.4% of the total cases. There were 2 neonatal deaths (1.4%) in women with BPP score of 8. No deaths were noted in new born with BPP score of 10 in mother.
DISCUSSION

In our study, we found that, 159 cases (79.5%) had BPP score of 8. BPP score of 6 and 10 was seen in 7(3.5%) and 34(17%) cases respectively. None had score of 0, 2 and 4. Similar results were noted by Manning et al in 2009 with normal score of 8-10 in 97.5%, 6 score in 1.7%, 4 score in 0.52%, 2 score in 0.18% and 0 score in 0 % cases.14-17

It was found in our study that neonates born to mother with low BPP had higher risk of having low Apgar score at 1 and 5 min and the relationship between them was statistically significant (p value <0.001) as shown in diagram 1 and 2. A research study by Hina et al at Pakistan, reported positive correlation between BPP score and Apgar score.18 Similar results were found in study done by Bano et al in which 70% babies had BPP ranged 9-10, 26% babies had BPP ranged 7-8 and 4% babies had biophysical profile score ranged from 4-6.19

We found significant association between BPP score and NICU admission (p value <0.001) as shown in diagram 3. Among the neonates born to women with low BPP score of 6 ,85.7% of neonates were admitted to NICU.

In our study, statistically significant association between BPP score and neonatal outcome was noted with p value <0.001. More number of deaths (5 out of 6 neonates constituting 71.4%) were found in neonates born to mothers with low BPP score (of 6). In a study conducted at Nashville TN modified ultrasonography based BPP was used which included expanded scores of foetal movements, foetal breathing and qualitative assessment of accelerated placental maturity and this method was compared with method of Vinzileos et al and applied to 180 high risk pregnancies to determine the correlation with perinatal outcome. Relationship of results of total score and perinatal outcome showed good predictive values with high specificity and sensitivity.20 Similar results were found in study conducted in Radiology
department PGMI, government Lady Reading Hospital, Peshawar from December 2007 to June 2008.21

There were 5 deaths in neonates born to mothers with BPP score of 6 and 2 deaths (1.4%) in women with BPP score of 8. However, no deaths were noted in new-born born to women with BPP score of 10. Thus, relationship of results of total score and perinatal outcome showed good predictive values with specificity of 98.8% and sensitivity of 82.4%.

Statistically significant association was found between 5 min Apgar score and outcome with p-value below 0.001. Only 2.8% of new born with 5 min Apgar score of >7 died as against 66.7% of neonates with Apgar score of <7.

Limitations of the current study were that BPP includes the use of ultra-sonographic machine for foetal assessment; it takes a longer time to complete if foetus is in sleep state and there was no consideration of presence of hydramnios as a parameter.

CONCLUSION

To summarize, BPP score of 6,8 and 10 was found in 7 (3.5%), 159 (79.5%) and 34 (17%) cases respectively. Majority of the subjects included in this study had normal BPP score.

Majority of the new born 85.7% with BPP score of 6 required admissions. Out of the total 141 new born with BPP score of 8, 21.3% were admitted with 78.7% requiring no admission. 9.4% with BPP score of 10 required admissions. Statistically significant association was found between maternal BPP score and neonatal admission at birth (p<0.001). It was observed that lower the score, sicker were the babies.

There was statistically significant association between BPP score and 1 min Apgar score and with 5 min Apgar score with p value below 0.001. Higher BPP score was found to be associated with higher 1 min Apgar and 5 min score.

Lower BPP score were found to be associated with poor outcome and association was statistically significant. Lower BPP scores were found to be associated with poor outcome. So, it is concluded that BPP score is a valid score for better outcome.

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Ethical approval: Not required

REFERENCES
