ROLE OF BIOPHYSICAL PROFILE IN HIGH RISK PREGNANCIES

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ABSTRACT

BACKGROUND

Foetal biophysical profile is an effective method of antepartum foetal surveillance. It involves ultrasound monitoring of foetal gross body movements, foetal breathing movements, foetal tone, amniotic fluid volume and foetal heart rate monitoring.

AIMS

The aim of the present study was to evaluate the efficacy of biophysical profile in antepartum foetal surveillance.

STUDY DESIGN

This was a prospective study, which was conducted in a tertiary care hospital.

MATERIAL AND METHODS

200 pregnant women with gestational age of ≥ 32 weeks and with certain high risk factors were included in the study. Patients were evaluated by biophysical profile consisting of non-stress test recording for a period of 20 minutes followed by ultrasound monitoring of foetal gross body movements, foetal breathing movements, foetal tone and amniotic fluid volume. A score of "2" was given for each normal parameter and "0" if parameter was absent. A score of $\geq 8/10$ was considered normal and score of $\leq 6/10$ was considered as low. The perinatal outcome was assessed in relation to last biophysical profile score.

OBSERVATIONS AND RESULTS

The last biophysical profile score was normal ($\geq 8/10$) in 66% cases and low ($\leq 6/10$) in 34% cases. A statistically significant association was found between low last biophysical profile score and low Apgar score at birth, need for neonatal admission in intensive care unit and perinatal mortality. A low biophysical profile had an overall sensitivity of 86.8%, specificity of 90.2%, positive predictive value of 81.9%, negative predictive value of 93.0% and an overall accuracy of 89% in the prediction of poor perinatal outcome.

KEYWORDS

Foetal, Biophysical Profile, Ultrasound, Antepartum, Perinatal.

HOW TO CITE THIS ARTICLE: Manzoor M, Noor H, Ashraf S, et al. Role of biophysical profile in high risk pregnancies. J. Evolution Med. Dent. Sci. 2016;5(32):1710-1712, DOI: 10.14260/jemds/2016/403

INTRODUCTION

The biophysical profile, originally described by Manning and Colleagues.¹ has become a standard tool for providing antepartum foetal surveillance. Biophysical profile involves cardiotocographic and ultrasound measurement of amniotic fluid volume, gross body movements, foetal breathing movements and foetal tone. Two points are given for each measurement that is presently yielding a maximum score of 10.

Criteria for Coding BPP as Normal or Abnormal.²

Component	Definition
Foetal movement	$\geq$ Body or Limb Movement
Foetal tone	One Episode of Active-Extension and Flexion of the Limbs, Opening and Closing of Hand
Foetal breathing movements	≥ 1 episode of ≥ 30 seconds in 30 minutes
Amniotic fluid volume	A single 20 mm $\times$ 20 mm Pocket is Considered Adequate
Non stress test	2 Accelerations > 15 Beats Per Minute of at Least 15 Seconds Duration

Each parameter evaluated in the biophysical profile results from efferent signals originating in different central nervous system centres, which mature at different gestational ages.³ In most fetuses, absence of a particular biophysical profile parameter results from normal variations in foetal activity.⁴ The observation period of 30 minutes is chosen arbitrarily to exclude the effects of foetal sleep wake cycle on the majority of biophysical activities.

Financial or Other, Competing Interest: None.

Submission 02-02-2016, Peer Review 27-03-2016,

Acceptance 04-04-2016, Published 20-04-2016.

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DOI: 10.14260/jemds/2016/403

The effect of foetal hypoxia and acidosis on the components of the foetal BPP depends on the severity, duration and frequency of the insult. Acute foetal hypoxia will invariably result in a decrease in foetal heart rate reactivity (Nonreactive, non-stress test) and foetal breathing movements. In advanced stage of foetal injury and acidosis, foetal body movements and tone will be absent.⁵ Amniotic fluid volume is not altered by acute foetal changes and is considered to be a chronic integrated condition.

The biophysical profile is a non-invasive test that predicts the presence or absence of foetal hypoxia and ultimately the risk of foetal death in the antenatal periods. When the biophysical profile identifies a compromised fetus, measures can be taken to intervene before progressive metabolic acidosis leads to foetal death.⁶ The biophysical profile has a false negative mortality rate of 0.7 deaths per 1000 test.⁷

MATERIAL AND METHODS

This prospective study was conducted at Government Lalla Ded Hospital, which is a tertiary care hospital associated with Government Medical College, Srinagar. Study period was from June 2012 to May 2014; 200 pregnant women with below mentioned high risk factors admitted to labour room/ward after 32 weeks of gestation were considered as study group.

Inclusion Criteria

1. Gestational age at admission, 32 weeks or more.
2. Pregnancies complicated by following high risk factors
 - Oligohydramnios.
 - Pregnancy-Induced Hypertension.
 - Intrauterine Growth Retardation.
 - Post Datism.
 - Bad Obstetric History.
 - Rh-Isoimmunized Pregnancy.
 - Gestational Diabetes Mellitus.
 - Elderly Primigravida.

Exclusion Criteria

- Pregnancies complicated with lethal congenital anomalies of the foetus.
- Multiple gestation.

Consent was taken from patients after explaining the procedure. A detailed history and thorough clinical examination was done. The patients were then evaluated with biophysical profile testing. A score of 2 was given to each of the 5 normal biophysical profile parameters and score of "0" was given to abnormal parameters. The test was repeated weekly or biweekly as per the severity of the high risk factors and biophysical profile score.

