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Original Article

Biophysical profile: An effective technique for predicting the foetal outcome

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Abstract :

Background: Maternal perception of foetal movement is one of the first signs of foetal life and is regarded as a manifestation of foetal wellbeing. Ultrasound imaging has broadened the scope of foetal assessment.

Objective : Evaluation of biophysical profile as an effective technique for the assessment of foetal condition and to improve foetal outcome by early detection of foetal hypoxia.

Study design and setting: This descriptive study was carried out for a period of one year from July 2009 to June 2010 in the department of Obstetrics and Gynaecology in Dhaka National Medical College Hospital (DNMCH).

Patients and methods : This study was carried out on all high risk pregnant patients including decreased foetal movements who were admitted from 34-42weeks during the study time. One hundred and sixty patients were selected and their BPP score was recorded and were followed till delivery. Those who went into spontaneous labour and who were induced monitored during labour and at any sign of foetal distress immediate caesarean section was performed. Apgar score of newborn was noted at one and five minutes and those having poor score were resuscitated and followed till one week after delivery. Apgar score was compared with biophysical score (BPS).

Results : In this study we performed biophysical profile in160 patients. Among them 62 patients were primigravidae and 98 were multigravidae. Out of 160 patients 146 were at term and 14 were preterm. In this study 108 had a BPP score of 10/10, 42 patients had a score of 8/10, and 10 patients had a score of 6/10.Majority of patients with normal biophysical score of 8-10/10 had good APGAR score. The rate of caesarean section was 73.75%. Concerning foetal outcome, 85% of cases with good outcome, low APGAR score at five minutes (<7/10) in 15% of cases, meconium staining in 16.25% cases, birth asphyxia in 10% of cases.

Conclusion : The foetal BPP is highly accurate and appears to be an effective technique for assessment of foetal condition.

Key words: Biophysical profile, decreased foetal movement, high risk pregnancy, APGAR score.

Introduction :

A pregnancy is defined as high risk when there is likelihood of an adverse outcome to the woman and or her baby that is greater than the incidence of that outcome in the general pregnant population[1]. Maternal appreciation of foetal life has been, since ancient times, a traditional indication that the pregnancy progression is normal. Ultrasound imaging has broadened the scope of foetal assessment[2]. Dynamic real time B-mode ultrasound is used to monitor cluster of variables, both dynamic and static collectively termed as biophysical profile (BPP) [3].The biophysical profile (BPP) is a non invasive test that predicts the presence or absence of foetal asphyxia and ultimately the risk of foetal death in the antenatal period. When the BPP identifies a compromised foetus, measures can be taken to intervene before progressive metabolic acidosis leads to foetal death[4].The BPP combines data from two sources, i.e., ultrasound imaging and foetal heart rate monitoring .Ultrasound is used to observe several types of foetal movements and to measure amniotic fluid. The foetal heart rate (FHR) is obtained using a pulsed Doppler

transducer. Each of these five parameters is given a score of 0(=suboptimal) or 2 (=normal) points for each parameter giving a maximum score of 10[5].The goal of antepartum fetal surveillance is to identify the healthy fetus and the fetus at risk of death[6]. Fetal surveillance should effectively identify the fetus exposed to intrauterine hypoxia and may therefore improve fetal outcome[7]. The BPP has become a standard tool for providing antepartum foetal surveillance. Biophysical profile includes following variables: (a) Fetal breathing movements (b) Fetal gross body movements (c) Fetal tone (d) Reactive fetal heart rate and (e) Amniotic fluid index. There is convincing data that during hypoxia and acidosis the earliest biophysical activity to become compromised are foetal heart reactivity and foetal breathing movements[8]. Maternal perception of good fetal movement is considered as a manifestation of fetal wellbeing[9].Inability to count 10 fetal movements in a 12 hour period was associated with increased risk of fetal death[10]. Maternal concern for decreased foetal movement (DFM) is a frequent cause for unscheduled antenatal consultations, occurring in approximately 10% of third-trimester pregnancies[11,12].In case of DFM in third trimester, screening for foetal vitality remains necessary through study of foetal heart rate and the foetal BPP[13].The role of sonographic biophysical profile in intrapartum foetal surveillance is established in high risk pregnancies and it has been found to be associated with significant reduction in incidence of cerebral palsy compared with an untested population (1.33 per 1000 versus 3.68 per 1000)[14]. The BPP should not be performed in fasting state, as hypoglycaemia reduces fetal activity[15]. The BPS $\leq$ 6 has significant association with neonatal morbidity[16].

