

Role of Modified Biophysical Profile in Antenatal Fetal Surveillance

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Abstract

Background: The development and perfection of specific and accurate diagnostic tests for identification of fetus at risk of damage or death in utero has long been a major challenge for obstetrician and perinatologists. The primary objective of antenatal fetal assessment is to avoid fetal damage or death. **Aims and Objectives:** To evaluate efficacy of Modified Biophysical Profile as a practical method for antenatal fetal surveillance and to correlate it with perinatal outcome. **Materials and Method:** In the present study hundred high risk pregnant women were enrolled. Modified Biophysical Profile Score (MBPP) was performed in these high risk women and the outcome was judged by fetal distress in labor, presence of meconium stained amniotic fluid, 5 minute Apgar score, NICU admission and perinatal mortality. **Results:** Non stress test (NST) was found reactive in 75% women and nonreactive in 25% women. 65% women had an amniotic fluid volume (AFI) of >5 while 35% had an AFI of ≤ 5 cm. Abnormal MBPP score was found in 54% high risk women. In these, pregnancy was terminated either by induction (63.8%) or by performing elective cesarean (35.2%). 46% women had normal MBPP score. In this group 47.8% were left for spontaneous labor, 30.43% were induced and 21.7% were taken for elective cesarean due to various

reasons. Incidence of emergency cesarean was found more in group with abnormal MBPP (22.2%) as compared to group with normal MBPP (17.3%). Women with abnormal MBPP score had more chances of fetal distress (14.81%) as compared to those with normal MBPP (4.34%) (p value .0379 i.e significant). More babies with low Apgar score were delivered in group with abnormal MBPP score (22.22%) as compared to only 10.8% in group with normal MBPP score (p 0.285). One early neonatal death was observed in group with abnormal MBPP score. **Conclusion:** With the help of MBPP score we can identify those fetuses that are in a compromised state in utero and thus by timely intervention we can avoid fetal damage or death. It is relatively easy to perform, less time consuming, non provocative and thus can be safely used as a screening test for high risk pregnancies at tertiary as well as peripheral level.

Keywords: MBPP; NST; AFI; High Risk Pregnancies.

Introduction

One of the major goal of antepartum fetal surveillance is an appropriate and timely identification of the compromised fetus for better perinatal outcome. Fetal disease may be categorized into 3 broad group-fetal asphyxial state (acute or chronic), developmental and anomalies.

Early recognition of fetal asphyxia may permit intervention and thus prevention of fetal death. Monitoring of fetal biophysical activity has a critical role in identifying asphyxiated babies. Initially, asphyxia will cause a loss of acute variables (heart rate, reactivity, breathing, movement, tone) but

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amniotic fluid volume may be normal. Repeated episodes of hypoxia with recovery in between may cause oligohydramnios but acute variables may be normal. Progressive and severe asphyxia produces both oligohydramnios and loss of acute biophysical variables.

Introduced by Manning et al. in 1980 [5], the Biophysical profile (BPP) has been widely used as a means of antepartum fetal evaluation. The 5 components of biophysical profile are: non stress test, fetal breathing movements, fetal movements, fetal tone and amniotic fluid volume.

The main problem with the biophysical profile however, is the structure of the test, in which each of the five criteria is assigned a score of either 0 or 2 points, despite the possibility that each of those variables may have different importance in assessing the fetal situation. Other problem is that the BPP takes a long time to perform especially if a fetus with decreased biophysical activity is being examined. To obviate this difficulty various modifications have been proposed which takes less time to perform without compromising the diagnostic efficiency¹ such as the modified biophysical profile.

MBPP combines the observation of acute fetal hypoxia i.e. the non stress test and an indicator of chronic fetal problem i.e the amniotic fluid volume (Nagoette et al 1994) [2]. Improved discrimination of fetus which is not at immediate risk even in presence of risk factors to mother, permit selective conservative management. It is important to remember, however, that no test is ideal for all high risk fetuses.

Materials and Methods

The present study was conducted in dept of Gynae and Obs RMC JLN medical college and associated groups of hospitals, Ajmer in the year 2010. The subjects taken for study were antenatal women with high risk factors. Inclusion criteria was high risk singleton pregnancies of more than 36 weeks of gestation and exclusion criteria were multifetal pregnancies and previous cesarean.

100 high risk women with more than or equal to 36 weeks of gestation were included in the study group. A written informed consent was taken from the patients and all routine investigations were done. MBPP was performed on every woman. Briefly fetal heart testing was performed during the post prandial period with the women in semifowler's position (30° - 45°) with mother lying slightly on her left side. Fetal heart rate was recorded with an ultrasound transducer or cardiotocography machine.

