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FETAL BIOPHYSICAL PROFILE;
AS A TOOL TO PREDICT FETAL OUTCOME

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ABSTRACT... To evaluate fetal Biophysical Profile as an effective technique for the assessment of fetal condition and to improve fetal outcome by early detection of fetal hypoxia. **Design:** Co relational study: **Place and Duration of Study:** The study was carried out for a period of one year from Oct 2004-Oct 2005 at Obstetrics and Gynecology Department of Fatima memorial hospital Lahore. **Patients and Methods:** All patients with history of sluggish fetal movements and clinical suspicion of IUGR, were underwent BPP from 32-42weeks. 100 patients were selected and their BPP score was recorded and were followed till delivery. Those who went into spontaneous labor and who were induced monitored during labor and at any sign of fetal distress immediate caesarean section performed. APGAR score of newborn was noted at one and five minutes and those having poor APGAR score were resuscitated and were followed till one week after delivery. APGAR score was compared with BPP score. **Results:** During this study 100 BPP were performed. 34patients were primigravidas and 66 were multigravidas. Among 100 patients 73had a BPP score of 9-10/10, 21 patients had a score of 7-8/10 and 6 patients had 4-6/10.In 2 patients with 4/10score emergency caesarean section led to the delivery of neonates with APGAR score of 8 at 5 minutes. Majority of patients with normal BPS of 8-9/10 had good APGAR score of 7-8/10.Only 8 patients having BPP of 9-10/10 had poor APGAR score 6/10 or <6/10. **Conclusion:** The fetal BPP appears to be an effective technique for assessment of fetal condition.

Key words: Biophysical profile, fetal hypoxia, APGAR score.

INTRODUCTION

The biophysical profile (BPP) is a non invasive test that predicts the presence or absence of fetal asphyxia and ultimately the risk of fetal death in the antenatal period. When the biophysical profile identifies a compromised fetus, measures can be taken to intervene before progressive metabolic acidosis leads to fetal death[1].

Biophysical profile combines data from ultrasound and fetal heart rate monitoring.

Ultrasound is used to observe several types of fetal movements, and to measure amniotic fluid. The fetal 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.

Fetal surveillance should effectively identify the fetus exposed to intrauterine hypoxia and may, therefore improve fetal outcome[2].

The impact of high resolution dynamic ultrasound imaging on the development of the science of fetology can not be over estimated. It can also be used to gauge the current fetal condition by evaluating fetal biophysical profile parameters, which include fetal breathing, gross movements, fetal tone and amniotic fluid volume. The combination of traditional modes fetal assessment, fetal heart rate monitoring, with ultrasound examination of fetus has provided obstetricians with the ability to directly examine intrauterine patient[3,4].

The goal of antepartem fetal surveillance is to identify the healthy fetus and the fetus at risk of death[5].False negative results in cases of subsequent fetal death reflects events that are subsequent to the last normal test results[6].

Biophysical profile includes following variables:

A. Fetal breathing movements
B. Fetal gross body movements
C. Fetal tone

D. Reactive fetal heart rate
E. Amniotic fluid index

Since the introduction of biophysical score (BPS) into perinatal medicine over 16 years ago by Manning et al, a number of clinical studies to assess the values and applications of BPS, have been carried out with impressive results. The potential benefits of BPS in the reduction of perinatal mortality have also been noted[7,8].

In our setup, other methods of fetal surveillance like cardiotocography, Doppler, ultrasound and Amniotic fluid index are used, but I wanted to assess BPS as only effective predictor of neonatal outcome. Keeping in mind the large number of booked patients admitted through OPD, this study became desirable for selecting the mode of delivery and assessment of fetal outcome. Thus BPS was used as screening procedure to determine the fetal wellbeing in this group of patients.

PATIENTS AND METHODS

This study was conducted in Obstetrics and Gynecology Department of Fatima Memorial Hospital, Lahore from Oct 2004- Oct 2005. All booked singleton pregnant women between 32 – 42 weeks admitted for sluggish fetal movements and clinical suspicion of IUGR, before the onset of labour were included. Women with known medical disorders, with congenital fetal anomalies and those admitted for elective LSCS were excluded. One hundred Patients were evaluated with detailed history and clinical examination was done. The confounding variables i.e. dehydration, hypoglycemia, expertise were controlled by matching. Their BPS was recorded and these patients were followed till the time of delivery. Those who went into spontaneous labour and those who were induced vigilantly monitored during labour and at any sign of fetal immediate C- section performed.

Those with BPS score of 8 were regarded as having normal BPS. Most of the patients admitted for evaluation and further care, if not in labour were sent back and checked weekly on out patient basis until they went into spontaneous labour or were induced due to poor BPS. Early ARM done during labour with poor BPS and if meconium stained liquor drained, decelerations on CTG, emergency LSCS was performed.