Patients were Managed according to Following Protocol

- A score of 10/10 or 8/10 with normal amniotic fluid volume was considered normal. Patients were followed with weekly biophysical profile and delivered at term.
- A score of 6/10 was considered suspicious for foetal hypoxia. The biophysical profile test was repeated at 24 hours, if biophysical profile score still came $\leq 6/10$, pregnancy was terminated irrespective of gestational age.
- A score of $\leq 4/10$ indicated probability of foetal hypoxia. The test was extended over a period of 30 minutes to 120

minutes and if biophysical profile score still came $\leq 4/10$, pregnancy was terminated irrespective of gestational age.

Perinatal outcome was assessed in relation to the results of last biophysical profile score. Low Apgar score ($\leq 7/10$), need for resuscitation in new-borns, neonatal intensive care unit admission and perinatal mortality were considered indicators of poor perinatal outcome.

OBSERVATIONS AND RESULTS

200 patients were included in the study. The mean age of patients was 28.7 ± 4.2 with a range of 23-29; 105 patients (52.5%) were primigravida and 95 patients (47.5%) were multigravida. Mean gestational age of patients at admission was 37.7 weeks. The biophysical profile was normal ($\geq 8/10$) in 132 (66%) and abnormal ($\leq 6/10$) in 68 cases (34%). Among 132 cases with normal last BPP score ($\geq 8/10$), 8 (6.1%) babies had low Apgar score at birth, 10 (7.6%) babies needed resuscitation, 3 (2.3%) babies were admitted in NICU while as there was only 1 (0.8%) perinatal death; 68 cases had low last biophysical profile score ($\leq 6/10$) among which 59 (86.8%) babies had low Apgar score at birth, 52 (76.5%) babies needed resuscitation, 31 (45.6) were admitted in NICU and there were 3 (4.4%) perinatal deaths. Statistically significant association was found between last biophysical profile score and low Apgar score at birth, need for resuscitation, NICU admission and perinatal mortality.

Risk Factors	N	%
Pregnancy-Induced Hypertension	137	68.50
Intrauterine Growth Retardation	43	21.50
Oligohydramnios	72	36.00
Gestational Diabetes Mellitus	10	5.00
Post Datism	14	7.00
Bad Obstetric History	7	3.50
Rh-Isoimmunized Pregnancy	4	2.00
Elderly Primigravida	3	1.50

Table 1: Risk Factors Present in the Studied Subjects

		n	%
BPP Score (Total)	4/10 (low)	20	10.0
	6/10 (low)	48	24.0
	8/10 (normal)	112	56.0
	10/10 (normal)	20	10.0
BPP Score (Total)	Low ($\leq 6/10$)	68	34.0
	Normal ($\geq 8/10$)	132	66.0

Table 2: Last Biophysical Profile Score of the Studied Subjects

	Last Biophysical Profile Score				p value
	Normal (≥8/10)		Low (≤6/10)		
	n	%	n	%	
Apgar Score	8	6.1	59	86.6	0.001 (sig)
Resuscitation	10	7.6	52	76.5	0.001 (sig)
Admission to NICU	3	2.3	31	45.6	0.001 (sig)
Perinatal Mortality	1	0.8	3	4.4	0.001 (sig)
Poor Perinatal	13	9.8	59	86.8	0.001 (sig)
Table 3: Last Biophysical Profile Score across Perinatal Outcome					

DISCUSSION

The present study was done to evaluate the role of biophysical profile in high risk pregnancy. In the present study the age of studied subjects was 28.7 years, 52.2% patients were primigravida. The most common risk factor present was pregnancy-induced hypertension (68.5%) followed by oligohydramnios (36.0%) and IUGR (21.5%). Almost similar results were seen by Manning et al. (1981).⁸ and Jimenez Solis G et al.⁹ in their study.

Present study showed that 90.2% cases with normal last biophysical profile score had good perinatal outcome. Apgar score at birth was normal ($\geq 7/10$) in 93.9% of babies whose mother had normal last BPP, while as 7.6% babies required resuscitation and only 2.3% babies were admitted in NICU. There was only 1 perinatal death among cases with normal last BPP. The cases with low last BPP score showed poor perinatal outcome in 86.8% cases, 76.5% babies needed resuscitation, 45.6% needed NICU admission and 4.4% babies had perinatal death. A cumulative sensitivity of 86.8%, specificity of 90.2%, PPV OF 81.9% and NPV of 93% was observed for low last BPP score in predicting poor perinatal outcome. Thus, we found an overall accuracy of 89% with low last BPP score to predict foetus jeopardy. The results of our study were consistent with studies of Urbankova et al.¹⁰ In a study done by Manning FA et al.¹⁰ 6 perinatal deaths occurred in the study group. Nadeem Ullah et al.¹¹ has done a study in which sensitivity of BPP was 79.1%, specificity was 92.9%, predictive value for a positive test was 98.55%, predictive value for a negative test was 41.93%.

CONCLUSION

Biophysical profile is an effective method for antepartum foetal surveillance, which can predict intrauterine foetal hypoxia with reasonable accuracy. Normal biophysical profile score has a good predictive value for good perinatal outcome. Low biophysical profile score is associated with low Apgar score at birth, increased need for newborn resuscitation, increased neonatal intensive care unit admission and increased perinatal mortality.

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