A reactive NST demanded at least two FHR accelerations within a 10 minute period, both of which peaked ≥ 15 beats/min above the baseline and lasted at least 15 seconds.

In the absence of reactive pattern within 20 minutes, the fetus was stimulated by either abdominal palpation or administration of glucose containing beverage to mother and the test was prolonged for 40 minutes.

If acceleration was not seen even within 40 minutes of testing the pattern was deemed as nonreactive.

Spontaneous fetal heart deceleration during the NST was defined as those lasting at least 15 seconds with a decrease of at least 15 beats per minute from baseline.

Amniotic fluid volume estimation was done by sonography measuring AFI using the four quadrant approach described by Phelan et al (1987) [4]. The maximum vertical diameter of the largest fluid pocket excluding the umbilical cord or any other fetal part is measured in centimeters in each of the four quadrants and the measurement obtained was summed to obtain AFI.

2 points each were assigned for a reactive NST and AFI > 5 cm.

A point of 0 was assigned if NST was nonreactive or if the AFI ≤ 5 cm

If both NST and AFI were normal, the patient was left to undergo spontaneous onset of labor in most of the cases by properly monitoring their risk factors. However in some cases as in postdated, severe PIH labor was induced even though the test score was normal.

Any of the following were considered an indication for appropriate intervention

1. Decrease amniotic fluid volume
2. Non reactive NST.

Measurement of fetal outcome included incidence of meconium staining during labor, cesarean deliveries for fetal distress, 5 minute Apgar score < 7 , an admission in neonatal unit and perinatal mortality.

Observations

100 high risk antenatal women were enrolled in the study. The age of the patients was between 18-38 years with the mean of 23 ± 4.1 years. 52 women were primigravida. Maximum women were between the gestational age of 38.1 to 40 weeks. Various high risk groups were included in the study. Maximum patients were of PIH (28%) while only 2% cases each were of GDM, heart disease and third trimester bleeding.

Table 1: Distribution of women according to gestation age

S. No.	Gestational Age (Weeks)	No. Of Women
1	36-38	27
2	38.1 -40	59
3	≥40	14

Mean gestational age is 38.4±2.4 weeks

Table 2: Distribution of women according to NST

S. No	NST	No. Of Women
1	Reactive	75
2	Nonreactive	25

Table 3: Distribution of women according to AFI

S. No.	AFI (cm)	No. of Women
1	≤5	35
2	≥5	65

75 women had reactive NST whereas 25 women had non reactive NST (Table 2)

Total 35 women had an AFI of <5 cm and 65 had an AFI>5cm (Table 3)

6 women had an MBPP of 0 as they had both nonreactive NST and an AFI<5 cm. 46 women had a MBPP score of 4 and 48 had a score of 2 (Table 4).

Labor was induced in 49 patients because of various maternal and fetal indications. 22 women were left spontaneous and 29 females underwent elective cesarean (Table 5).

Table 4: Distribution of women according to Modified Biophysical Profile Score

S. No	MBPP Score	No. of Women
1	4	46
2	2	48
3	0	06

Table 5: Distribution of women in accordance with nature of onset of labor with respect to high risk factors and MBPP score

S. No	High risk factors	Normal MBPP (n=46)				Abnormal MBPP(n=54)				P value
		S	I	Elec. Lscs	total	S	I	Elec. Lscs	total	
1	PIH	2	2	2	6	-	20	2	22	0.0023
2	Postdatism	-	4	-	4	-	7	3	10	0.606
3	Rh Negative	1	4	-	5	-	2	1	3	0.673
4	GDM	-	-	1	1	-	-	1	1	-
5	BOH	5	-	3	8	-	-	4	4	-
6	IUGR	-	2	2	4	-	-	6	6	0.0497
7	Third trimester bleeding	-	-	1	1	-	-	1	1	-
8	Anemia	10	-	-	10	-	5	-	5	0.0001
9	Heart disease	2	-	-	2	-	-	-	-	-
10	Decreased fetal movements	2	2	1	5	-	1	1	2	0.8097
	Total	22 (47.8%)	14 (30.43%)	10 (21.7%)	46	0	35 (64.8%)	19 (35.2%)	54	0.0006

Thus mode of delivery was correlated with MBPP score (Table 6) and it was found that total 46 women had normal vaginal deliveries of which 26 had normal MBPP score and 20 had abnormal MBPP score. Instrumental deliveries were performed in 2 women with normal MBPP- one for fetal distress and other

for prolonged second stage of labor. 29 women underwent elective cesarean and emergency cesarean was performed in 20 women for various indications. In women with abnormal MBPP, instrumental deliveries were performed in 3 cases, 2 for fetal distress and one for prolonged second stage of labor.