APGAR score of the new born was noted at one and five minutes and those babies having poor APGAR score, were resuscitated immediately and shifted to nursery and were followed till one week after delivery. After delivery APGAR score were compared with BPS. The collected information was entered in SPSS version -10 and analysed .Two observations of the BPS and APGAR score were compared for agreement and disagreement in a 2x2 table. For detecting the association of categorical outcome chi square (x^2) test was applied at P value of 0.05 or less.

RESULTS

Among 100 patients included, 34 were primigravidas and 66 were multigravidas. Commonest indication for BPS was decreased fetal movements in 46 patients followed by IUGR. Most of the cases presented were at 39-41 weeks of gestation; making 60% of the total and 28% of patients were between 36- 38 weeks, making P- value < 0.05 and (x^2 = 4.6) which is statistically significant showing that mostly the fetal distress may be more common at this gestational age in the present study. 50% of patients delivered by emergency LSCS and 43% delivered vaginally, 7% delivered by instrumental delivery. Out of 100 patients, 73 had BPS of 9 – 10/10, and 21 had BPS of 7-8/10, 4 patients scored 5-6/10 and 2 had BPS of 4/10. In one of the two patients with 4/10 BPS emergency cesarean section was performed on the same day and baby with APGAR score of 8 at five minutes was born. Second case had 37 weeks fetus with severe IUGR corresponding to 32 weeks of gestation. Emergency LSCS delivered baby with APGAR score of 6 requiring immediate resuscitation and was shifted to nursery.

Majority of the patients with normal BPS i.e. 8-9/10 were having good fetal APGAR score i.e. more than 7-8/10. Only eight patients having BPS of 9-10/10 had APGAR

Table-I. Distribution of cases by duration of pregnancy

Duration (weeks)	No. of patients	%age
33-35	05	5.0%
36-38	28	28.0%
39-41	66	66.0%
42	01	1.0%

$X^2 = 4.6$ $P<0.05$

Table-II: Distribution of cases by Complaints

Complaints	No. of patients	%age
Sluggish fetal movements	46	46.0%
No complaints	10	10.0%
Labour pain	11	11.0%
Pregnancy induced hypertension	09	9.0%
Post dated	06	6.0%
Others	10	10.0%

$X^2 = 6.7$ * $P<0.01$

score of 6 or less than 6/10, showing that with normal BPS good fetal outcome was observed. Out of 21 patients with BPS of 7-8/10, ten babies had APGAR score of 8/10, ten were having 7/10 APGAR score and only one had a score below 6/10.Two babies with normal BPP 9-10/10 delivered by C- section due to meconium stained liqour put on ventilator, died in early neonatal period. They had poor APGAR and were diagnosed having (MAS).

Two patients having a normal BPS of 9-10/10 delivered with APGAR score of less than 6/10, delivered by caesarean section thus showing that there was no significant statistical difference between BPS and APGAR score at birth. Reason for poor APGAR was found to be tight Cord around neck in one case and sudden abruption in other case. There was no single inutero death in those with normal BPS in current study, showing the effectiveness of BPS in detection of fetal

Table-III: Distribution of cases by history of sluggish fetal movements

Hours	No. of patients	%age
Normal /24 hours	04	4.0%
1-2	41	41.0%
3-4	07	7.0%
5-7	05	5.0%

$X^2 = 7.2$ * $P<0.01$

Table-IV. Distribution of cases by cardiotocography (CTG)

Results	No. of patients	%age
Decelerations	11	11.0%
Non-reactive	22	22.0%
Reactive	67	67.0%

$X^2 = 4.3$ $P<0.05$

hypoxia. Six babies with pregnancy induced hypertension (PIH) and sluggish fetal movements, delivered by C–section due to poor BPS, three were meconium stained and all survived due to early intervention. 22 babies were meconium stained, 15 had normal BPP. Twelve cases were having cord around neck; four cases had placental calcifications due to PIH leading to placental insufficiency. In one case due to sudden abruption baby went on ventilator and died due to severe hypoxia. In four cases no significant cause of fetal distress could be appreciated. Three babies with APGAR of 5/10 and 6/10 with two of them having BPP of 10/10 and one with 7/10 were sent neonatal intensive care as they were pre-term.

DISCUSSION

Manning and colleague in 1980 proposed the combined use of 5 fetal biophysical variables as a more accurate mean of assessing fetal health than any single variable used alone could significantly reduce both false positive and false negative rates[3].