Patients and methods :

This study was conducted in the Obstetrics and Gynaecology department of Dhaka National Medical College Hospital from July 2009 to June 2010. All singleton pregnant women between 34-42 weeks admitted for sluggish foetal movement and high risk pregnant patients, before the onset of labour were included. Women with known medical disorders, with congenital foetal anomalies and those admitted for elective LUCS were excluded. One hundred and sixty patients were evaluated with detailed history and clinical examination. Non stress test has been done for all patients (considered as reactive when two accelerations of fetal heart with fetal movements, non reactive when no accelerations or less than two movements in a 20 minutes period) and the BPP score was recorded (in the ultrasound department of DNMCH which includes: fetal breathing movement, gross body movement, fetal tone, reactive fetal heart rate and amniotic fluid volume) and were followed till delivery. Those who went into spontaneous labour and who were induced monitored during labour and at any sign of foetal distress immediate caesarean section performed. APGAR score of the newborn was noted at one and five minutes and those babies having poor APGAR score were resuscitated immediately and shifted to neonatal care unit and were followed till one week after delivery. After delivery APGAR score was compared with biophysical score (BPS).The collected information was entered in SPSS version -16 and analysed. For detecting the association of categorical outcome chi square (x^2) test was applied at P value of 0.05 or less.

Results:

Table -I: Demographic characteristics :

Demographic character		**Number (N=200)**	**Percentage (%)**	**Mean ±SD**
Maternal age (years)	16-20	26	16.2	24.82±4.25
	21-25	68	42.5	
	26-30	56	35.0	
	31-35	08	5.0	
	36-40	02	1.2	
Gravidity	Primi-Gravida	62	38.80	1.86± .835
	Multi-Gravida	98	61.25	
Weeks of gestation (weeks)	34-36	14	8.75	38.49±1.42
	>36-38	62	38.80	
	>38-40	66	41.25	
	>40-42	18	11.25	
Birth Weight (kg)	<2 kg	02	1.25	2.85± .392
	2-<2.5kg	24	15	
	2.5-2.9kg	62	38.75	
	3-3.5kg	64	40	
	>3.5-4kg	06	3.75	
	>4kg	02	1.25	

Amniotic fluid index (AFI) in cm.	4-6cm	9	5.63	11.53±3.42
	6.1-8cm	12	7.5	
	8.1-10cm	34	21.25	
	10.1-14cm	78	48.75	
	14.1-17cm	23	14.38	
	17.1-24cm	4	2.5	
Last BPP to delivery interval (in hours)	2-6hrs	44	27.5	21.01±18.44
	7-12hrs	26	16.25	
	13-24 hrs	66	41.25	
	25-48hrs	12	7.5	
	49-72 hrs	12	7.5	

During the study period 160 high risk pregnant patients were examined through clinical and sonographic biophysical profile. The maternal and foetal demographic characteristics are expressed in Table –I. Patients ages were in the range of 16-40 years. Mean maternal age was 24.82±4.25 years. Out of 160 patients 62 (38.8%) were primigravidae and 98 (61.25%) were multigravidae. Most of the cases presented were at 37-40 weeks of gestation making 80.05% of the total and 8.75% of the patients were between 34-36 weeks of gestation making P –value <0.05 which is statistically significant showing that birth asphyxia may be more common at this gestational age in the present study. Mean gestational age was 38.49±1.42. Last BPP to delivery interval was within 72 hours with a minimal interval of 2-24 hours. The mean amniotic fluid index (AFI) was 11.53±3.42. In 134(83.75%) cases neonatal birth weight was normal except in 26(16.25%) cases where birth weight was <2.5 kg with a mean of 2.85± .392 kg.

Table-II: Indications for biophysical profile scoring (n=160)

Indications	Number of patients	Percentage (%)
Hypertension	04	2.5
Diabetes mellitus	06	3.8
PIH/ preeclampsia	15	9.4
Decreased foetal movement	103	64.4
Postdated pregnancy	14	8.8
IUGR	12	7.5
PROM	06	3.8

The most common obstetrical indications for antepartum evaluations are mentioned in table –II. Here major indications were decreased foetal movement (64.4%).In 9.4% of cases BPP was done in patients having pregnancy induced hypertension (PIH) and preeclampsia.

Table-III: Distribution of cases by biophysical profile score

Biophysical profile score	Number of patients	Percentage (%)
10	108	67.5
8	42	26.2
6	10	6.2

Table –III shows that out of 160 patients 108 (67.5%) had normal BPP (10/10) and 26.2% had a BPS 8/10. Ten patients (6.2%) had scores of 6/10.

Table-IV: Distribution of cases by mode of delivery

Mode of delivery	Number of patients	Percentage (%)
Vaginal delivery	42	26.25
Caesarean section	118	73.75
a. Elective	42	35.59
b. Emergency	76	64.41

The mode of delivery was shown in table –IV. Here 42 (26.25%) patients had vaginal delivery and 118 (73.75%) cases delivered by caesarean section.

Table –V: Indications of caesarean section.

Indications	Number of patients	Percentage (%)
Severe PIH, Preeclampsia	14	11.86
Diabetes mellitus	04	3.39
IUGR	12	10.17
Intrapartum foetal distress	24	20.34
Severe Oligohydramnios	08	6.78
Previous H/O caesarean section with decreased foetal movement	20	16.95
Failed induction	22	18.64
CPD with reduced foetal movement	14	11.86

Table-V shows indications for caesarean deliveries. Here preeclampsia, intrapartum foetal distress, decreased foetal

movement in patients with H/o previous caesarean section and CPD.