Table 6: Correlation of mode of delivery with Modified Biophysical Profile Score

S. No.	Mode of delivery	Normal MBPP (n = 46)	Abnormal MBPP (n =54)
1	Vaginal (n=46)	26(56.3%)	20 (37.0%)
2	Instrumental Vaginal (n=5)	2(4.34%)	3(5.5%)
3	Elective LSCS (n=29)	10(21.7%)	19 (35.18%)
4	Emergency LSCS (n =20)	8(17.39%)	12(22.22%)
5	Total (n=100)	46	54

Of the 20 emergency cesarean 10 were done for fetal distress, of these 8 women were with abnormal MBPP score. Thus while comparing fetal distress as an indication for emergency cesarean with respect to MBPP, p value is .0379 (statistically significant).

Out of 100 women, 12 women had meconium stained amniotic fluid. Of these 4 women had MBPP Score of 0 and 6 had MBPP Score of 2 (p value 0.0298, statistically significant)

Apgar score was recorded at the end of 1 minute and 5 minute. Apgar score of <7 at 5 minute was

considered as an indication for admission to NICU. It was found that out of 54 women with abnormal MBPP score (0 or 2), 12 babies had Apgar score <7 at 5 minute whereas only 5 babies of 46 women with normal MBPP score (4) had an Apgar >7 at the end of 5 minute(p value 0.0283).

Total 23 babies required NICU admission. 18 babies were of women with abnormal MBPP score and 5 babies of 46 women with normal MBPP required NICU admission (p value.0078 statistically very significant) (Table 8).

Table 7: Correlation of indication for Emergency LSCS with MBPP

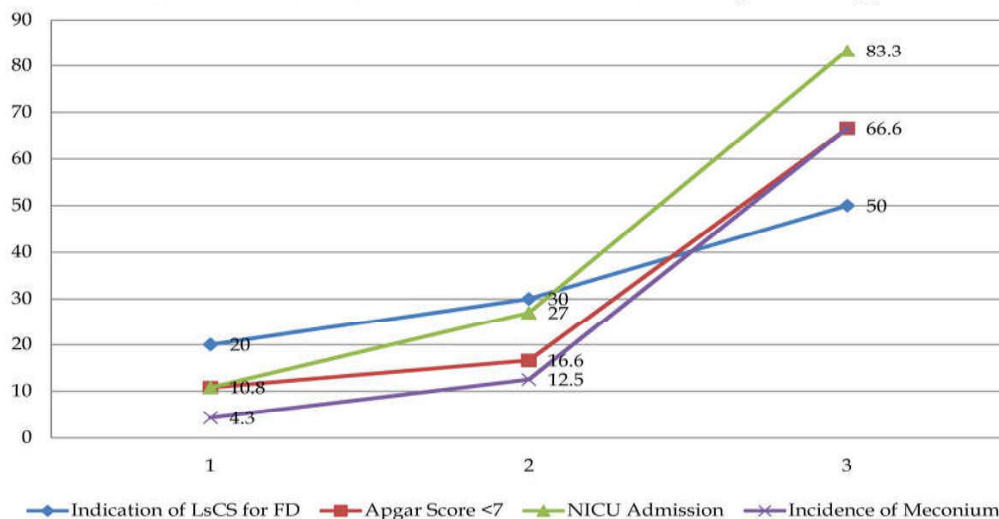
S. No	Indications	MBPP score	
		Normal(46)	Abnormal(54)
1	Fetal distress(10)	2(4.31%)	8(14.81%)
2	Others(10)	5(10.86%)	5(9.25%)

P value 0.0379

Table 8: Distribution of neonatal outcome variable with respect to MBPP score

S. No.	Neonatal Outcome	MBPP		
		4	2	0
1	Incidence of Meconium	4.3% (2)	12.5% (6)	66.6% (4)
2	Apgar score <7	10.8% (5)	16.6% (8)	66.6% (4)
3	NICU Care	10.8% (5)	27% (13)	83.3% (5)
4	Indication of LSCS for FD	20%	30%	50%

Distribution of Neonatal outcome Variable with Respect to Mbpp



It is evident from the above table that as the modified biophysical profile score decreased there was a progressive increase in the percentage of babies showing poor

prognostic variables like incidence of meconium, Apgar score <7 and NICU admission.

Only one neonatal death occurred in group with

abnormal MBPP score because of meconium aspiration.

Discussion

The art of obstetrics currently remains essentially the balancing and weighing of relative risks, culminating in a clinical management strategy. The advent of methods for monitoring of fetal biophysical activities and responses to stress in utero offers further means of refinement of relative perinatal risk. The purpose of this clinical study was to determine the relationship between the modified biophysical profile score and markers of perinatal morbidity and mortality among high risk obstetric women.