Table-VI. Correlation of BPS with C-section rate

No. of Patients	BPS	Vaginal deliveries	C-sections	C-section	Instrumental deliveries	C-section rate
73	9-10/10	42		29	02	39%
27	4-8/10	01		21	05	77%

Table-V: Fetal Outcome

Outcome	No. of patients	%age
Good	62	62.0%
Meconium stained	14	14.0%
Asphyxiated	06	6.0%
Meconium stained + ventilator assisted	05	5.0%
Ventilator assisted	04	4.0%
Asphyxiated + meconium stained	03	3.0%
Others	06	6.0%

$X^2 = 6.82$ *P<0.01

Fig-2. Distribution of cases by mode of delivery

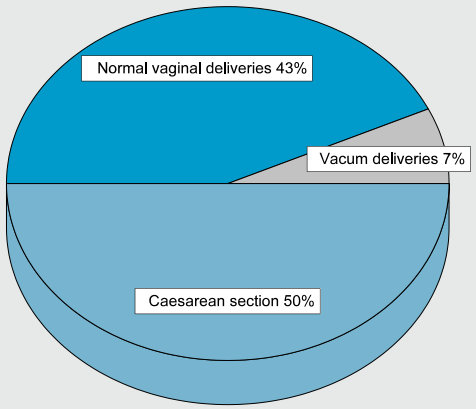
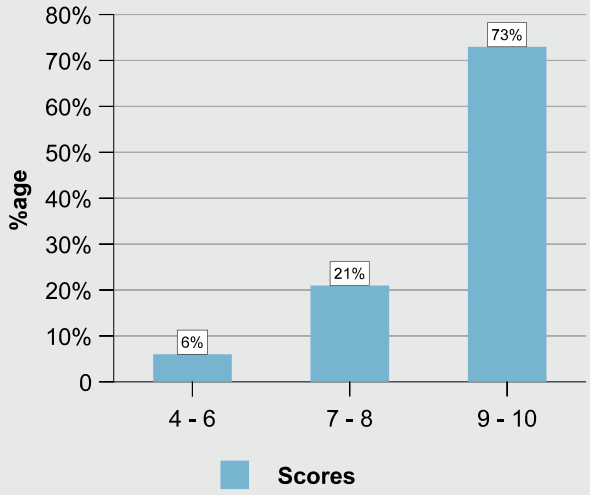


Fig-3. Distribution of cases by biophysical profile score



Abnormal BPS is associated with an increase in perinatal morbidity and possibly an increase in perinatal mortality as well; if no prompt action is taken to deliver the infant. A pregnant lady is four times more likely to be delivered by cesarean section when the BPS is abnormal, than when it is normal.

The confidence built around BPS has led some institutions to base their antenatal fetal risk determination on composite fetal biophysical profile score[9,10] while others have confidently managed pregnancies at 42 weeks gestation and above with normal BPS conservatively, while awaiting spontaneous onset of labour[11].

Abnormal deliveries (vacuum) also constituted 7% of the deliveries. These figures were not however; statistically significant but the odds ratio revealed a two and three fold increase in the likelihood of vacuum deliveries

Johnson,[11] in her study on BPS in the management of post-term pregnancies found substantial and significant increase in the incidence of fetal distress, low APGAR score and neonatal morbidity in fetuses exhibiting abnormal BPS, when compared to a group of fetuses with normal BPS. This study is very much comparable to

the results of Johnson[11] in which patients with poor BPP showed hypoxic babies requiring ventilation and prolonged nursery care afterwards.

Vintzileos and colleagues evaluated the relationship between biophysical profile and umbilical cord pH in patients undergoing cesarean section before the onset of lobour. Their data suggested a significant relationship between biophysical profile scoring and fetal acid-base status[12]. The fetal heart rate reactivity center and the fetal breathing center cease functioning when pH was lower than 7.2, the centers controlling movements and tone began to malfunction at pH 7.1 to 7.2 and were completely abolished at pH below 7.10. Hence, it seems that the initial manifestations of fetal acidosis are non reactive fetal heart rate and loss of fetal breathing while in advanced fetal acdemia; fetal movements and tone are compromised[13]. Vintzileos reported 42.8% perinatal death rate in fetuses without fetal tone[14]. In this study cesarean section was performed in 4 patients before the onset of labour due to very poor BPP i.e. < 4-6/10 (out these four, two expired and other two survived). Perinatal mortality was 50% which is comparable to Vintzileos[13] showing 42.8%. This might be due to greater number of patients selected by Vintzileos.

Perinatal morbidity and mortality was low in patients having good APGAR score in current study comparable to results English JD[15,16], conducted in North West Armed Forces Hospital.

This study showed that the patients having poor BPS, delivered babies with low APGAR score. However, despite the complaints of decreased fetal movements and clinically smallish babies, most of the patients had normal BPS and babies delivered with good APGAR score. It means BPS effectively detected those patients who really needed early intervention and thus avoiding unnecessary inductions and cesarean sections with related morbidity.

CONCLUSIONS

In our clinical setup we don't have facilities for cord blood pH, so BPS is a good non invasive test to detect fetal hypoxia at early stage and saves the life of babies. Fetal biophysical profile was found to be an effective technique for the assessment of fetal condition. It may offer advantages over other traditional methods of fetal surveillance and monitoring for which further intervention and work in different settings is required. It is recommended that health institutions involved with obstetrics care should incorporate the BPS system in their protocol, but sole dependency for obstetrical intervention should not depend only on BPP and clinical assessment is mandatory.

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