Table-VI: The foetal outcome

Foetal outcome	Number	Percentage (%)
APGAR Score:		
≥*7/10*	136	85
<7/10	24	15
Meconium staining	26	16.25
Birth asphyxia	16	10
IUGR	12	7.5
Premature	14	8.75
Neonatal jaundice	16	10
Neonatal infection	06	3.75

The foetal outcome is shown in table –VI. It revealed that out of 160 cases, 85% babies were with good perinatal outcome, low APGAR score was in 15% of cases. Meconium staining liquor was found in 26% of cases .Birth asphyxia developed in 16 (10%) of cases. They were resuscitated and shifted to neonatal ward for delayed crying. Neonatal jaundice was found in 10% of babies and 3.75% had neonatal infection.

Table –VII: Correlation of biophysical profile and decreased foetal movement (n=103)

Biophysical profile score	No. of patients with decreased foetal movement	Percentage
10/10	72	69.9
8/10	25	24.3
6/10	06	5.8

***X^2*= 14.794 *P value* <0.05**

Table –VII reveals correlation of BPP with decreased foetal movement. Here 72(69.9%) of patients with decreased foetal movement had normal BPP score of 10/10, 24.3 % had score of 8/10 and 6 (5.8%) of patients were with score 6/10.

Table –VIII: Distribution of neonatal morbidity among biophysical scores

Biophysical profile score	APGAR Score >7/10	APGAR Score (<7/10)
10	100 (62.5%)	8 (5%)
8	32 (20%)	10 (6.2 %)
6	4 (2.5)	6 (3.8%)

***X^2*=23.322 *P value* <0.05**

Distribution of neonatal morbidity among biophysical profile is shown in table-VIII. Here out of 160 cases 100 (62.5%) had a normal biophysical score of 10/10 and had a normal perinatal outcome with 5 minutes A/S >7/10, 32 (20%) had BPS 8/10 with normal perinatal outcome and 2.5% of cases had A/S <7/10 with BPS 6/10.

Discussion :

Antepartum foetal surveillance is used to identify potential foetal jeopardy. The introduction of foetal surveillance programmes have resulted in dramatic lowering of stillbirth rates. A significant reduction or sudden alteration in fetal movement is a potentially important clinical sign. It has been suggested that reduced or absent fetal movement may be a warning sign of impending fetal death. Studies of fetal physiology have demonstrated an association between DFM and poor perinatal outcome[17]. The majority of women (55%) experiencing a stillbirth perceived a reduction in fetal movement prior to diagnosis[18]. The rate of foetal demise in unmonitored high risk pregnancies is 10-30 per 1000; with antepartum surveillance the rate is reduced to 1-3 per 1000,which is lower than the unmonitored low risk pregnancies (2-4 per 1000)[19]. Bobby in 2003 proposed the combined assessment techniques (using the five parameters of BPP) to evaluate antepartum fetal risks as more accurate of assessing fetal health than any single variable including non stress test[20]**.** Johnson et al, in her study on BPP in the management of post term pregnancy found an increase in perinatal morbidity in fetuses exhibiting an abnormal BPP, when compared to a group of fetuses with normal BPP[21]. This study is very much comparable to our study where abnormal BPP associated with increased perinatal morbidity. In contrast to other study which concluded that DFM is normal as the pregnancy approaches term[22]**.** In this study, more than 80% were term gestation as term defined as 37 completed weeks and there was considerable perinatal morbidity with DFM.

The rate of caesarean section in our set up was 73.75% which was high. The reasons for high incidence of caesarean section was due to obstetrics indications like severe preeclampsia, oligohydramnios, IUGR, failed induction and reduced foetal movement in patients with repeat caesarean section. The higher rate of sections may also be due to fear of litigation, by the choice of the patient and possibly because of lack of foetal blood sampling in our labour room so that in cases of foetal compromise emergency caesarean section had been done. Perinatal morbidity was low in patients having good BPP score in the current study which was comparable to the results of English JD conducted in North West Armed Forces Hospital[23, 24]**.** This study showed that the patients having poor BPP score, delivered babies with low APGAR score. However, despite the complaints of decreased foetal movements, most of the patients had normal BPP score and babies delivered with good APGAR score. It means BPP effectively detected those patients who really needed early intervention and thus avoiding unnecessary induction and caesarean sections with related mortality.

Conclusion :

The goal of antenatal surveillance is to prevent foetal injury and death. The role of biophysical profile in intrapartum surveillance is established in high risk pregnancies and it has been found to be associated with significant reduction in incidence of cerebral palsy compared with an untested population. In our clinical setup we don't have facilities for cord blood p^H, so BPS is a good non invasive test to detect foetal hypoxia at early stage and saves the life of babies. In our study we found a significant correlation between DFM and poor fetal outcome. Proper clinical evaluation and BPP assessment is indicated in any patient presented with DFM so that fetal hypoxia can be detected early before fetal death. It is recommended that health institutions involved with obstetric care should incorporate the BPS system in their protocol, but for obstetrical intervention we should not depend solely on BPP and clinical assessment is mandatory.

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