In our study, mean age of patients was 23 ± 4.1 years which was comparable to the study performed by Eden et al (1988) [11] and Kovit Compituk (2004) [12]. Mean gestational age in our study was 38.4 weeks (Table 1) while in the study by Manning et al (1987) [10] the mean gestational age was 36.4 ± 1.4 weeks. Most patients were from rural areas with poor antenatal care and so they visited health services late while in developed countries increased awareness about antenatal checkup and improved diagnostic modalities leads to early identification of such fetuses.

In present study NST was found reactive in 75% cases and nonreactive in 25% cases. Also of these 100 women 35% had an amniotic fluid index ≤ 5 and 65% had AFI > 5 . Thus MBPP score of 4 was seen in 46% women, 48% had score of 2 while 6% had both nonreactive NST and AFI < 5 and thus MBPP of 0 i.e 54% patients were with abnormal test results (Table 2,3,4). But in the study conducted by Clifford J Bochner et al (1987) [8] MBPP was normal in 80.9% patients and abnormal in 19.18% cases. While in the study by Robert D Eden et al (1988) [11] NST was found reactive in 95.8% cases and nonreactive in 4.1% cases. This difference may be due to difference in the size of study population.

In our study of the 46 patients with normal MBPP, 22 (47.8%) were left spontaneous, 14 (30.43%) were induced and 10 (21.7%) were taken for elective cesarean. While of 54 patients with abnormal MBPP, no patient was left spontaneous, labor was induced in 35 (63.8%) and elective cesarean was performed in 19 (35.2%) (Table 5). In the study by Robert D Eden (1988) [11] of the 285 patients with normal results 63.5% were left spontaneous and 36.4% were induced because of various maternal or obstetrical complications while of the 52 patients with abnormal results labor was induced in all (100%). Less induction in the group with abnormal test results in

our study may be due to the fact that we opted for elective lscs in those patients in which more than one high risk factor coexisted.

Table 6 shows that 46% women had normal vaginal delivery, 5% had instrumental deliveries and 49% had cesarean while in the study by Kovit Compituk et al (2004) [12] spontaneous vaginal deliveries were 57%, cesarean section was 26% and instrumental deliveries was 15%. Significant difference in the percentage of cesarean section between the present study and the study by Kovit Compituk et al may be because in our study we opted for elective cesarean section in most of the patients with abnormal MBPP score or in those in which various high risk factors coexisted. This table also shows that the number of emergency cesareans were more for patients with abnormal MBPP (22.22%). This was comparable to the study by Miller, Rabello et al (1996) [7] where the cesarean rate in the women with abnormal test results was 24%.

Table 7 in our study shows that out of 46 patients with normal MBPP score 2 patients (4.34%) were taken for emergency cesarean because of fetal distress while 5 patients (10.86%) were taken for various other indications. On the other hand out of 54 patients with abnormal MBPP score 8 patients (14.81%) underwent emergency cesarean because of fetal distress while 5 patients were taken for cesarean due to some other indications. The study results was comparable to the study performed by Clifford J Bochner et al (1987) [8] which also showed that more emergency cesarean were performed for fetal distress in cases with abnormal MBPP (16%) versus only 0.6% in cases with normal MBPP. Robert D Eden et al (1987) also found that more cesarean sections were performed for fetal distress in abnormal test group.

Table 8 represent the final outcome of the study. This table shows that as the modified biophysical profile score decreases there was a progressive increase in the percentage of babies showing poor prognostic variables like incidence of meconium, apgar score < 7 , increase admission to NICU and increase number of cesarean for fetal distress.

The sequential loss of biophysical variables yielding the range of equivocal to abnormal score results reflects the magnitude and the repetitive frequency of antepartum episodes of fetal hypoxemia and therefore serves as a marker of the degree of placental dysfunction.

Thus all markers of adverse perinatal outcome should increase as the test score falls. This was comparable to the study by Lawrence d platt et al (1985) [9] and FA manning et al (1990) [16].

Conclusion

The goal of any method of antepartum fetal surveillance is to identify that point in the natural progression of a perinatal disease process at which the risk attendant with continued fetal existence in utero exceed those of delivery and neonatal life.

Our study confirms that with the help of modified biophysical profile score we can identify those fetuses that are in a compromised state in utero and thus by timely intervention we can avoid fetal damage or death.

The modified biophysical profile score is relatively easy to perform and requires limited ultrasonographic experience. It is less time consuming, non provocative and thus can be safely used as a screening test for high risk pregnancy at tertiary level as well as in periphery.

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